8.5 Telecommunications Management Network (TMN)

8.5.1 Scope and Purpose

Telecommunications management is the subject of extensive study and specification activity in international standardization bodies. This work is known under the title of Telecommunications Management Network, or TMN. Conceptually, the TMN can be considered to be a supporting entity and framework that equips management with flexible and efficient ways to manage the day to day activities associated with operating telecommunications networks and services. TMN addresses the needs of management across the full range of activities to plan, provision, install, maintain, operate and administer telecommunications networks and services.

The overall targets of TMN are:

- to speed up telecommunications service provision to the customers, and
- to make all actions which are necessary to operate, sustain and administrate telecommunications more efficiently and cost effectively.

The underlying force that will drive TMN implementation from the network operator's point of view is cost optimization. However, there will clearly be benefits for the user in terms of faster and more flexible service provisioning, better quality of service, etc.

Network Operators are expected to evolve their networks towards TMN according to different migration paths depending on their network investment cycles and the availability of stable international standards. Due to the scale of TMN, the international standardization process is slow. Good progress has been made with Synchronous Digital Hierarchy (SDH) transmission technology which was the management domain that was the basis of the initial work in TMN standardization, that started in 1998. Work is now ongoing in other management domains, particularly traffic management. The TMN standardization program is expected to run for several years yet, and is not expected to be completed before the end of this decade. TMN is therefore expected to be introduced on a piecemeal basis, with most network operators first implementing SDH systems with TMN functionality.

Despite the slow rate of progress in standardization, TMN concepts have now achieved such a level of recognition and acceptance world-wide that it is essential that TMN be stitched into the strategy for the large scale development of the Syrian network. Clearly, it will be necessary to revisit the strategy based on how standardization and product development evolves. However, it must be an underlying assumption that the technical arrangements for (centralized) Operation and

Maintenance and Network Management of the Syrian network must at some point during the planning period be merged with the developing TMN.

In this context therefore, the objectives and scope of this plan are:

- to outline the framework for a future TMN in Syria,
- to provide guidance for the development towards the TMN.

8.5.2. Telecommunications Management Network (TMN)

(1) Scope of Telecommunications Management

Telecommunications management comprises all tasks related to:

- Service provision in general such as telephone service provision, data service provision and special services provision in an Intelligent Network (IN). (Note that the so called Service Management Function (SMF) is explicitly identified as one of the functional components in the IN architecture);
- Modification of service characteristics for services already operational in the network, such as the upgrading IN supported services;
- Service provision to the customer, which includes:
  - allocation of a subscriber number from the range of designated but not yet allocated numbers in the subscriber numbers administration system for the respective exchange and up-dating of that system,
  - allocation of a service profile according to the customer's requests,
  - actual subscriber initialization in the exchange,
  - allocation of a (physical) subscriber line from the pool of unallocated subscriber lines in the local cable administration system for the respective exchange area and updating of that system,
  - subscriber data and number registration for:

- charging and billing,
- the subscriber directory number inquiry service,
- subscriber directory editing,
- (automatic) line testing purposes,
- fault clearing purposes,
- statistics purposes;

- Modification of subscriber service profiles, including:

  – modification of the service profile as per the customer's requests,
  – new subscriber profile initialization in the exchange,
  – up-dating of the relevant subscriber data registers, as required, due to the subscriber profile modification;

- Sustaining service at the network level, including :

  – measuring, collecting, evaluating and presenting data on network availability and utilization for:

    - overall grade of service determination,
    - network management,
    - Signalling System No.7 (SS7) signalling network management,
    - network planning,
    - SS7 signalling network planning,

  – detecting, collecting, evaluating and presenting indications on faults and fault localization at network level,
  – performing network management based on the data and indications available in terms of:

    - transmission facilities fault management,
    - traffic management;

  – detecting, collecting, evaluating and presenting indications on faults and fault localization at equipment level;

  – performing fault clearing based on the available indications in

    - exchanges and exchange-associated equipment,

- transmission systems and transmission-associated equipment,
- other equipment related to service provision;

– continuous monitoring of the spare part (circuit board) stocks and the circuit board repair process, and the management of 'just-in-time' ordering and stock control;

– keeping and evaluating records on equipment faults down to the circuit board level to determine quality of the equipment;

– planning, optimization and implementation of network expansions based on the data collected for network planning;

– up-dating of the administration systems related to the network expansion such as:

  - the subscriber numbers administration system,
  - the local cable administration system;

– initialization of newly implemented network resources including :

  - trunks and junction lines,
  - circuit groups,
  - routes,
  - SS7 signalling links,
  - SS7 signalling link sets,
  - SS7 signalling routes.

• Sustaining service at the level of the individual subscriber, including:

– provision of state-of-the-art automatic subscriber line fault detection capabilities in the local exchanges;

– provision of a customer complaint service in conjunction with an efficient fault clearing service;

  - keeping records on subscriber complaints, faults and repair times for determination of the grade of service at subscriber level;

- on-line transfer of charging data or regular bulk transfer of charging data records to a billing center directly or via a charging data collection system;

- billing at regular intervals in conjunction with an effective late payment or non-payment management and control system.

– Termination of the entire service or a part of the service profile at the subscriber's request, or for other reasons, in conjunction with register updating and the management of obsolete data on past subscribers.

In the beginning of telecommunications, all necessary telecommunications management actions were performed manually, on paper and by means of card registers. In the subsequent development automatic equipment and computers, and later personal computers, have gradually taken over and have formed managed domains.

However, these managed domains have in most cases not been interlinked with each other and with the telecommunications network. This was due to a lack of open interfaces for communication between computers of different vendors and between computers and computer-like entities in the telecommunications networks. As a result, the managed domains are presently in fact isolated management islands. In between them, lots of paper or physical data carriers such as disks and tapes are exchanged, and the same or in large parts the same data are manually inserted in different computers again and again.

Furthermore, real time interaction with/between software controlled entities in the telecommunications network is limited to those cases where the entities to be interlinked are provided by the same supplier. Rare examples are the operation and maintenance center (OMC) systems and the exchanges as well as the transmission facilities management systems and the transmission systems. However, today it is not possible to operate or to maintain an exchange from one supplier through the OMC system of another supplier, or to manage the transmission systems from one supplier through the transmission facilities management system of another supplier.

TMN is the most promising approach ever made to solve this problem. The first step towards such a solution is to break down telecommunications management into functions and allocate them to appropriate layers in a management model. The model used for the TMN has the following functional layers (see also Figure 8.5.2-1):

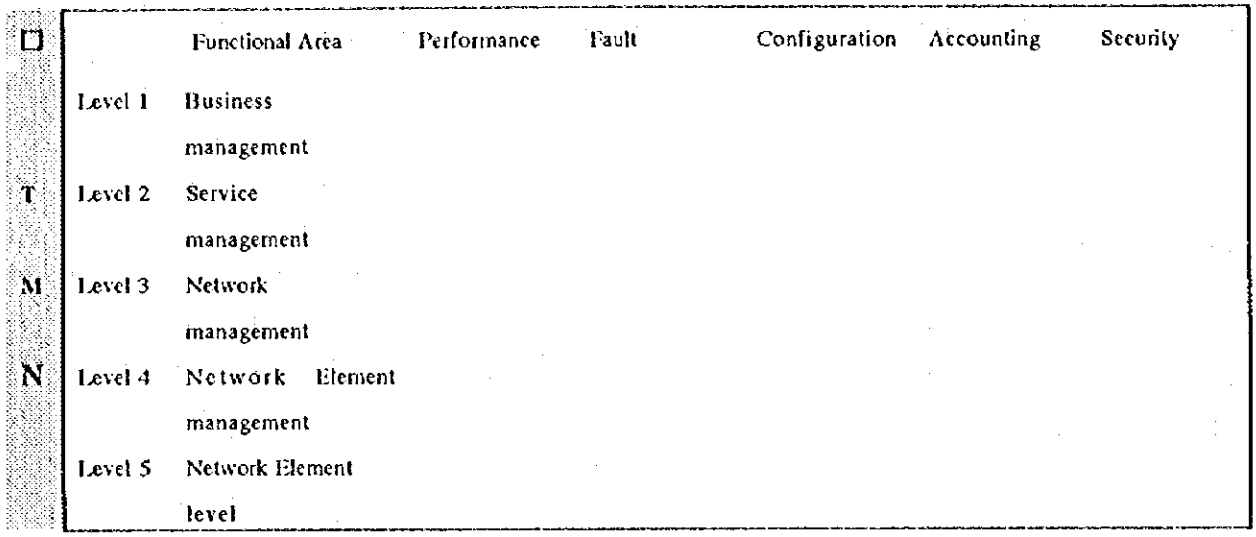


Figure 8.5.2-1 The Model Used for the TMN

(2) TMN Concept and Architecture

For the purpose of basic understanding, a TMN can be imagined as a very large Operation System (OS). It has access to all telecommunications equipment in a network. Automatic monitoring and controlling of the telecommunications equipment via these accesses is based on indications and notifications received from the equipment. Triggering of actions by human intervention via the Work Stations (WS) is also an inherent feature of this system.

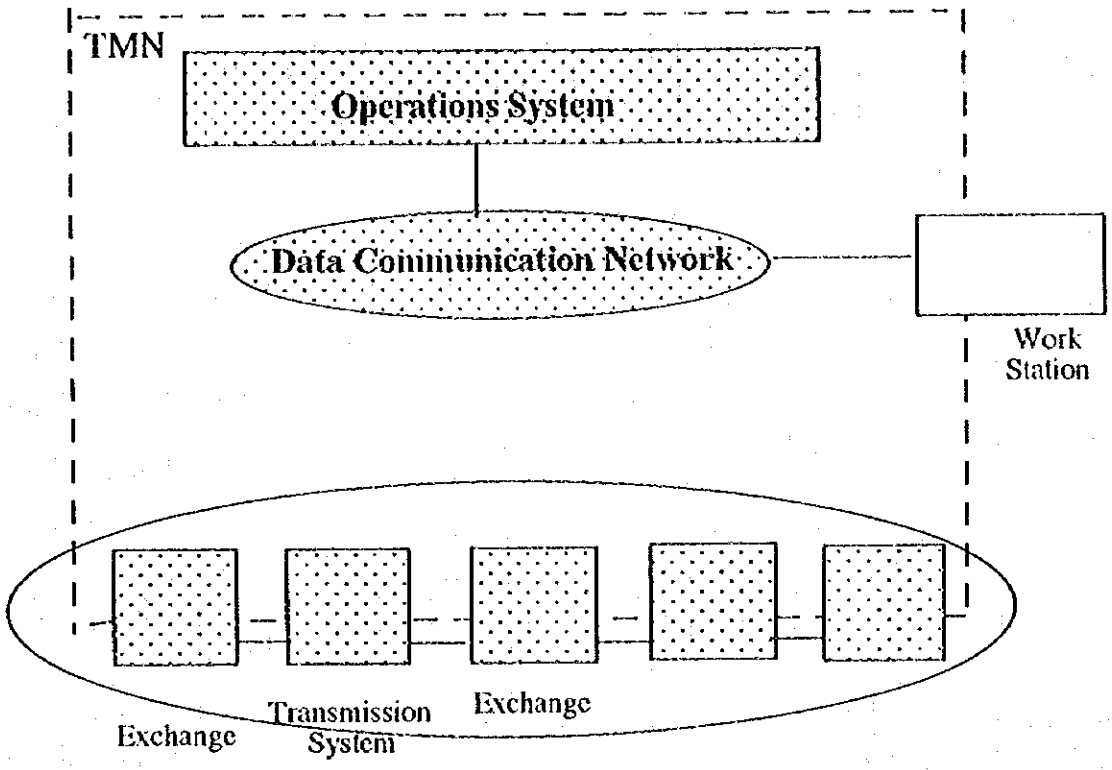


Figure 8.5.2-2 Basic TMN Concept

In a large public telecommunications network all the telecommunications management tasks (as listed in section (1) of this plan) are to be performed. It is obvious that one large OS running on only one physical machine (computer) cannot handle all these tasks at the same time for a few millions of subscribers and the associated amount of trunks and junction lines.

Consequently, the above OS must be understood as cascaded Operating Systems running on several platforms (computers) distributed in the network. The distribution may be done on a per function / task basis or on a regional/area basis. In reality, both ways of distribution will appear.

However, independent of the way of distribution, the concept of cascaded Operations Systems requires that these OS can communicate with each other.

The above considerations borne in mind, the TMN concept is based on:

- an organized architecture for interconnection of various functional types of cascaded operation systems and telecommunications equipment with the aim of exchanging management information by means of standardized protocols and messages;

- open standardized interfaces to be provided at any network element in the telecommunications network and throughout the TMN itself. The aim is to provide full management access to any network element in a telecommunications network, and thus, to all the manageable functions contained therein.

In terms of network architecture, a TMN presents a logical overlay network to the telecommunications network as illustrated in Fig 8.5.2-2. The particular entities in the TMN architecture (the TMN building blocks) are the places where the TMN functions reside (see also ITU-T Recommendation M.3010). These entities are :

The Network Elements (NE) represent the telecommunications equipment or telecommunications environment or groups or parts thereof, which are the objects of manipulation by telecommunications management. A NE has one or more standard Q-type management interfaces. NE's may optionally have F interfaces (to connect work stations directly), and exceptionally may have an X interface (if operation system functionality is contained in the NE).

The Q Adapters (QA) adapt non-TMN compatible interfaces to TMN standardized Q (Q3, Qx) -type interfaces. A QA can provide management access to NE-like equipment that does not possess Q-type interfaces.

The Data Communications Network (DCN) provides all required communications functions between the particular entities in a TMN. The DCN represents an implementation of Open Systems Interconnection (OSI) Layers 1-3 (OSI network service). The DCN does not contain any OSI-Layer 4-7 functionality. The DCN may make use of any type of sub-network or combination of sub-networks available.

The Mediation Devices (MD) provide mediation between operations system functions and network element functions / Q adapter functions represented by the respective Qx-type interfaces. Mediation may include (but is not limited to) storing, adapting, filtering, thresholding and condensing of information.

The Operations Systems (OS) provide the management applications functions at OS level by processing of information for the purpose of monitoring, co-ordinating and controlling telecommunications functions.

The Work Stations (WS) provide the functions to interpret TMN information for the management information user. Outside the TMN boundary, the WS provide support for interfacing to a human user. However, this support is not considered to be part of the TMN.

It should be noted that some of the TMN functions are distributed over different TMN building blocks. A typical example is the Management Application Function (MAF), which is distributed between the OS, the MD, the NE and / or the QA.

Not all components of a TMN will necessarily be physically independent from the telecommunications network. The NE's by definition reside in both networks and the DCN may partly be integrated with the telecommunications network.

Three basic types of interfaces are defined for a TMN:

The Q-type interfaces, which are internal interfaces for communication between the building blocks in a TMN, in particular:

The Q3 interface family, which represents the original interfaces as defined for direct communication between an operation system and a network element in a TMN. By definition, Q3 allows for a variety of protocol stacks not only in the lower layers (layer 1 - 3) but also in layers 4 - 7.

For the lower layers, the variety of possible protocol stacks reflects the option to use any available facility as a DCN (e.g. point-to-point circuits, a circuit-mode network or a packet-mode network). The facilities may be dedicated to the TMN or shared (e.g. an ISDN, an existing Packet switched public data network (PSDN), or even the Signalling System No.7 signalling network). This allows for the optimum choice depending on the characteristics of the envisaged management data transfer, which may range from spontaneous (alarm) message transfer, to dialogues, to bulk data transfer and file transfer. The possible range of protocol stacks for layers 1-3 is defined ITU-T Recommendations Q.811 / Q.961 / G.773.

For the higher layers, the protocol stacks are chosen in accordance with the needs of the transactions envisaged. However, for each set of TMN application functions with similar needs, a uniquely selected protocol stack should be used. The possible range of protocol stacks for layers 4-7 is defined ITU-T Recommendations Q.812 / Q.962 / G.784.

It is possible to combine any lower layer protocol stack with any higher layer protocol stack, as appropriate.

The Qx interface family allows protocol stacks to be chosen by the Administrations or network operators. However, the components of these protocol stacks must be CCITT - standardized.

Details of one of the chosen Qx interface specifications and a Qx family of protocol suites will appear in the network specific recommendations.

The common characteristic for the Qx interfaces is that a mediation function is needed for communication with an operation system. A certain Qx interface is characterized by that portion of the information model that is shared between the mediation device and the network elements it supports.

The F interface provides for connection of workstations to the TMN and allows for interaction with a human user. However, the interface between the human user and the work station function (G interface) is considered to be outside the TMN, and thus, subject to Administrations and network operators own specifications. This allows for language adaptation, for example.

The X interface provides for the possibility of interconnection with other TMN's or other management networks with TMN like interfaces. Basically, such interconnection requires an elevated level of security compared with a Q3 interface (which is very similar at least in the basic functionality).

(3) International Standardization Work on TMN

The TMN specifications are the results largely of ITU-T efforts to provide a standard framework for the management of telecommunications networks. The TMN standard specifies management functions for both telecommunications services and networks.

The TMN specifications are based on OSI application services where appropriate. One of the key concepts of the ITU-T specifications is their "abstract" view of managed network elements. This abstract view allows the management of diverse equipment via a common communications interface.

The present state of basic TMN definition is documented in ITU-T M 3000 Series Recommendations.

With these ITU-T Recommendations the basic principles for further TMN definition are now well established and accepted internationally. However, present specifications are not yet fully sufficient for implementation, and a lot of work has yet to be done.

(4) TMN and Organizational Change

The TMN concept defines functions and architectural entities where these functions are thought to reside. It does not define any interdependence of particular functions and particular physical machines (computers/platforms) and organization units, i.e. the concept does not preclude that a certain management function is performed by a certain computer, "owned" by a certain department of the organization. In other words, not every department or provincial area in Syria needs to have its "own" TMN. As long as the telecommunications network in Syria remains one single resource and is not divided up amongst several independent network operators, the TMN in Syria should be seen (in terms of functionality) as one system. Subdivision of that system into operation systems should be planned and implemented in accordance with the overall management concept and the functional requirements of the various management domains.

Detailed planning and preparations for TMN should take into account that :

- on the one hand, the TMN gives every degree of freedom as to where supervision and control may be placed geographically;

- on the other hand, TMN requires a well defined task-oriented organization in accordance with the respective management functions. This requires that the person handling a certain management domain must have full access to data, full supervision, full control, full authority and also full responsibility for this domain.

As a typical example, the traffic manager in charge of the long distance network may be considered. If, in a major fault situation, the traffic manager decides on a routing reconfiguration action to restore traffic to the extent possible, the traffic manager must also have the full authority to execute his decision at the exchange level without the need to obtain approval from any Provincial Area Managers and/or Provincial Department heads. This means the traffic manager must be authorized to bypass the administrative hierarchy completely. Before making the final decision, the traffic manager should consult the transmission network manager and may consult advisors to support the decision making process. However, the advisors should be in their position first of all for their special knowledge about the network and about network management, but not for their position in the administrative hierarchy.

This example is intended to make it unambiguously clear, that only with a suitable functional organization can all the capabilities of a TMN be fully exploited.

(5) Security Aspects of a TMN

There are two main aspects to be considered :

- security from the point of view of access and use of the TMN by the network operators personnel

- the management of security as part of service management for services for which customer access to and control over network/service resources is envisaged.

Only the former is considered in this paragraph.

In a TMN with fully interlinked operation systems, theoretically, every work station (WS) and any person having access to a work station could "manage" everything. Such a situation is not bearable, since it could lead to major disturbances due to intrusion by accident or intention. Therefore, two kinds of system access authorization and system access security should be introduced. Internally they may again have several levels of authorization:

Terminal access authorization and security should limit each particular terminal to the application function(s) for which it has been designated by the functional organization. As an example, a terminal in a customer service center, which is designated to the subscriber line provision, should have any possible access to the traffic management application function securely blocked.

Such authorization can be allocated and modified by a system master console. Even several levels of system master authorizations may exist. However, there must be at least one terminal which has absolute overall control on the system, and its authorization must not be changeable.

Personal access authorization and security should limit each particular person to the application function(s) this person is allowed to access based on the functional organization. This prevents that unqualified/unauthorized persons initiating management actions which are beyond their capabilities and beyond their responsibilities.

Such authorization may be based on personal passwords or chip cards (at higher security levels) or even a combination thereof.

(6) Migration towards TMN in the Syrian Network

Taking into account the various types of activities and the wide range of applications to be covered by a TMN (as section 8.5.2(1) of this plan shows), it becomes obvious that a TMN cannot be implemented in a single all-out effort.

On the one hand, there are still a lot of open study items to be addressed in ITU-T , and several TMN related ITU-T Recommendations are still to be finalized. On the other hand, the Syrian telecommunications network is still in an early phase of development with its major growth phase still ahead. Therefore, strategic and technical advance planning and preparations for a future TMN introduction taken in due time are certain to pay dividends in terms of the of equipment modification and therefore costs, that may be avoided when the time comes for actual TMN introduction.

a. Advance Planning for TMN Implementation

TMN is one of the most important future directed developments in telecommunications. Ultimately, it has the potential to dramatically improve and to cost-optimize provision, operation, maintenance and administration of telecommunications. However, TMN cannot be bought from the shelf. It requires sound preparation from the network operators side. This must include the planning and introduction of an appropriate functional organization to enable optimum exploitation of the TMN. Preparation should be started right now by introducing and staffing a 'center of expertise' in charge of overseeing the definition, planning and implementation of the TMN. The responsibility of this organization should not be limited to technical aspects but must also cover the organizational aspects and the scheduling of implementation.

The main tasks of this organization should be to:

- provide overall co-ordination (e.g. by a special co-ordination staff);
- systematically collect, analyze and make available the present state of TMN definitions and specifications (the ITU-T Recommendations of the M.3000 Series in their White Book version must serve as a starting point);
- keep abreast with the latest development in the international bodies in charge of TMN definition;
- observe and assess what the suppliers offer on the market;

- observe what other network operators are planning and doing (try to learn from their initial experiences);

- ensure that any telecommunications equipment ordered has TMN defined management interfaces (or at least that the supplier is contractually bound to implement them as soon as definitions and specifications are available);

- define and plan the Syrian TMN at the functional level on an overall basis as a target projection and draft an implementation scenario;

- define, plan and specify appropriate functional implementation portions and steps (e.g. transmission network management system, traffic management system, switch maintenance support systems, customer services management system, charging data collection and billing system, etc.), and allocate implementation priorities;

- define the associated functional organization structures;

For some of these tasks, special working groups and working teams may be established.

b. Technical Requirements for TMN Implementation

First of all it is indispensable that all equipment procured in the future has open interfaces for TMN access. Open interfaces in this sense means that the supplier cannot or (by binding commitment in advance) does not reserve any proprietary protection rights on the interface(s) designated for TMN access.

The best way to obtain this is to require mandatory implementation of Q3 or Qx-type interfaces for each piece of equipment to be deployed in the network. The Q3 and Qx-interfaces are the ITU-T specified interfaces for TMN, and thus are open interfaces.

If this is not possible (e.g. due to lack of specifications for the upper layers or lack of the appropriate object models), the supplier must be committed in the initial contract to upgrade the equipment as soon as the specifications are available and the network operator requests it. However, the physical interfaces with layers 1 to 3 should be provided right at the beginning whenever the basic communication needs of the equipment are clear to the extent that the lower layer protocol stacks can be chosen.

For existing telecommunications equipment in the network, it must be decided, based on its remaining useful life time, whether upgrading by means of Q3 or Qx-type interfaces or Q Adapters is to be considered. In addition, it must be examined whether the equipment under consideration has already sufficient internal management intelligence or whether this management intelligence can be inserted or upgraded to the extent desired at acceptable costs. Unless this is the case, the equipment under consideration shall remain outside the TMN and / or be replaced as soon as feasible.

c. Telecommunications Management Islands

In the Syrian network (as in other networks as well) there exists already some (partly) automated telecommunications management functions. Typically, these functions have been provided in tailored systems (e.g. on PC's) to suit a certain task and are not directly interlinked with other functions (systems) which e.g. are triggered by the same event. If there is information flow required between these systems, this is performed by exchange of tapes, disks and even paper. Consequently, these systems appear as isolated telecommunications management islands. Typical examples of such existing functions (systems) are:

- the charging data collection - charge calculation - billing function
- the local cable administration system
- the transmission resource supervision (and management) systems
- the customers directory inquiry system

New telecommunications management islands may be created in the course of time, since TMN introduction is thought to be an evolutionary process taking several years, and the benefits of such islands may be so significant that rapid implementation appears to be preferable, even if e.g. the interlinking with other functions in the TMN is not yet possible.

However, if new telecommunications management islands are created, their future integration into the TMN must not be neglected and their migration to the TMN must be planned in advance. Creation of new telecommunications management islands, which cannot be integrated into the TMN later on, must be avoided under all circumstances.

d. Integration of the Management Domains

Integration of the existing telecommunication management domains does not necessarily need to take place for all of the domains at exactly the same time. This process should be regarded as an

evolutionary one, too. In this process, integration of those telecommunications management islands which create the most additional benefit by being interlinked with the other TMN functions should make the lead.

In the first step, all existing telecommunication management islands should be thoroughly examined:

- whether they are to be integrated into the TMN in their existing form
- whether they should undergo minor or major redefinition or reshaping
- whether they should be merged with or absorbed by other management functions

and the necessary modifications should be initiated.

The second step will be to define the communication needs including the necessary communication protocols.

In a third step, the telecommunication management islands (the equipment used therein), which are designated to be integrated into the TMN, should be upgraded by adding Q3 or Qx-type interfaces or Q-Adapters (QA) as appropriate.

e. Strategic Considerations on the TMN Operations Systems

An operation system (OS) in the TMN consists of (an) Application System(s) which run(s) on a so called Platform.

The Application System can be understood as the programs, the data and the communication protocols to execute the management functions allocated to that operation system function.

The Platform is the physical hardware (computer) where the applications system(s) run(s) on. The platform includes its own operating system (which in this case means the system that keeps the computer organized and going as e.g. the MS DOS for PC's, and which is not identical with an operations system as defined in the TMN) and the physical communication interfaces.
Several application systems may share the same platform, provided the platform is powerful enough to support them in parallel.

Two important criteria must influence the decision for a particular platform:

First of all, some major TMN applications (e.g. network management) require fault tolerance (also called continuous availability) from the platforms. Fault tolerance means that neither major hardware faults nor software faults should cause termination of operation. Only a limited number of computer manufacturers offer such fault tolerance. However, it must be decided on a per- case basis and based on the application envisaged, whether the platform under consideration really needs to be fault tolerant.

Secondly, it is very desirable for the network operator that the application systems are portable from platform to platform, ideally without any or at least without major adaptations in the application system. This would allow the network operator to chose and change platforms freely and without major extra costs for adaptation of the application systems software. This is only possible when both the original platform and the new platform use the same (standard) operating system (e.g. UNIX or UNIX-derived operating system).

CHAPTER 9 PRESENT STE MANAGEMENT

9.1 Current STE Management

9.1.1 Background of the STE Management

The STE was separated from the government in 1987, and STE has been monopolizing the national and international telecommunication services in Syria. The STE is independent from the government in a economic side. The STE, however, is still a state-controlled organization and is responsible to the Minister of Communications. Some important decisions regarding the STE's management are controlled by the government. For example, tariff determination requires government approval and the STE's administration and investment are legislatively regulated.

9.1.2 STE Management Issues

The major STE management issue is trimming the waiting list that is 2 million at the end of 1995. This large waiting list for telephone installation mainly arises from the low telephone density in Syria that stood at about 4.95% in 1994. This figure is low compared with other countries in the Middle East. Increasing the telephone density is also necessary to improve the nation's infrastructure, and will contribute to economic development.
To eliminate rapidly the waiting list and to increase telephone density, the STE must concentrate its managerial resources into a telecommunications-network-expansion project. Besides such intensification the STE must improve its managerial quality.

Table 9.1.2-1 STE Management Issues

Management issue	Present status
Improvement of productivity	Telephone density: 4.95% in 1994
Improvement of management	Waiting list for telephones: 1.2 million

9.1.3 Improvement of Work Accompanying Network Expansion

The number of employees per 1,000 main subscribers is 24. This ratio is large compared with other telephone companies and reflects low productivity. Managerial improvement is thus vital to

reduce this ratio.
To cope with the increased workload coincidental to network expansion, enhanced productivity in handling telephone subscriptions and usage (mainly billing work) is vital. Introducing computers is thus expected to be highly useful.

9.1.4 STE Managerial Improvement

Managerial improvement is necessary for the STE to handle cancellations of unexecuted requests for telephone installation and to change the STE into an exemplary organization. It is thus important to review current managerial subjects such as organization, finance and accounting, training, and computerization.

9.2 Organization

The organization of the STE consists of a Director General, a Vice Director General, 17 Headquarters Directorates, 14 Provincial Directorates, and Consultants. The 17 Headquarters Directorates are constituted as follow.

- Directorate of Technical Studies
- Directorate of Execution
- Directorate of Operating & Maintenance
- Directorate of Planning, Statistics, and Follow-Up
- Directorate of Exploitation and Traffic Affairs
- Directorate of Accounting
- Directorate of Financial Affairs
- Directorate of Rural Services
- Directorate of Internal Control
- Directorate of Training and Research
- Directorate of Contracts
- Directorate of IT (Information Technology)
- Directorate of Radio Frequencies
- Directorate of Transport and Vehicles
- Directorate of Public Relations
- Directorate of International Regions

• Directorate of Province

Some issues exist in the STE's organization. These comprise obstacles for the effective management of the STE. These issues are:

• The functions of Headquarters are too distributed. Functions overlap between Directorates.
• Many decisions regarding managerial issues are vested in the Director General. As a result, decision-making delays occur and prompt action is difficult.

To make the STE organization more effective and flexible, it is necessary to summarize the headquarters functions and to distribute the duties of the Director General among several top-management positions (example, Vice Director Generals).
The following organizational scheme is one idea that is considered appropriate for the STE. In this organization, four Vice Director Generals manage facilities, administration, sales and customer service, and technology, respectively. This would streamline the decision-making process.

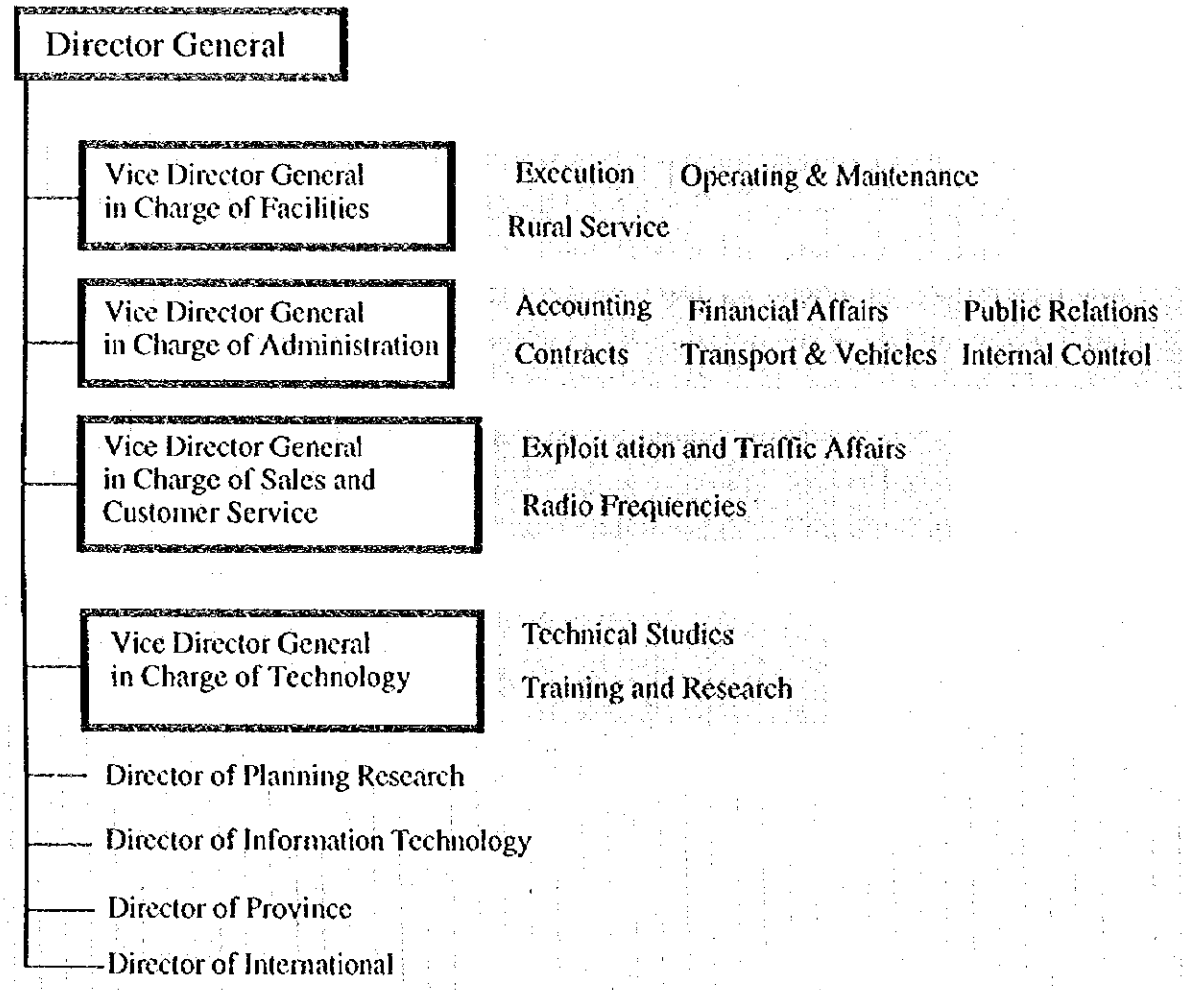


Figure 9.2-1 Example of STE Reorganization

To reduce the waiting list is a major managerial issue. Accordingly, it is necessary to establish a project team for network expansion to resolve this issue.

9.3 Finance and Accounting

The financial status of the STE has improved rapidly as follows:

Table 9.3-1 Financial Status from 1990 to 1994 (million Syrian pounds)

	1990	1991	1992	1993	1994
Revenue	2,545	2,832	3,170	4,291	6,493
Expenditure	1,264	1,206	1,444	1,718	2,737
Profit	1,281	1,626	1,724	2,573	3,756

Revenue and profit have been increasing rapidly. Especially the profit percentage to revenue has attained a high level (58% in 1994).

The STE has been increasing its telecommunications investment from 1990 to 1994 as follows.

Table 9.3-2 Telecommunications Investment from 1990 to 1994 (million Syrian pounds)

	1990	1991	1992	1993	1994
Investment	195	378	663	5,024	4,300

In the present Five-Year Plan are the Kuwait fund for Economic Development of $172 million plus a government loan. In the next (Eighth) Five-Year Plan, however, more money will be needed for telecommunications investment compared with the present Five-Year Plan. The STE will thus require self-financing as well as foreign and government loans.

To maintain a healthy future financial status it is necessary for the STE to increase its self-financing ratio in the next telecommunications-investment program and to raise profits. To enhance profits, the STE must work to increase revenue and to diminish costs by the following strategy.

The accounting system has two prime objectives. One is reporting the financial status to the government. The other is for controlling business activities.

The STE strives to use the accounting system to control business activities, but it takes much time to gather accounting information. It is thus difficult to make a quick decision based upon accounting information. For example, it takes about a year to gather correct billing information—an extraordinary situation.

The feedback of accounting information to the managers in each department is inadequate. As a result, business activities are not controlled by managers based upon accounting information and the cost of business is out of control. As for the project management of telecommunications-network investment, no cost-control system is employed.

To expand profits, it is indispensable to introduce a cost-control system.

9.4 Training

In the next Five-Year Plan more trained people are needed to achieve the elimination of unfulfilled requests for telephone installation. STE personnel consist of the following educated persons.

STE personnel (at the end of 1994)	
Engineers	1,137
University graduates (non engineers)	305
Institute level	1,099
Secondary school	1,997
Telecommunications school	2,392
Preparatory school	3,025
Less then Preparatory school	6,700
Total	16,655

The STE has the following plan regarding the number of personnel in 2000.

STE personnel in 2000	
University graduates:	
Engineers	2,000
Others	592
Institute graduates	6,380
Telecommunication school &	
Secondary school graduates	8,640
Preparatory graduates or below	3,888
Total	21,500

Comparing the required work force for 2000 with present STE personnel, many workers who graduated from institutes, schools, and Secondary school will be needed.

Institute graduates	1,099 --> 6,380
School + Secondary graduates	4,389 --> 8,640

With the installation of digital exchanges and computer systems, more educated people will be required over the next five years. Intensive training is thus required for present employees in addition to the induction of highly educated personnel.
The training center is strengthening the following educational subjects in addition to the existing courses.

- Computer systems
- Network planning
- Transmission
- Management

These courses are listed in Table 9.4-1.

Computer-system training is mainly focused on operation of personal computers, but system engineers are needed to design the STE's computer systems.
The current management training courses are for managers of telephone center, technical office, contract office, and testing room. For management, the training center offers training courses for lower-echelon managers, but management training for top- and middle-management (especially for directors and managers in the headquarters) is needed for managerial improvement. For example, management training for top-and middle-management should include the subjects regarding organization management, project management, strategic management, and managerial accounting.

Table 9.4-1 Strengthening Training Courses

	Course name	Course period	Number of trainees
Computer	DOS, Windows, Excel	1 weeks for each course	20~24
Network	Operating and Maintenance of EWSD	12 weeks	20~24
	EWSD operator	4 weeks	20~24
	Studying and execution of local network	3 weeks	20~24
Transmission	PCM transmission technique, optical fiber, stations for optical	4 weeks	20~24
	Operating and maintenance of microwave stations	2 weeks	5
	Fiber optical cables stations OLTE36	4 weeks	20~24
	Measuring instruments for optical fiber stations	1 week	20~24
Management	Technical office	3 days	20~24
	Auto Exchange center manager	-	20~24
	Operating rooms managers	3 days	20~24
	Telephone installations	-	20~24
	Accounting	2 days	20~24
	Contract office	-	20~24
	Finance	-	20~24

9.5 Computer Systems

Computer systems are becoming indispensable managerial tools. Many companies are improving managerial effectiveness by computer employment. The STE presently uses computer systems in the following application areas in addition to billing-center processing and telephone-center processing.

- Financial management
- Wage calculation
- PC LAN systems
  - Printing and E-mail in STE headquarters (for directors)
  - Software development in the Billing Center

The following computer systems are under development.

- Data-management system in the Frequency Department
  (PC standalone system)
- Accounting-management systems

The use of computer systems for the STE management is not sufficient. The STE should therefore install more computer systems. The prices of computer systems are decreasing rapidly, and the systems are easy to install.

At present, directorates in the STE headquarters and provinces take much time to get the information regarding the revenue, the new subscription and the collection of charges, and it causes the delay of management decision makings. To strengthening the management decision makings, the installation of management information system is very important. This system stores the information regarding the revenue, the new subscription and the collection of charge into the management database through the network which is connected to the telephone center system and the billing system.

9.6 Recommendation to the STE Management

The most important managerial issue is reduction of the waiting list. This is the STE's principal managerial target. The issue is not expected to be resolved until 2000.

To achieve success, additional educated technical staff (especially graduates from institutes, telecommunication schools, and secondary schools) are required. From 1996 to 1998 the STE must therefore hire technical staff as well as strengthen the training of existing technical staff. As training reinforcement, the addition of trainers in the training center will also be needed, and the hiring of foreign trainers is recommended.

It is necessary for the STE to establish a project team for network expansion from 1996 to 2000 in addition to the STE's organizational changes. This project team will be controlled directly by the Director General and the team will have great competence to achieve its target. The members of the team should be gathered from throughout the STE's organization. The functions of this project team will be as follow:

- Planning of network expansion from 1996 to 2000
- Project management
- Coordination between related departments regarding the project

	1995	2000	2005	2010
Management Target		Demand satisfaction for waiting list	Improvement of work productivity	Improvement of customer service
Organization	Project team Orgnizational change		Secondary Orgnizational change	
Training/hiring	Hiring New training system			

Figure 9.6-1 STE Management Plan from 1996 to 2010

CHAPTER 10 COMPUTERIZATION

10.1 The Present Situation of Computerization in STE

Computer systems are becoming indispensable managerial tools. Many companies are improving managerial effectiveness by computer employment. STE presently uses computer systems in the following application areas.

- Billing system (VAX) in the Billing Center (in Damascus)
- Financial management (Tower/32)
- Wage calculation (Tower/32)
- PC LAN systems (Novell-Netware)
  - Printing and E-mail in STE headquarters (for directors)
  - Software development in the Billing Center

The following computer systems have begun operation in the end of 1995. They are described in detail later.

- Billing system (Bull DPX) in the New Billing Center (in Damascus)
- Telephone-center system (Bull DPX) in 14 telephone centers in Damascus City

The following computer systems are under development.

- Data-management system in the Frequency Department
  (PC standalone system)
- Accounting-management systems

The use of computer systems for STE management is not sufficient. STE should therefore install more computer systems. The prices of computer systems are decreasing rapidly, and the systems are easy to install.

At present, directorates in STE headquarters and provinces take much time to get the information regarding the revenue, the new subscription and the collection of charges, and it causes the delay of management decision makings. To strengthening the management decision makings, the installation of management information system is very important. This system stores the information regarding the revenue, the new subscription and the collection of charge into the management database through the network which is connected to the telephone-center system and the billing-system.

10.2 Trends of Computerization in Telecommunication Companies

10.2.1 General

As the number of subscribers increases, it becomes more important for a telecommunication company to enhance efficiency of telecommunication service and manage correctly information of subscribers, plants, network, billing and so on. Most of telecommunication companies in the countries where telephone service is spread to a certain degree are utilizing computerized system to do so. In general, such a computerized system contains of following functions, for example.

- Customer management
- Service order
- Plant management (outside, inside)
- Billing
- Management of failure or breakdown

After telephone service becomes enough spread, next objectives for a telecommunication company is to enhance customer satisfaction level and to gain more profit. If the telecommunication service market is competitive, the company will aims to be more competitive. Therefore, the role of computerized system changes and more sophisticated one is required, for example, to be able to enhance customers' convenience, to be able to gain more detailed customer information.

10.2.2 Trends in Foreign Countries

(1) Thailand

TT & T introduced computerized system called CSS (Customer Service System) a couple of years ago. That is distributed processing system installed in 4 centers by area, each of which is functionally containing service order, billing and management of failure.

Main functions

- Service order - - - application registration, subscriber line management, issuing work- order, subscriber information management
- Billing - - - calculating and issuing bills, collection, management of debt
- Management of failure - - - registration, arranging repairmen, management of data

(Source : NTT)

(2) Japan

NTT used to utilize some independent computerized systems according to works, but a few years ago, a new system integrating those systems in was completed. This new integrated system called CUSTOM (Customer Service Total System)

Independent computerized system before CUSTOM

- New Customer Service System
- New Plant Management System (Cable Conductors)
- Billing System
- SATs (Subscriber Assignment and Traffic Administrative System)
- SIFS (Subscriber Information Filing System)
- Branch local System

Features of Integrated Customer Service system, CUSTOM

- Integration of customer data
- System integration
- Enhanced applications
- Supply of management data
- Common platform (Shared use of terminals)
- Core for SIS structuring

Effects of System introduction

- Enhanced service
- Strengthened sales activities
- Improved work efficiency

(Source : NTT)

(3) USA

In USA, there are many telecommunication companies and the market is very competitive. Not only traditional telephony but also telephone services via cable or wireless are growing. Therefore computerized system for telecommunication service makes a great role in a company. Practically, systems are very different.

Company providing software for telecommunication service like service order, billing (example)

- Alltel Information Systems
- Little Rock, AR
- American Computer and Electronics Corporation
- Gaithersburg, MD
- American Management Systems, Inc.

Product Function (example)

- Service order
- Customer care
- Billing
- Traffic analysis
- Cable and circuit management
- Purchase order management
- Trouble management

10.2.3 Examination of System Application in STE

In Syria, in the last decade, number of subscribers were rising rapidly, and have been still rising now. In this situation, regarding to service order of which is increasing the operation amount, it has been done all manually and all information concerning customers, plants, line and so on has been filled in paper in telephone centers except for those in Damascus City now. Up to now, because network expansion has not caught up with demand, the service operation efficiency in telephone centers might not be so important. However, from now on , while network is expanding more speedy, especially operation for new application should be executed efficiently and correctly.

On the other hand, STE has been utilizing computerized system for billing; two VAX systems and Bull system recently begun operation. Issuing bills has been about one year behind schedule because two VAX systems are very old and often have some trouble. Though Bull system may improve the situation, it should be examined if it could issue bills for still increasing subscribers.

Considering above situation, as computerized system in STE examined in the Study, we have suggested service order system including subscriber line management, and billing system. In addition, from other point of view, as mentioned above (10.1), management information system (MIS) should be examined, which utilize information of other computerized system and is expected be useful for directors in STE.

10.3 Computerization Strategy until 2010

10.3.1 Policy of Computerization

As mentioned above (10.2), computerization in telecommunication companies should be done appropriately depending on the degree of demand fulfillment in their countries. In addition, social conditions and social-infrastructure influence computerization.

Considering the situation expanding telecommunication network rapidly and social conditions such as general degree of customer service, other public service like mailing, electricity in Syria, at present, improving productivity of works essential for telecommunication service operation itself should be main objective of computerization.

After that, STE should aim to improving customer services more, enhance customer satisfaction level and gain more profit. Moreover, as social situation changes, services or functions requested to STE would be changed and increased. Accordingly, objectives of computerization would be also changed, for example: enhance customers' convenience, to grasp customer needs related to telecommunications. It is expected after the year of 2005.

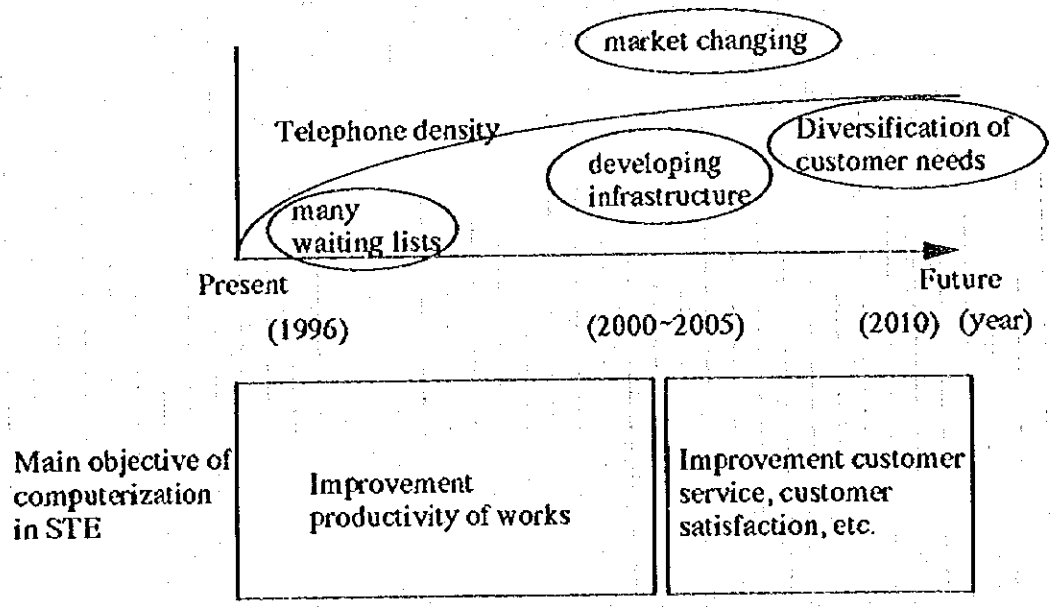


Figure 10.3.1-1 Policy of Computerization in STE

10.3.2 Computerized Systems Implemented for the Present

Until the year of 2000, the objective of introducing a computerized system is to improve productivity in STE's telephone-subscription and usage tasks.

We have striven to develop a total system for achieving the above objective. The final system outline is thus a total system that computerizes inefficient tasks in telephone subscription and usage (mainly billing). It means that no distinction will exist between the service-order system, the billing system, and the subscribers' line-management system. A common subscriber-database will be shared. This database can be retrieved and updated by all systems.

The final-system image for the present is such an integrated system. The urgency for each system, however, differs, meaning that the introductory schedule may vary. Therefore, in next section we will separately study the service-order system (including the subscribers' line-management system) and the billing system.

Regarding to Management Information System (MIS), it is relatively less urgent to introduce, and it requires information from telephone-center system and billing-center system. Accordingly, the implementation would be later than implementation of some telephone-center systems and billing-center systems.

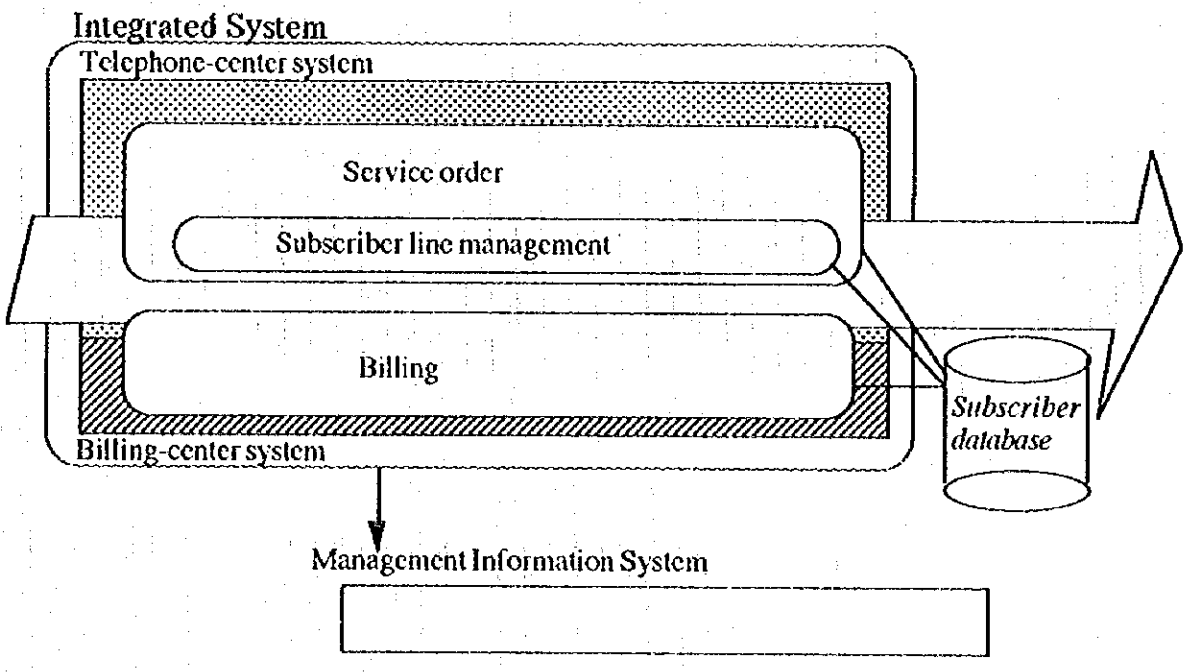


Figure 10.3.2-1 Computerized System's Final Scheme for the Present

10.3.3 Computerized-system-development Schedule

Billing and service-order system must be installed that synchronizes the network-expansion plan.
A service-order system whose objective is also to improve productivity should be speedily devised. Inasmuch, however, as the system is to be installed in telephone centers, the urgency differs with each telephone center. If the budget or manpower is constrained, or considering possible trouble, the system could be installed step by step.
A billing system should be developed whose objective is to improve productivity before commencing network expansion. This must be developed as soon as possible.
Management Information System should be developed after implementing billing and service-order system.

Table 10.3.3-1 System-Development Timing

System name	Main objective	Development start	Service Start
Service order system (including subscriber line management)	Improving productivity of service order and subscriber line management	As soon as possible	Beginning from provinces where subscribers are specially increasing
Billing system	Improving productivity of billing process	As soon as possible	Until overcharge of Damascus new billing system by Bull
Management information system (MIS)	Supporting managerial work and decision making	After implementing billing system and service order system in some provinces	

We show the system development schedule as compared with the network-expansion plan. The billing system should be developed immediately considering the capacity of present billing system by Bull.

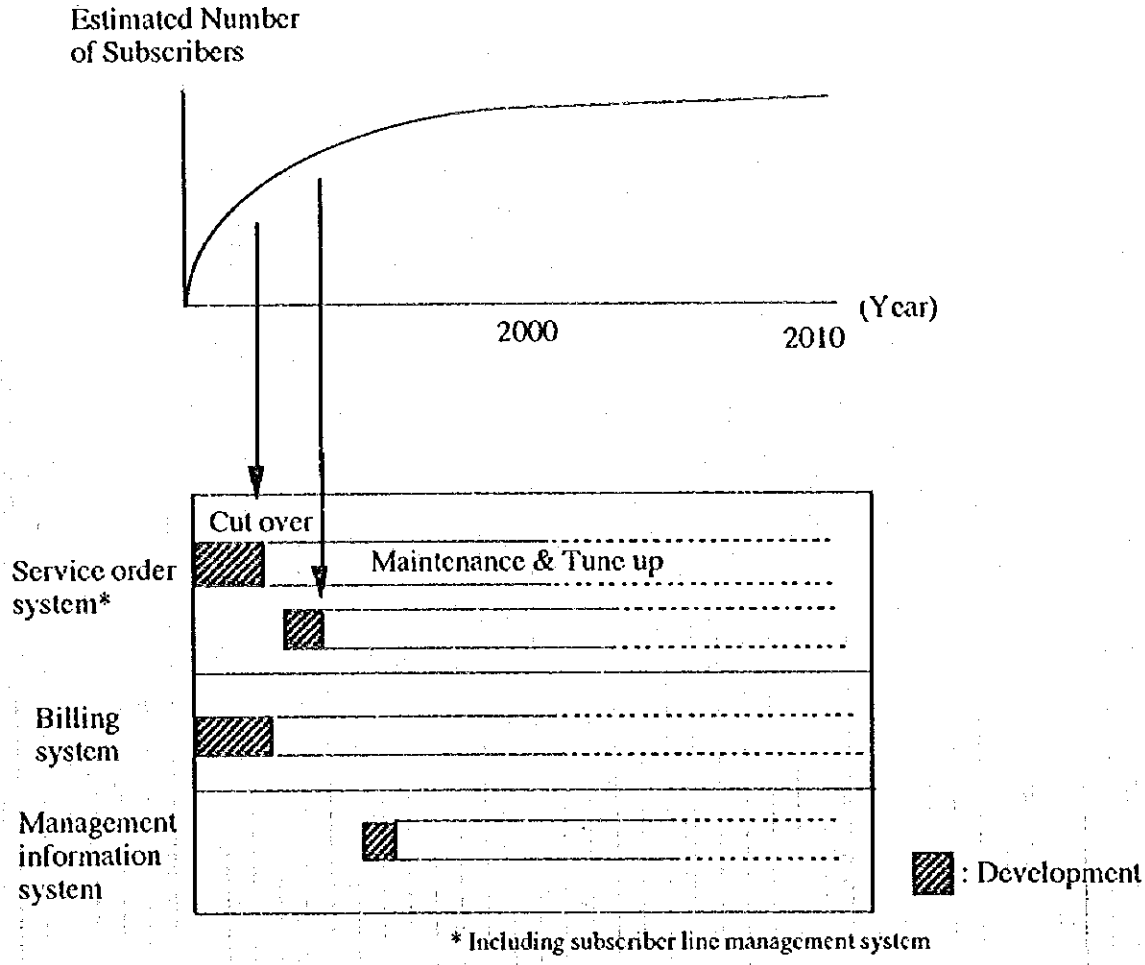


Figure 10.3.3-1 System-development Schedule

10.4 Analysis of Present Service Operation

10.4.1 Introduction

As mentioned in the management analysis (Chapter 9), elimination of the waiting list is the most important managerial issue. To resolve this we will examine the network-expansion plan. It is not enough, however, merely to devise a network-facilities' introductory scheme. It is vital for STE to increase its work efficiency so that it can satisfactorily handle telephone expansion. Accordingly, we will look into a computer system that can process the necessary workload even if the number of subscribers is rapidly increased.

Table 10.4.1-1 Background of Systematization

Item	Content
Environmental change surrounding STE	Increase of subscribers according to network-expansion plan targeting demand satisfaction for waiting list
Background of systematization	Improving work efficiency for telephone subscription and usage
Objectives of systematization	To cope with above tasks using limited human resources

For the attainment of these objectives, below is a flow chart for the work necessary in telephone subscription and usage (such as telephone-subscription reception, provision of the subscriber's line, bill issuance and collection, and management of the subscriber's line information). In the Study we try to improve productivity through a work flow facilitated by a computerized system.

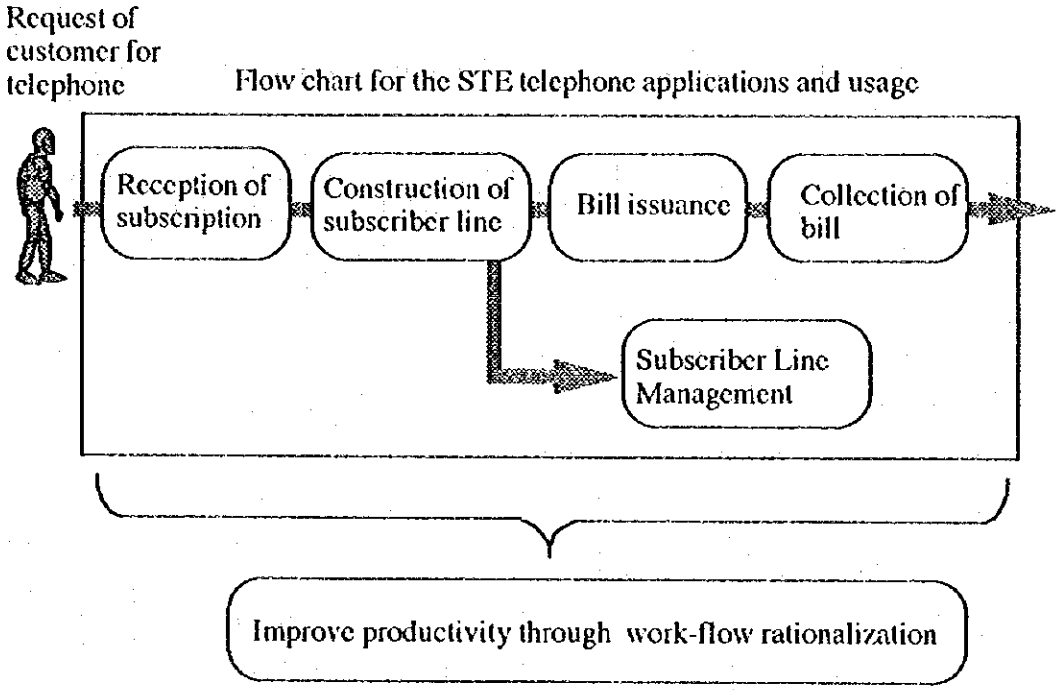


Figure 10.4.1-1 Work flow to be improved

The tasks mentioned above already present some problems. Accordingly, STE is trying to introduce a new computer system (the Bull Company's system). This "Bull system," however, is for installation in only 14 telephone centers and a billing center, and its execution fails to consider network expansion. It is therefore not regarded as system owning enough capacity to process all transaction for many years.

Conversely, the target area of the Study is all of Syria. We accordingly examine a computer system based on the number of subscribers estimated in the Study. (The Bull system is outlined in 10.4.6).

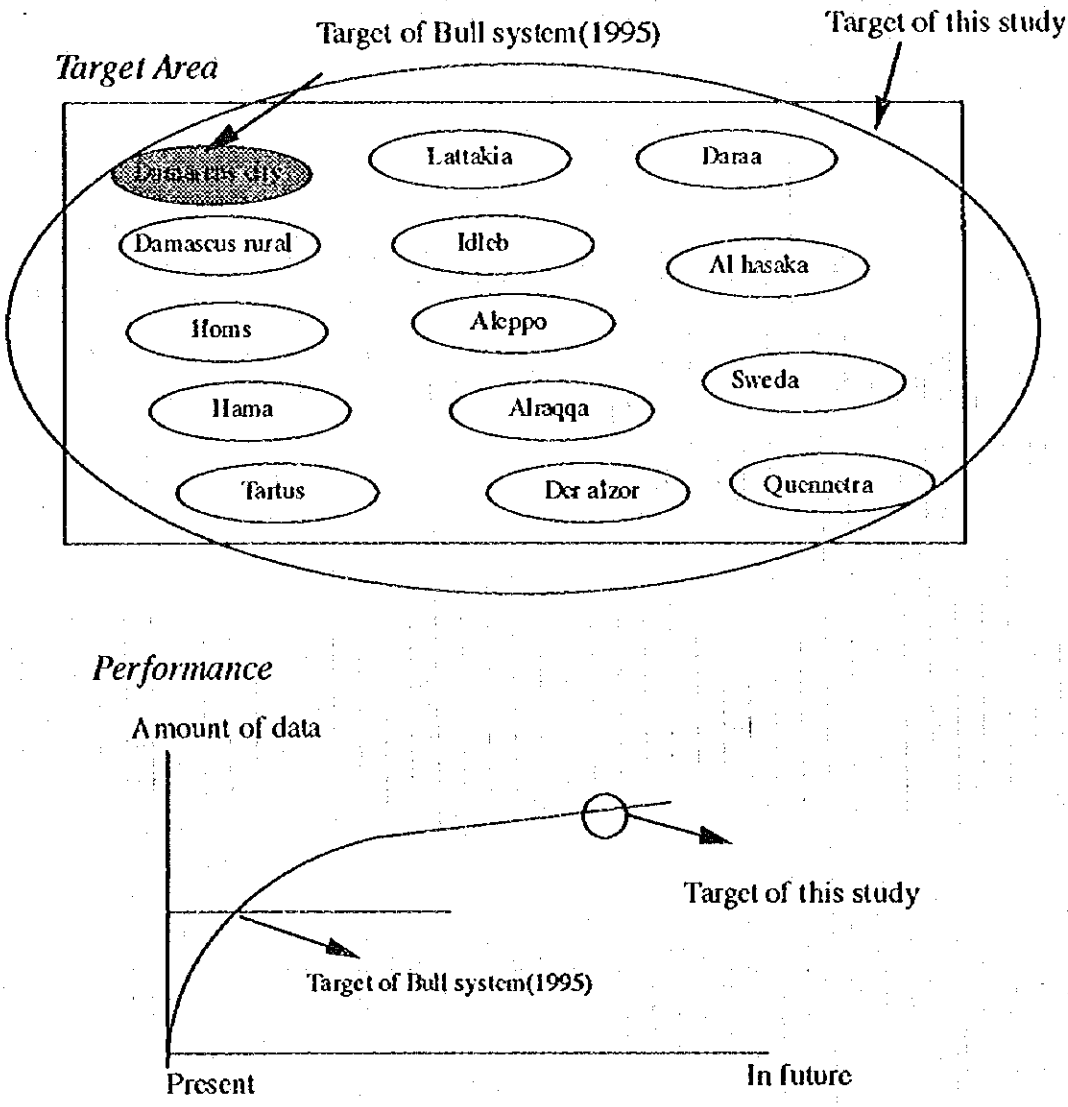


Figure 10.4.1-2 Relationship between Bull System and This Study

Here we examine service operation before the beginning operation of Bull system as "Present Service Operation."

10.4.2 Methodology

(1) Viewpoint of the Study

In the Study we pay attention to STE's "process"* to prepare a computer-system plan. We develop a system outline to solve each managerial issue using the process. Accordingly, we do not only propose a computer system for particular work but propose instead work-flow improvement.

Note*: "Process" means a series of tasks from a customer's request to fulfillment. The process thus cannot be divided according to organization or personnel.

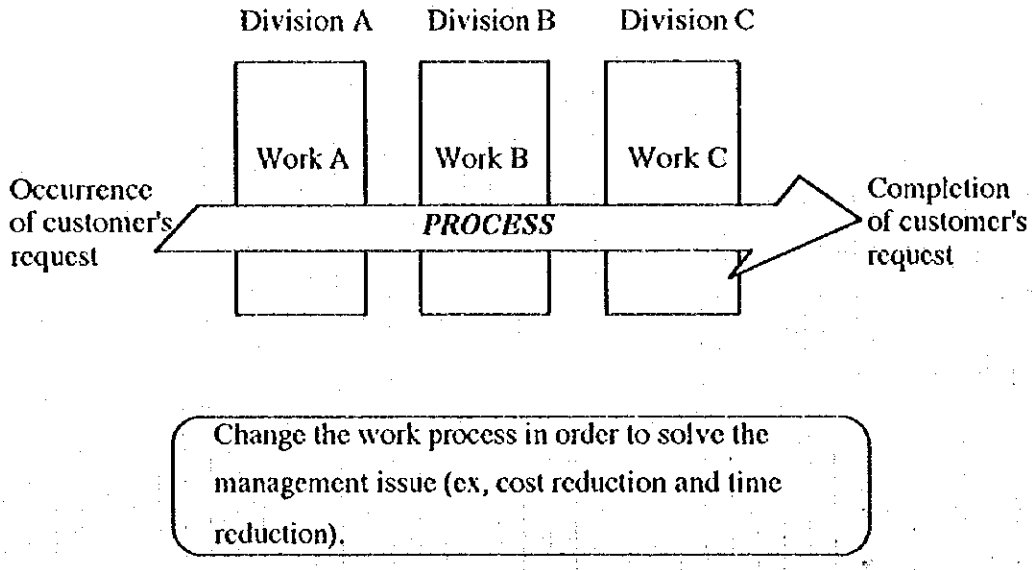


Figure 10.4.2-1 Viewpoint of the Study

(2) Methodology

Business-process reengineering

We use the concept of "BPR" to improve the STE's work. BPR is advocated by Dr. M. Hammer of MIT and this advanced method is very popular in the United States and Japan. In BPR we clarify the series of tasks ("process") generated by a customer's request. After that we strive to change the series by a viewpoint such as concurrent process, distribution of specific work, etc. to resolve the managerial issue. We endeavor to use information technology to effect the change. The proposed system is thus apt to be an integrated system that connects many divisions. (Reference: "Reengineering the Corporation" by M. Hammer.)

Business Process Reengineering

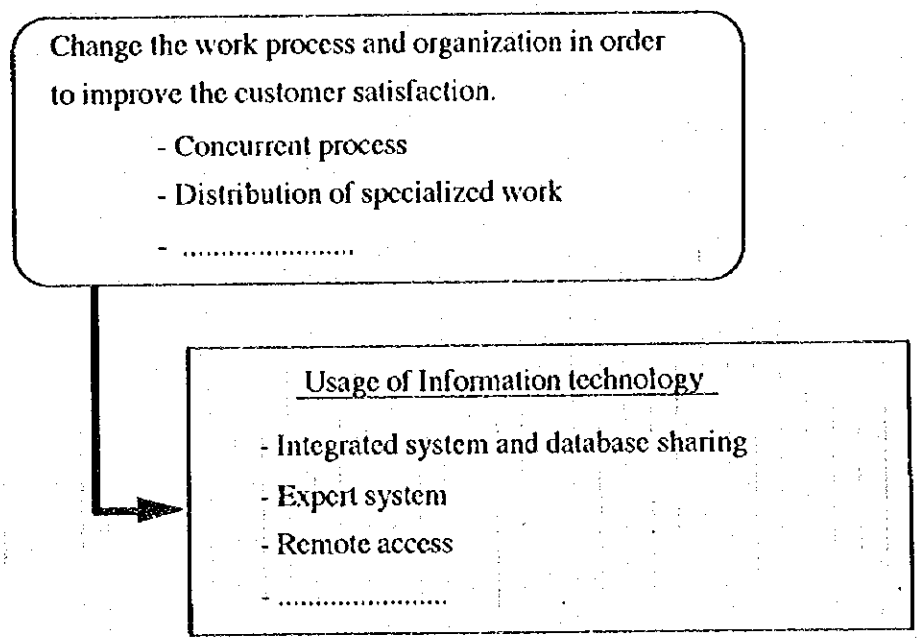


Figure 10.4.2-2 The BPR Concept

Office work chart

We use an "office work chart" to clarify the main work stream and to grasp the relationship between organizations. In this chart, one axis indicates the organization and the other indicates the time. We list the main tasks according to actual sequence.
We describe the status of each managerial issue (for example, if the issue is time reduction, we describe the necessary time for each task). On the basis of work that should be implemented according to a macro view.

Office Work Chart

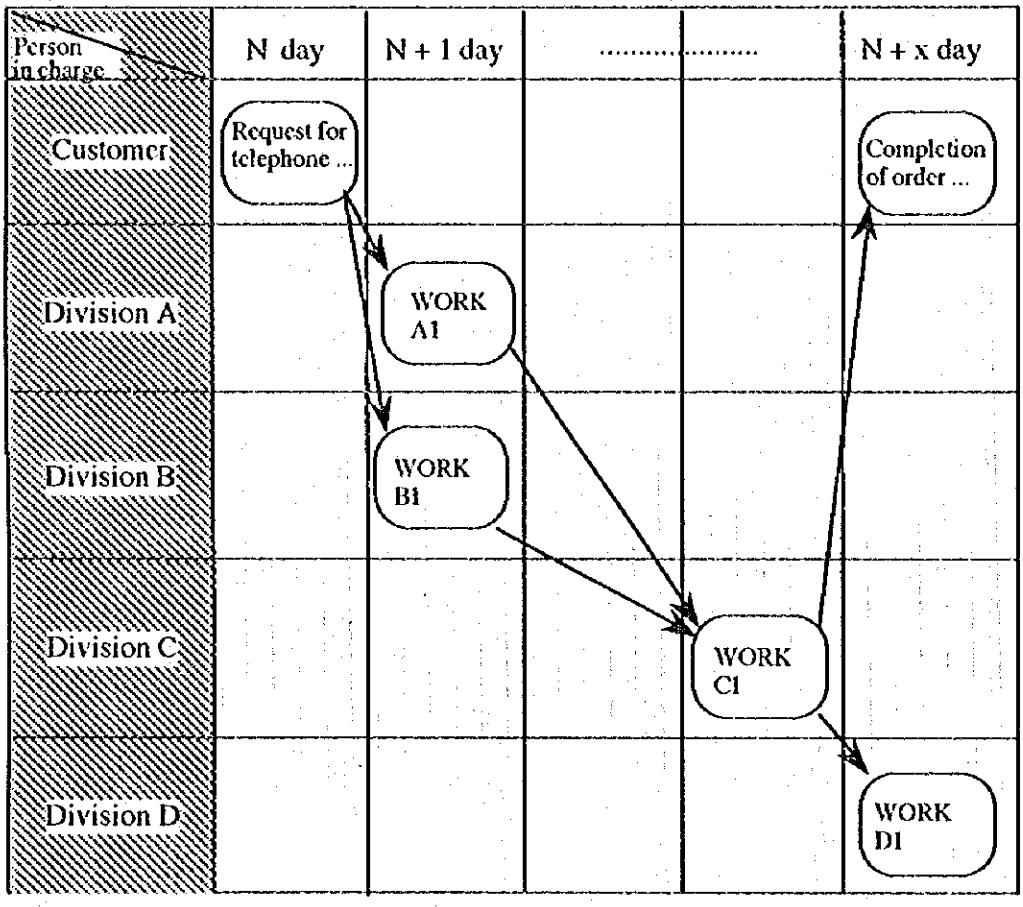


Figure 10.4.2-3 Office Work Chart Example

I/O chart

We use an I/O chart to clarify detail work flow. We clarify the detail work step and grasp the necessary input and output information. We quantitatively survey the information volume and processing performance. On the basis of the chart we locate the bottleneck of the process and prepare an improvement plan.

Input / Output CHART

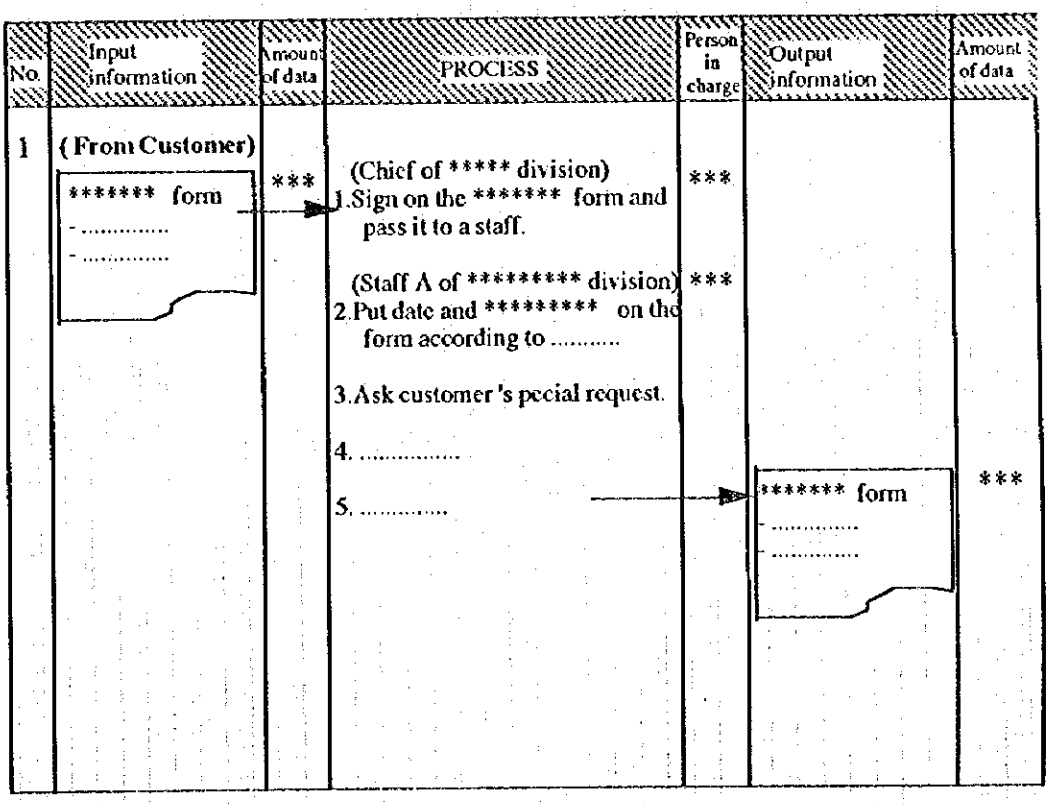


Figure 10.4.2-4 I/O Chart Example

10.4.3 Customer Service

Customer Service contains the following kinds of tasks: new subscriptions, changing telephone numbers, etc. In STE the number of new subscribers is supposed to be rapidly increased according to the future plan for telephone-network expansion . It is therefore natural to consider new subscriptions here as the most important task.
We will investigate new subscriptions chiefly for the above reason.

Table 10.4.3-1 Customer Service Tasks

1. New subscription
2. Changing telephone number
3. Changing address in same city
4. Changing address in another city
5. Giving telephone to other person
6. Cancel telephone number
7. Returned telephone number
8. Correcting the name
9. Unlisting number
10.Discontinuing service

New-subscription processes

First we will investigate new subscriptions, using the office-work chart (Figure 10.4.3-1). The reason for choosing the Old Mazzeh telephone center as a model is that this center is of intermediate-level exchange capacity (25,000) and in the number of personnel (49) among the Damascus centers. The following office chart tell us two facts.

(1) Ten days have elapsed from the customer's telephone-installation request . This seems to be a common situation. Nowadays, however, STE restrains customer requests for new subscriptions according the type of request. Those who want a telephone as soon as possible must pay a premium (Table 10.4.3-2).

Table 10.4.3-2 Type of Requests for New Subscription

Year of customer's request	Necessary payment	Type of requests
~ 1980	4,000 SP(normal cost)	Normal
1981 ~ 1985	35,000 SP	Urgent
1986 ~ 1990	55,000 SP	Urgent
1991 ~ 1994	65,000 SP	Urgent
1995 ~	75,000 SP	Urgent

(2) Considering the total time, we realize that it takes too long for the office section to perform their work, which means there is something wrong.

Office Work Chart in case of New subscription (MAZZEH)

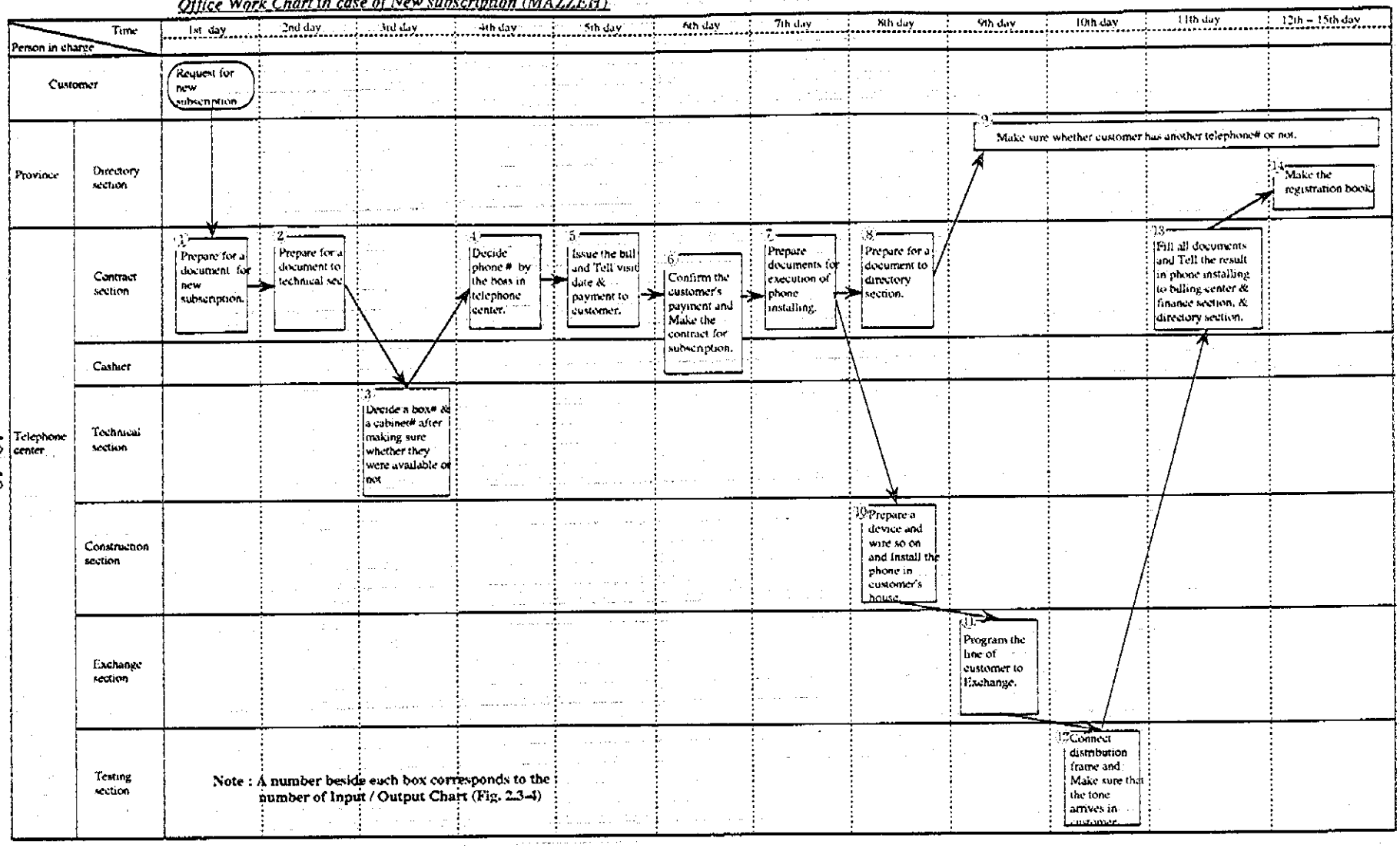


Figure 10.4.3-1 Office Work Chart for New Subscription(Mazzeh)

Input-Output Chart for New Subscriptions

Next we will investigate new subscriptions, including data and process information, using an I/O chart (Figure 10.4.3-4). We will especially like to make clear the reason for the above-mentioned problem--why the office work takes excessive time.
The following I/O chart tell us two things.

(1) Compared with executive work, the potential data related to office work (Tasks No. 1 through 7 in Figure 10.4.3 -4) are fewer than in executive tasks. This means wasted time in executive work. By this it is meant that the Construction and Exchange Sections, etc. must be awaiting instructions for new subscriptions (Figure 10.4.3-2).

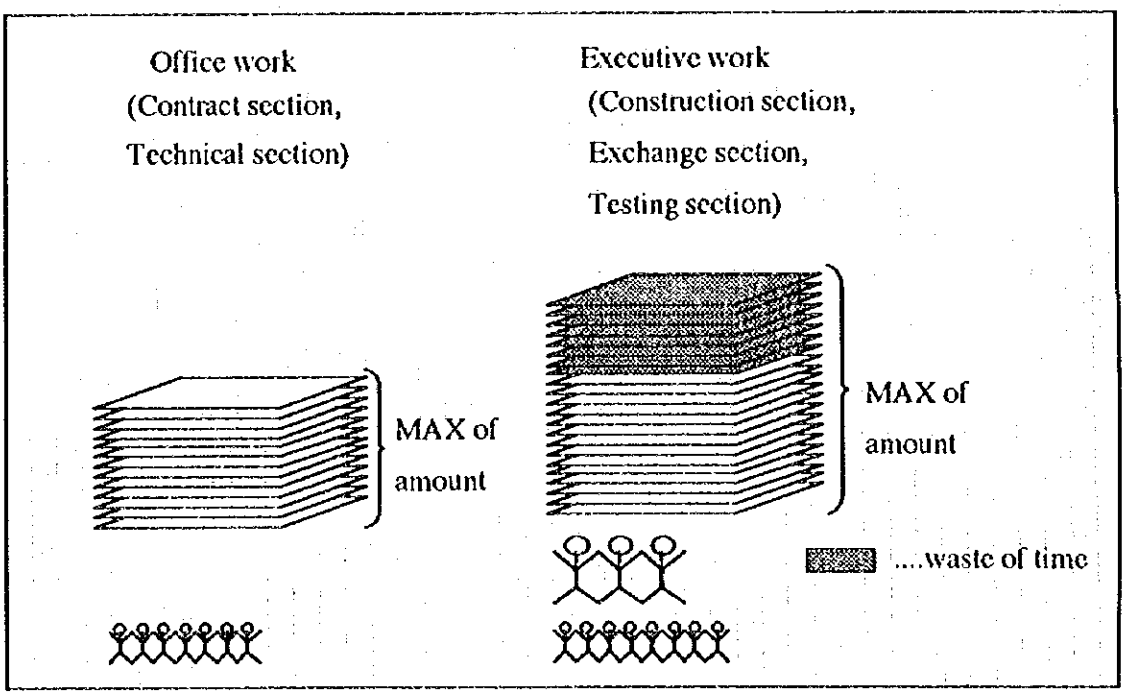


Figure 10.4.3-2 Waste of productivity by the gap of potential data between office and executive work

(2) We realize that there is excessive transcription in the job-process series for the office section. Similar data—such as the customer's name and address—are delivered to other personnel in the same section or in another section (Figure 10.4.3-3). This means wasted time.

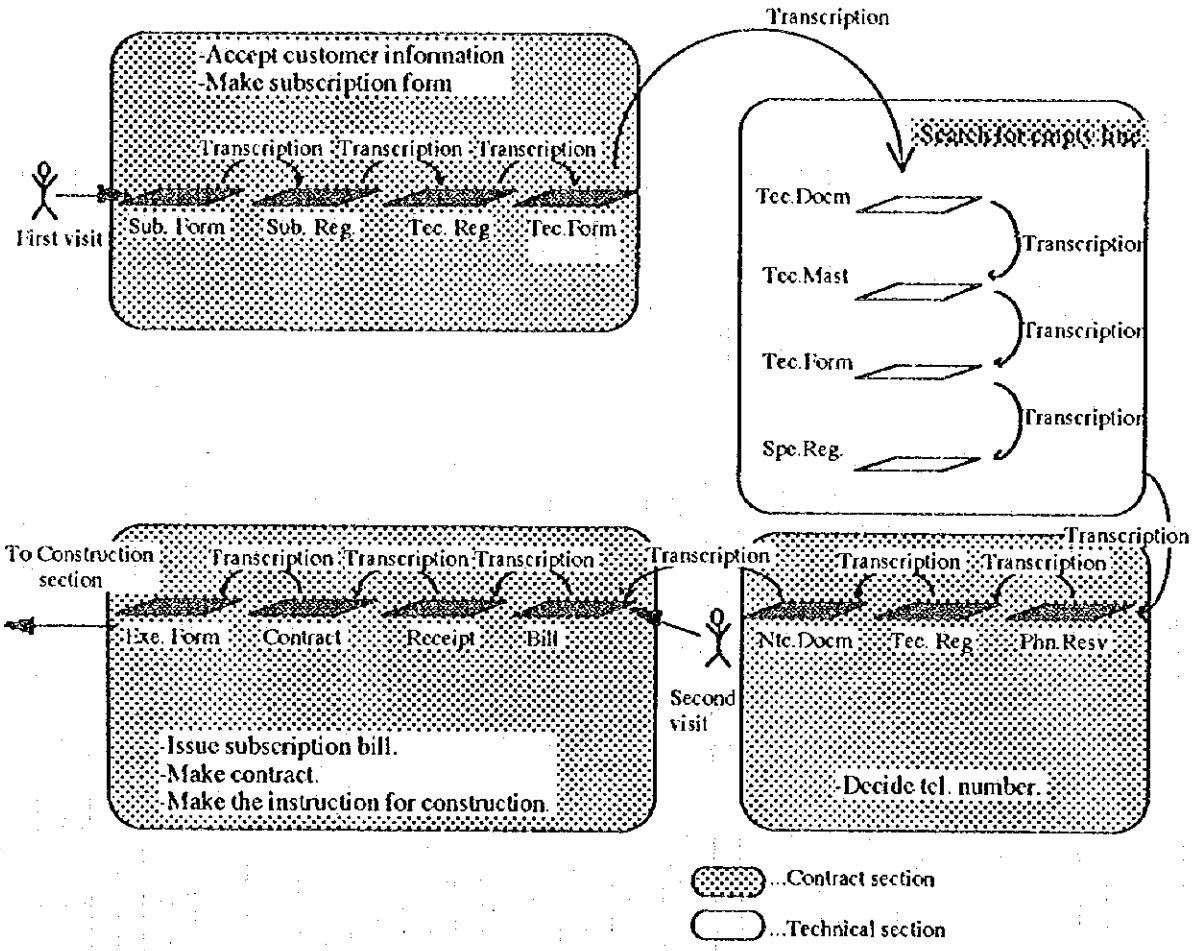


Figure 10.4.3-3 The waste of productivity by excessive transcription

The details of forms indicated in figure 10.4.3-4 are shown in the supporting Report (from S1-10-1 to S1-10-17).

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
1	(From Customer) Subscription form (user's field) - Subscriber identification - Information about last subscription - Kind of service	7~16 papers	(Chief of Contract section) 1.Sign on the subscription form and pass it to a staff.	1/4		
	(In Contract section) Subscription registration book		(Staff A of Contract section) 2.put date and subscription # on the form according to Subscription registration book. 3.Ask customer 's kind and section and put their information on them. 4.Check the subscription form, sign to it and stamp by the staff of contract section. 5.Pass the stub of the form for customer.	1/4	(To Contract section) Subscription registration book (To Contract section) Subscription form filled all field except technical book # (To Customer) Subscription form filled all field (Stub)	7~16 papers 7~16 papers 7~16 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
2	**(In Contract section)** Subscription form filled all field except technical book #	7~16 papers	(Staff A of Contract section) 1.Fill in 2copies of Technical form according to the subscription form.	1/4	**(To Contract section)** Technical registration book	7~16 lines
	(In Contract section) Technical registration book		2.Put date and technical book # on technical forms according to Technical registration book. 3. Pass the subscription form and technical forms to chief of contract section.			
			(Chief of Contract section) 4.Check all information on them, put technical book # of technical form on subscription form and sign to technical forms by the chief of contract section.	1/4	**(To Contract section)** Subscription form filled all field	7~16 papers
			(Staff A of Contract section) 5.Keep subscription form in contract section.	1/4		
			6.Pass technical forms to technical section.		**(To Technical section)** Technical form -Subscription information (No. date,kind, address) -Customer's information (Name,address, Tel.# for contact)	7~16 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
3	(From Contract section) Technical form	10~40 papers	(Chief of Technical section) 1. Receive technical form from contract section.	1/3		
	(In Technical section) Technical document		(Staff A of Technical section) 2. Fill in the front page of technical document (including instruction) according to technical form and Sign on it by Chief.	1/3		
			3. Pass technical document for each staff of technical section.		(To Technical section) Technical master book	10~40 lines
			(Staff B of Technical section) 4. Go out to confirm whether available or not (box , cabinet,) and check home/office, distance between box and home, customer's profession.	1/3		
			5. Fill in the backside of technical document. 6. Pass it to the chief of technical section		(To Technical section) Special register book	10~40 lines
			(Chief of Technical section) 7. Check all information on technical document and sign to it.	1/3		
	(In Technical section) Technical master book		8. Fill in the blank of technical form(box #, cabinet #...) and write these information in technical master book.		(To Contract section) Technical document	10~40 papers
	(In Technical section) Special register book		9. Write date and technical book # in special register book, and pass technical form to the chief .		(To Contract section) 2 copies of Technical form	10~40 papers
			10. Pass technical document and technical forms to contract section.			

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
4	(From Technical section) Technical document		(Staff B of Contract section) 1. Receive technical document and technical forms from technical section.	1/4		
	(From Technical section) 2 copies of Technical form	10–40 papers	2. Bring them to center boss.		(To Boss of center) Phone line's reservation book	10–40 lines
	(In Boss room) Phone line's reservation book		(Boss of telephone center) 3. Write phone # in them based on phone line's reservation book, and write customer's name in it.	1		
			(Staff B of Contract section) 4. Pass one copy of technical form to technical section, and keep another technical form and technical document in contract section.	1/4	(To Technical section) One copy of technical form to technical section	10–40 papers
	(In Contract section) Technical registration book		5. Write the form-returned-date in Technical registration book.		(To Contract section) Another technical form Technical document	10–40 papers
					(To Contract section) Technical registration book	10–40 lines

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
5	(In Contract section) Technical form Technical document	10~40 papers	(Staff C of contract section) 1. Make the document that indicate to visit telephone center and necessary payment. 2. Attach the copy of this document to those form; Subscription form,Technical form, Technical document. 3. Keep those in contract section. 4. Inform it to customer by mail. (No need stamp)	1/4	(In Contract section) Technical form Technical document Notice document for customer (To Customer) Notice document for customer	10~12 papers 10~12 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
6	(From Customer) Notice document for customer	10~12 papers	(Customer) 1. Submit stub of subscription form and notice document to contract section.			
			(Staff C of Contract section) 2. Receive it from customer. 3. Issue the bill for their application.	1/4	(To Customer) Bill	10~12 papers
	(From Customer) Bill	10~12 papers	(Customer) 4. Bring the bill to cashier. 5. Pay necessary money at cashier.			
			(Staff A of Cashier) 6. Issue the receipt, stamp and put Bill # on it at cashier.	1/2	(To Customer) Receipt attached Bill#	10~12 papers
	(From Customer) Receipt attached Bill #	10~12 papers	(Customer) 7. Bring receipt to contract section.			
			(Staff C of Contract section) 8. Check the contents of receipt. 9. Make the Rent contract and the Pledge at contract section.	1/4	(To Customer) Rent Contact	10~12 papers
			(Customer) 10. Sign to contract and pledge by customer.			
			(Staff C of Contract section) 11. Make copy of contract and pass it for customer. 12. Keep necessary form as files in contract section. (Subscription form, Technical form, Technical document, Notice document for Customer, Receipt, Rent contract, Pledge)	1/4	(To Contract section) Rent Contact, Pledge	10~12 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
7	**(In Contract section)** Subscription form Technical form Technical document Receipt	(per day)	(Staff C of contract section) 1. Fill in part(I) field of Executing form according to all documents (Subscription form, Technical form, Technical document, Receipt). (Chief of contract section) 2. Check part(I) field of Executing form. (Boss of center) 3. Check all documents filed for subscription and sign on Executing form. (Staff C of contract section) 4. Keep all document including one copy Executing form for subscription. 5. Pass the rest of six copies of Executing form to construction section.	1/4 1/4 1 1/4	**(To Contract section)** Subscription form Technical form Technical document Receipt Executing form filled in part(I) field **(To Construction section)** Executing form filled in part(I) field	(per day) 10~16 papers 10~16 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
8			(Staff B of Contract section) 1. Fill in Phone number directory form according to (ANNEX 5.3.3-1) , sign on it and pass to the chief of contract section.	1/4		
			(Chief of Contract section) 2. Check the Phone number directory form, sign on it and pass to center boss.	1/4		
			(Boss of Center) 3.Check the Phone number directory form, sign on it.	1		
			(Staff B of Contract section) 4. Pass the Phone number directory form to Directory section.	1/4	(To Directory section) Phone number directory form	10~12 papers/ day

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
9	**(From each Contract section in a Province)** Phone number directory form	300–400 papers	(Chief of Directory section) 1. Receive telephone number directory from contract section.	1/3		
	(From Directory section) Construction registration book		(Staff A of Directory section) 2. Confirm whether customer has another telephone number or not. 3. Write the result on telephone number directory.	2/3		
			(Chief of Directory section) 4. Sign on it by the chief of directory section. 5. Pass the Phone number directory form to contract section.	1/3	**(To Contract section)** Phone number directory form	30–130 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzen

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
10	**(From Contract section)** Executing form filled in part(Ⅰ) field	10~16 papers	(Staff A of construction section) 1. Receive six copies of executing form 2. Prepare a device , wire and so on for construction according to Executing form. 3. Inform of construction to Testing room by phone 4. Connect between Main cable and branch in Cabinet, and test it exchanging the result by phone between worker and testing room. 5. Connect between Box and the house or office, and test it exchanging the result by phone between worker and testing room. 6. Fill in part(Ⅱ)field of Executing form (Customer) 7. Write customer's name and signature on Executing form by himself. (Chief of construction section) 8. Sign on Executing form. (Staff A of construction section) 9.Keep special copy and another copy for warehouse. (Staff B construction section) 10. Pass them to Exchange section.	17/19	**(To Construction section)** Executing form filled in part(Ⅰ , Ⅱ) field **(To Exchange section)** Executing form filled in part(Ⅰ , Ⅱ) field	10~34 papers 10~34 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
11	(From Construction section) Executing form filled in part(Ⅰ, Ⅱ) field	10~34 papers	(Staff A of Exchange section) 1. Receive four copies of executing form. 2. Allocate a new telephone number by computer. 3. Fill in part(Ⅳ) of Executing form. (Chief of Exchange section) 4. Keep one copy of Executing form. 5. Pass the rest of copies of them to Testing section.	4/5 1/5	(To Exchange section) Executing form filled in part(Ⅰ, Ⅱ, Ⅳ)field (To Testing section) Executing form filled in part(Ⅰ, Ⅱ, Ⅳ)field	10~34

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
12	(From Exchange section) Executing form filled in part(Ⅰ, Ⅱ, Ⅳ)field	10~34 papers	(Staff A of Testing section) 1. Receive three copies of executing form. 2. Connect between the horizontal flame of Exchange and the vertical flame of cable room by jumper wire. 3. Fill in Part(Ⅲ) of Executing form and sign. (Chief of Testing section) 4. Sign on Executing form. 5. Keep one copy of Executing form. 6. Check with Construction section to make sure that tone arrives. 7. Pass the rest 2 copies of them to Contract room.	14/15 1/15	(To Testing section) Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field (To Contract section) Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	10~20 papers 10~20 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
13	(From Testing section) Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	10~20	(Staff A of Contract section) 1. Make a time table(3 copies) which contains all installed telephones.	1/4	(To Contract section) Time table	10~20 papers
			(Chief of Contract section) 2. Sign on it.	1/4	Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	
			(Staff A of Contract section) 3. Keep one copy of time table and Executing form in contract section.	1/4	(To Billing center) Time table	10~20 papers
			4. Pass one copy of time table and a Executing form to Billing center.		Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	
			5. Pass one copy of time table to Finance section.		(To Finance section) Time table	10~20 papers
			6. Pass one copy of Executing form to Directory section.		(To Directory section) Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	10~20 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Input / Output CHART (New Subscription) in case of Mazzeh

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per day)				(per day)
14	**(From Contract section)** Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	200~300 papers	(Chief of Directory section) 1. Receive executing forms from all centers in a Province.	1/3	**(To Directory section)** Construction registration book	40~75 lines
	(From Directory section) Construction registration book		(Staff B of Directory section) 2. Fill in the Construction registration book according to Executing forms .	2/3		
			3. Return back Executing forms to each center.	1/3	**(To Contract section)** Executing form filled in part(Ⅰ, Ⅱ, Ⅲ, Ⅳ) field	40~75 papers

Figure 10.4.3-4 Input / Output Chart (New Subscription) in case of Mazzeh

Anticipated shortage of existing office-work capacity to handle service orders

Next we will study whether the office-work capacity will be inadequate in the near future (until 2000) (Figure 10.4.3-5). The chart shows that in almost all office tasks, capacity will be insufficient to handle new subscriptions.

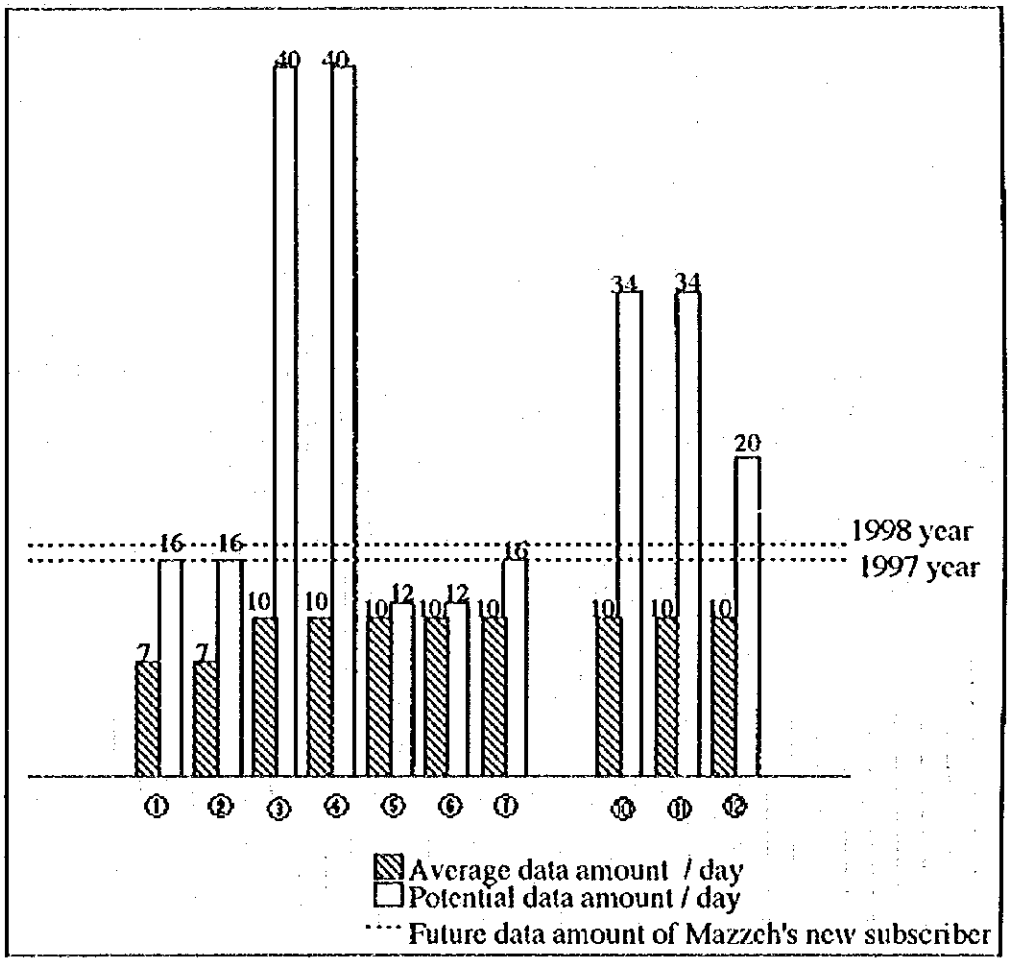


Figure 10.4.3-5 Anticipatory shortage of service order capacity

Main service-order matters requiring improvement

To rationalize office handling of service orders, the principal factors needing improvement are as follow.

- Excessive transcription: delivering similar data such as the customer's name and address to other personnel in the same section or in another section, using other documents
- Too many checks by chiefs or bosses
- Excessive time elapses before informing the customer about telephone installation. (Personnel cannot know whether a line is available when they call on a potential customer the first time.) (This matter is related to subscriber line management.)

Necessary improvements for handling service orders:

- To reduce transcription, have one person transact a series of tasks: compiling a subscription form, searching for an available line, etc.
- To search for an available line in the contract section, have the Technical Section prepare accurate information concerning the subscriber line. (This matter is related to subscriber-line management.)

10.4.4 Subscriber-line Management

In general, subscriber-line management comprises the following tasks: preparing information on unused lines (Cabinet number and Box number) for service orders, and preparing information on unused lines for cases of line changes for damaged lines, etc. As mentioned above (10.4.3), in STE the number of new subscribers are supposed to be rapidly increased according to the future plan for telephone-network expansion. Also in subscriber-line management, which is handled by STE's Technical Section, the tasks related to service orders, especially for new subscriptions, are of primary importance.
We investigate this chiefly for the above reasons.

Table 10.4.4-1 Tasks in subscriber line management

1. Line management for service order
2. Line management for line change in damaged line
3. Line decision according to network expansion
4. Warning in case of full line

As mentioned above (10.4.3), subscriber-line management is related to making office work, especially in the Contract Section, more efficient. It is therefore important to grasp how the Technical Section operates.
We will look into this by referring to the information from S1-10-6 in the Supporting Report and the Input Output Chart (Figure 10.4.3-4).

Principal matters to be improved in subscriber-line management

To make the office work more efficient, subscriber-line management should be improved as follows.

- It is impossible to prepare information on unused lines for service orders. (This is because personnel go out to check line availability. The reason is that there is no accurate map indexed in the cabinet or box.

Necessary improvements for subscriber-line management:

- To maintain accurate maps and to manage subscriber lines not only on paper but also by computer.

10.4.5 Billing

In general, billing comprises the following tasks: issuance, collection, dunning, management of collected amounts and debts, handling bill complaints, and reporting. Although in STE, different sections or departments are responsible for these tasks, we must consider them as a series of tasks related to billing because the billing system should have functions that enhance the efficiency of each of these tasks. Because bill issuance is the most urgent matter to be resolved, we will investigate the process.

Table 10.4.5-1 Billing Tasks

Issuance
Collection
Dunning
Management of collected amount
Management of debt
Handling billing complaints
Reporting matters related to billing or calling

Bill-issuance outline

Bills are issued for telephone use in each year's trimesters (or cycles). The year's first cycle is from January to March; the last is from October to December.
When bills are issued, STE informs subscribers by television and newspaper that they must pay their bills at a telephone center. A subscriber obtains a separate receipt for the bill when payment is made. If he has applied for details or if the payment exceeds 1,000 SP, an itemized document is issued (refer to S1-10-18).

Issuing bills is executed by a computerized system in the Billing Center (part of the Information Technology Directorate), and separately for each of the nine provinces of Damascus, the South Region, Hama, Homs, Aleppo, Idleb, Tartous, the East Region, and Lattakia.
Bill issuance for Damascus has been delayed by four months and for most of the other provinces by 15 or 16 months (Figure 10.4.5-1).

The computer system for billing contains three sets of equipment. Two of these are part of the VAX system that chiefly assembles entered data, updates master files for billing, and prints bills. The other is a Novell Network system that primarily deals with AMA tapes containing international, national, and operational-calls' information and is used for programming. The configuration of the existing billing system is seen in Figure 10.4.5-2.

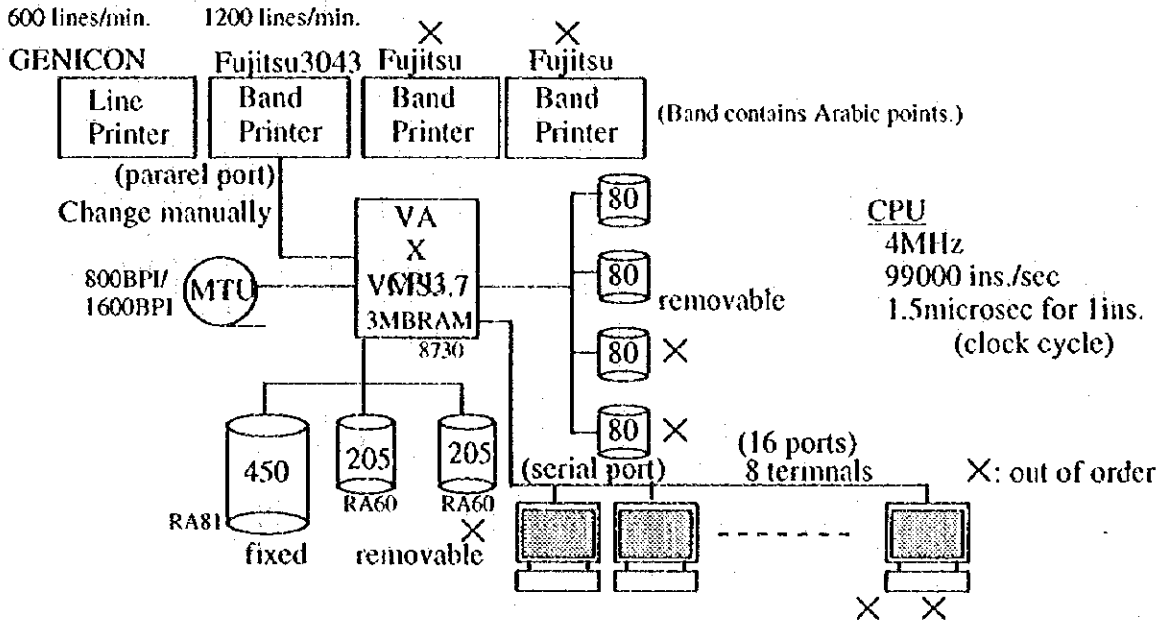
Province \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Damascus	2/94		3/94		4/94		1/95		2/95		3/95	
South Region	3/93		4/93		1/94		2/94		3/94		4/94	
Hama		3/93		4/93		1/94		2/94		3/94		4/94
Homs		3/93		4/93		1/94		2/94		3/94		4/94
Aleppo	4/93		1/94		2/94		3/94		4/94		1/95	
Idleb		3/93		4/93		1/94		2/94		3/94		4/94
Tartous		3/93		4/93		1/94		2/94		3/94		4/94
East Region	3/93		4/93		1/94		2/94		3/94		4/94	
Lattakia		3/93		4/93		1/94		2/94		3/94		4/94

1/95 ... 1st cycle of 1995

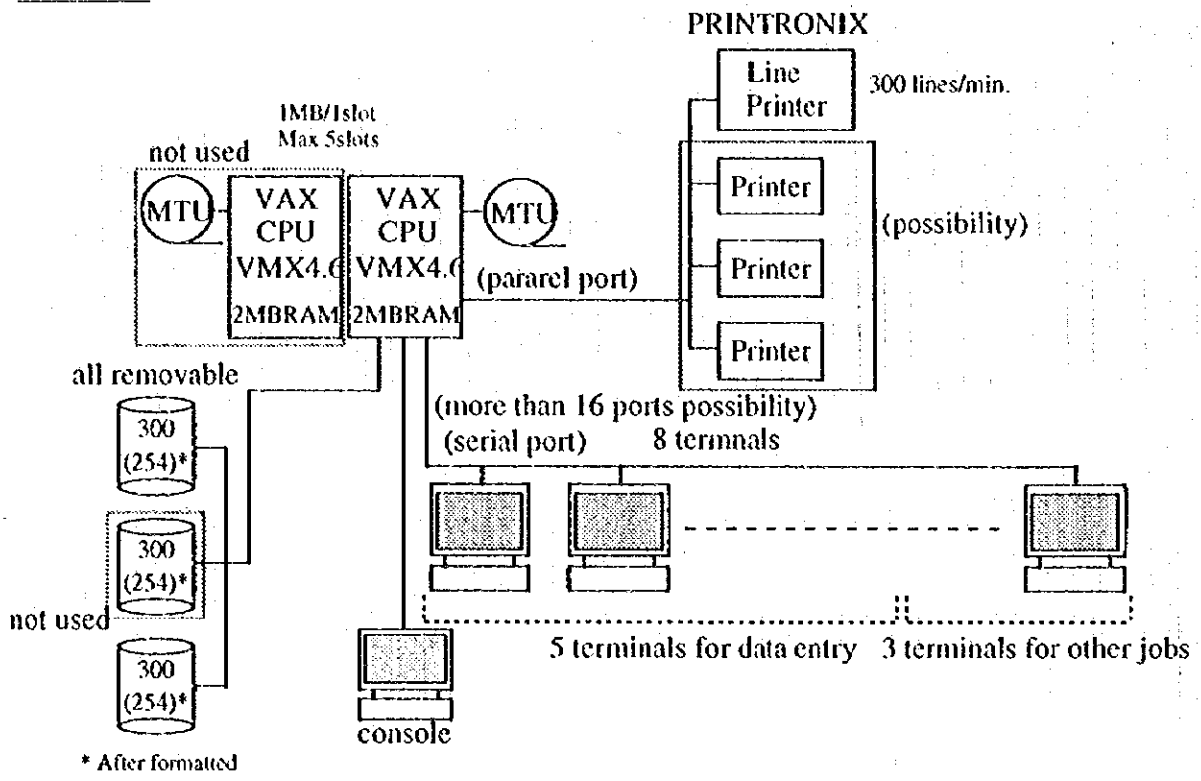
Note ; Schedule for the current situation if the automation project has not executed or has been delayed for any reason

Figure 10.4.5-1 Time Schedule of Bill Issuance for the year of 1995

Old VAX



New VAX



· 3 priners (Fujitsu, PRINTRONIX, GENICON) are changable for both old VAX and new VAX.

Figure 10.4.5-2 System configuration of the current billing system (1)

Configuration of Novell Network

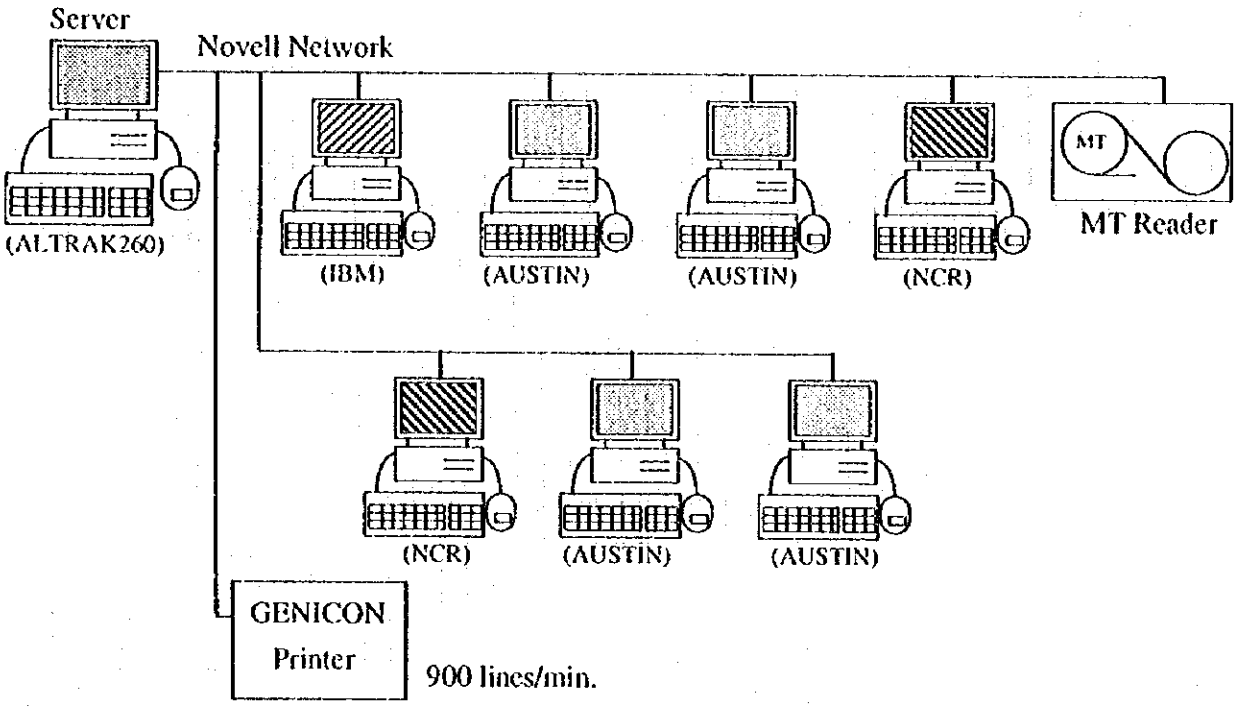


Figure 10.4.5-2 System configuration of the current billing system (2)

Work flow in bill issuance

The work flow in issuing bills is as indicated in the Office Work Chart (Figure 10.4.5-3). In this chart the necessary time for a process or a series of processes is indicated for a center because each process of issuing bills is executed for each telephone center in a province. For Damascus, soon after printing bills and details of bills for the center, the bills are sent to the center. In the other provinces, after printing the bills for all the centers of each province, the bills are sent in a batch to the main provincial center.

To elucidate the processes of bill issuance for plural centers, we prepared a Time Chart Model (Figure 10.4.5-4). According to the chart and other information related to the time for issuing bills in each province, it would be possible to issue bills for a cycle for all of Syria within the next three months—the next cycle—if two VAX machines (old and new) and two printers were always available (Figure 10.4.5-5).

The "Possible Schedule" (Figure 10.4.5-5), however, is merely a model, and in practice bill issuance has already been much delayed. For Damascus, the delay is relatively shorter because of the area's priority over other areas. For most provinces, however, there are large backlogs and the data entries are not begun until after more than a year has passed from the end of a cycle.

Office Work Chart in case of Billing (Bill Issuance)

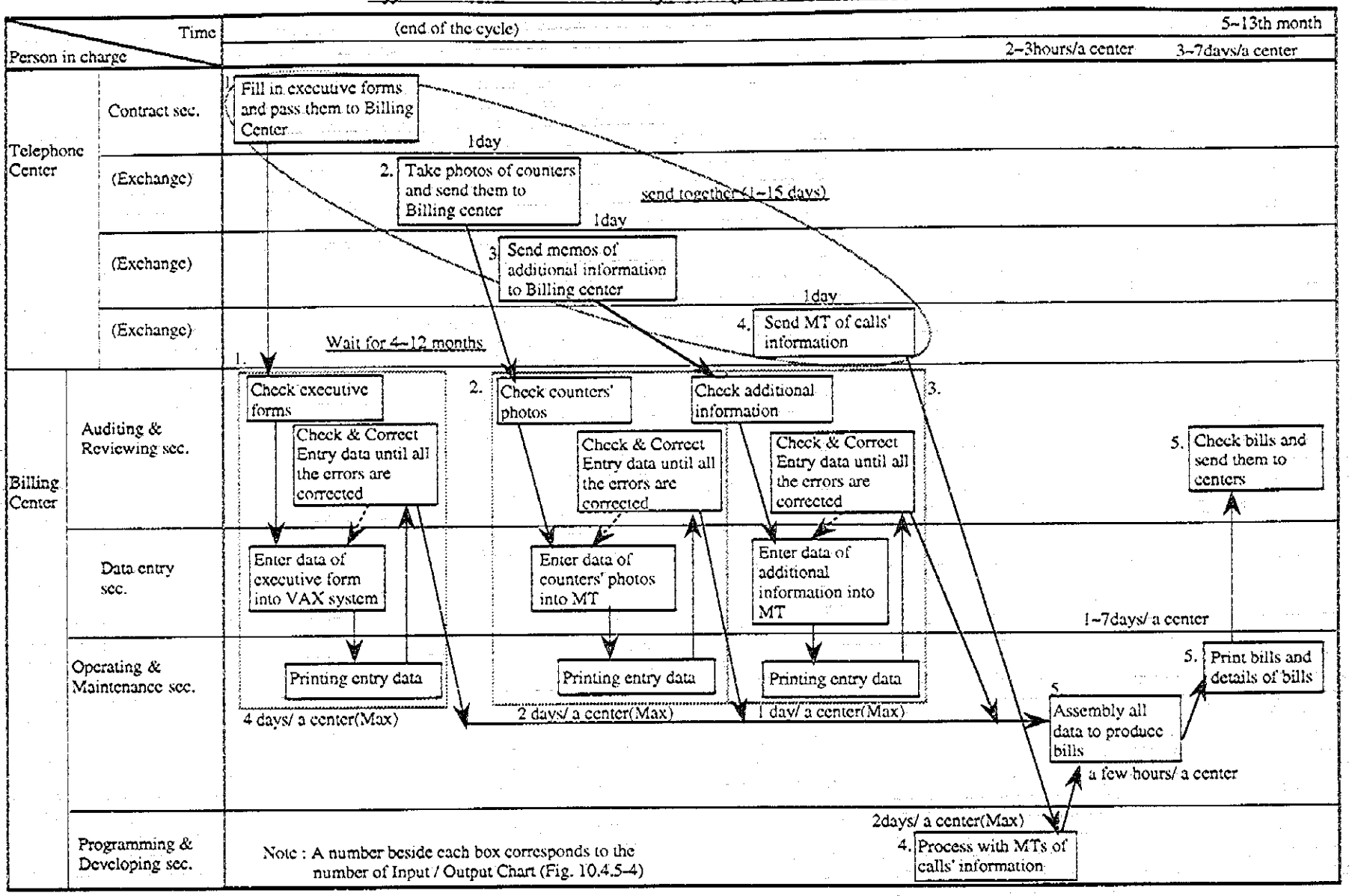


Figure 10.4.5-3 Office Work Chart for Bill Issuance

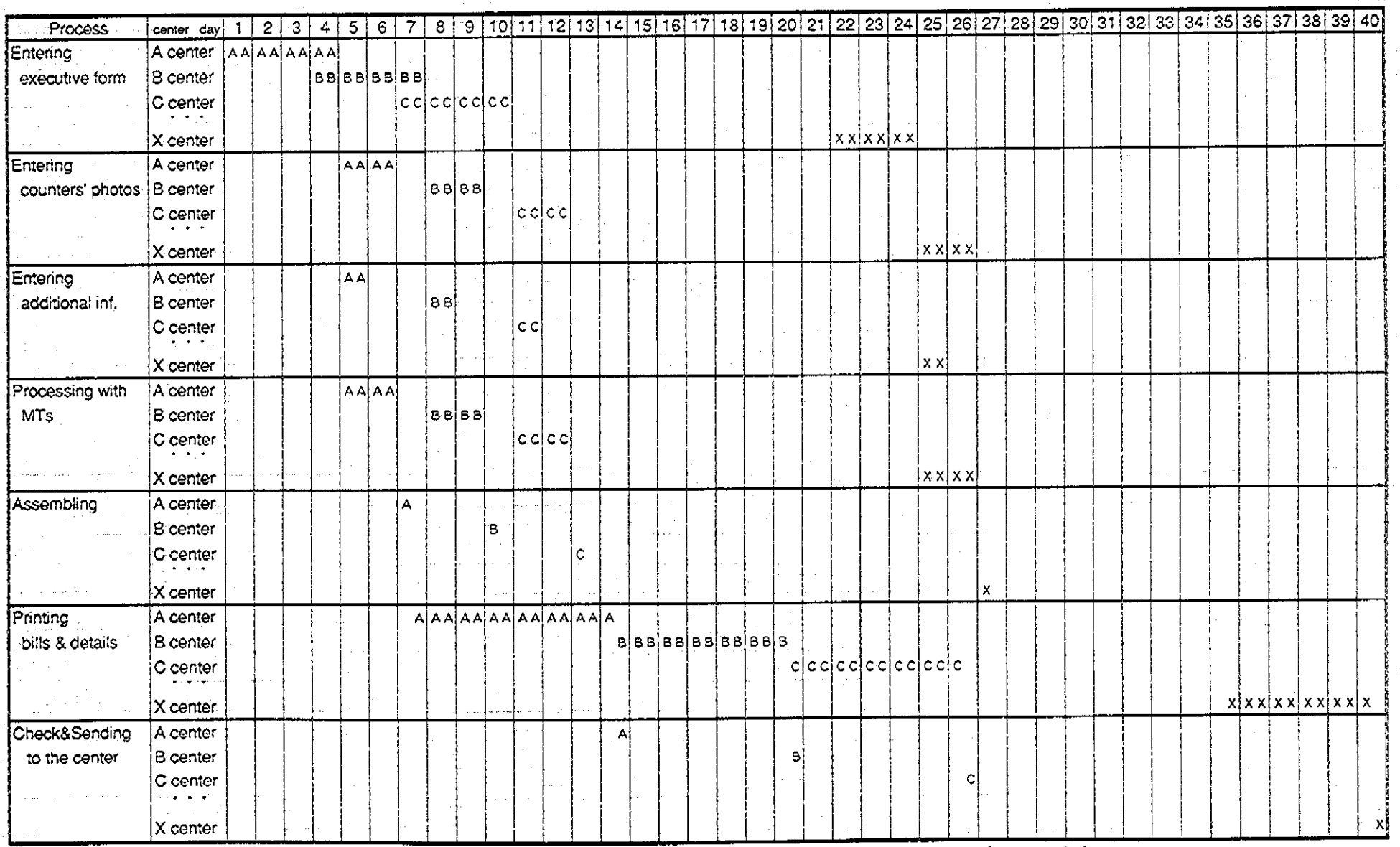


Figure 10.4.5-4 Time Chart Model for Bill issuance for Damascus (Example)

Province	Last Cycle	Current Cycle			Next Cycle
		1st month	2nd month	3rd month	
Damascus		* * * * * * * * * *	* *		
South Region		* * * * * *			
Hama		* * *	* * *		
Homs			* * * * * *		
Aleppo			* * * * * * * * * *		
Idleb			* * * *		
Tartous				* * * *	
East Region				* * * * * *	
Lattakia				* * * *	

Necessry time data sent from telephone centers

* * * Bill Issuance

Figure 10.4.5-5 Possible Billing Schedule without the Present Delay

From the bill-issuance work flow, and considering the situation related to issuing bills, we find the following.

(1) The main reason for the great delay in issuing bills is the accumulated backlog.

- Figure 10.4.5-5 tells us that it would be possible to issue bills for all of Syria within the next cycle, if bill issuance could begin promptly after a cycle is completed.
- Unfortunately, until about four or 16 months pass after a cycle finished, the cycle's bill issuance cannot begin because of the backlog—bill issuance for the past one to five cycles.
- This backlog was caused by a long-term breakdown of entry machines, delays in changing programs when the tariff was changed, and other reasons.

(2) The delay would become worse under the present situation.

- The backlog could continue to increase. This is because equipment might malfunction—in which case repairs would take a long time.
- In the present situation, inasmuch as there is no better performance than issuing bills for a cycle for all Syria within three months, once additional delay is incurred, the loss cannot be recovered.
- Accordingly, as long as the situation continues unchanged, delay in bill issuance will become worse.

(3) The existing bill-issuance process will be inadequate to handle additional subscribers.

- The amount of data treated in issuing bills is continuing to increase because of new subscribers.
- It is clear that bill issuance will be inadequate in the future.

We find two bottlenecks in issuing bills according to the Time Chart Model (Figure 10.4.5-4). One is entering executive-form data with checking and corrections. The other is printing the bills and their details.

(1) Completing executive forms takes much longer than entering other data.

- It is not until finishing entry of all kinds of data, and processing with MTs of calls' information, that bills can be assembled and printed.
- Executive-form completion takes a maximum of four days for a center despite working in triple shifts day and night, although entering other data and processing with MTs takes just one or two days.
- This comprises the first bottleneck.

(2) The greatest amount of time is consumed in printing bills and their issuance details.

- Printing bills and details takes five to seven days at a large center.
- Until recently only one printer was available, so the waiting time for printing was long. This

often affected the printing of entered data, as well.

- The situation has been improved somewhat because another low-speed printer has become available.
- The improvement, however, is insufficient, and printing is still the second bottleneck.

Input Output Chart for bill issuance

Next we investigate in detail each bill-issuance process by preparing an Input/Output Chart (Figure 10.4.5-6).

To find how many bills the present billing system can issue, or the extent of unused capacity, we calculated the amount of data treated as input and the possible amount of treatable data as output. According to the chart, in most bill-issuance processes little unused capacity remains.

Moreover, to verify the near future's billing-system-capacity shortage, we prepared a chart indicating three kinds of data volume. Two are the same as in the I/O Chart. The other is the amount of data estimated for the future (until 2000) (Figure 10.4.5-7). The chart shows that in most processes, capacity will be inadequate for handling new subscribers and subscriptions.

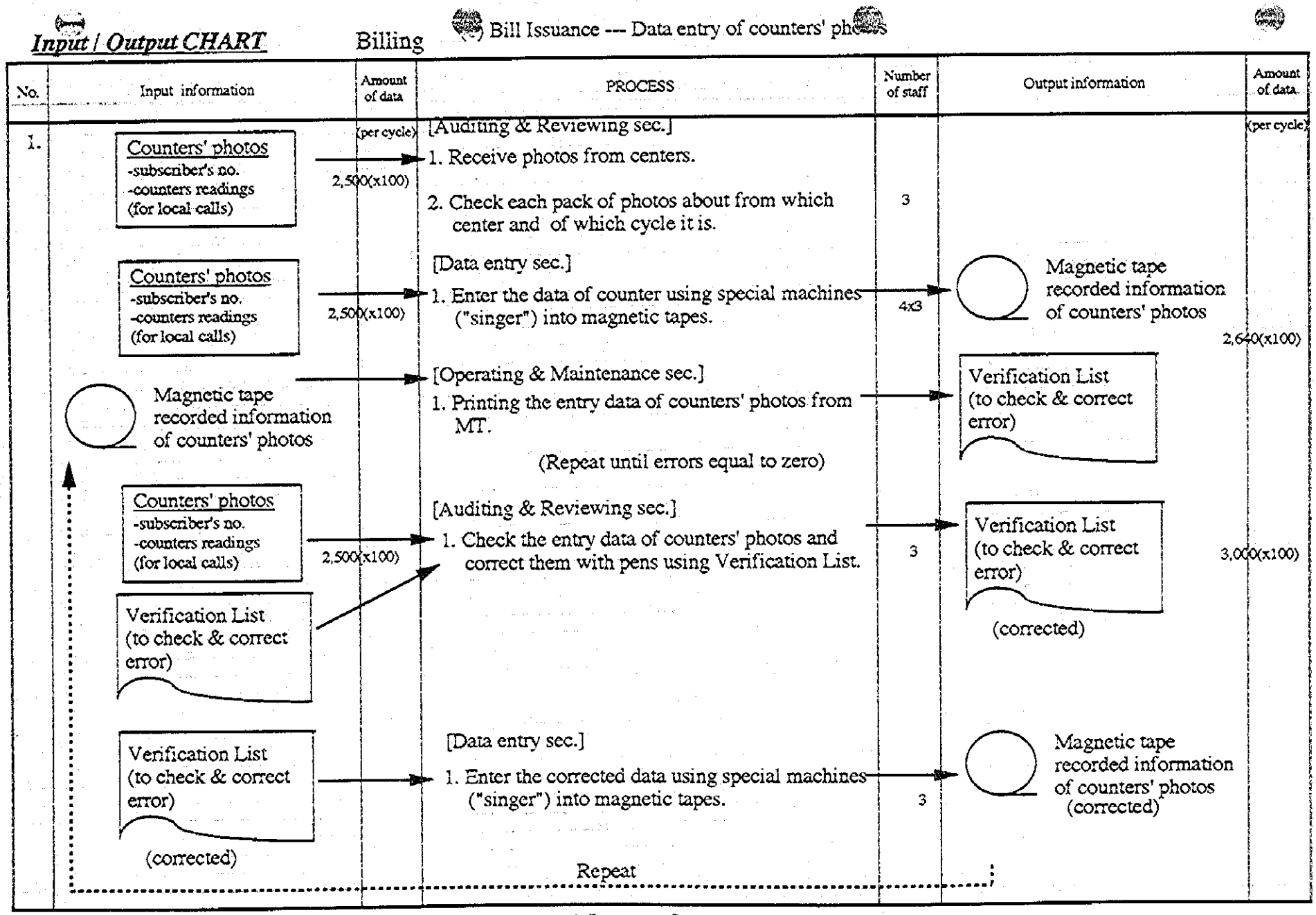


Figure 10.4.5-6 Input / Output CHART for Bill Issuance

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
2.	Memos of Additional Inf.. -subscriber's no. -transaction code -amount	(per cycle) 1000	[Auditing & Reviewing sec.] 1. Receive memos of additional information from centers.			(per cycle)
			2. Check each memo of additional information.	1		
	Memos of Additional Inf.. -subscriber's no. -transaction code -amount	1000	[Data entry sec.] 1. Enter the data of additional information using special machines ("singer") into magnetic tapes.	1	Magnetic tape recorded additional information	3600
	Magnetic tape recorded additional information		[Operating & Maintenance sec.] 1. Printing the entry data of additional information from MT. (Repeat until errors equal to zero)		Verification List (to check & correct error)	
	Memos of Additional Inf.. Verification List (to check & correct error)	1000	[Auditing & Reviewing sec.] 1. Check the entry data of additional information and correct them with pens using Verification List.	1	Verification List (to check & correct error) (corrected)	4000
	Verification List (to check & correct error) (corrected)		[Data entry sec.] 1. Enter the corrected data using special machines ("singer") into magnetic tapes.	1	Magnetic tape recorded additional information (corrected)	
			Repeat			

Figure 10.4.5-6 Input / Output CHART for Bill Issuance

(3) Bill Issuance --- Data entry of executive forms

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per cycle)				(per cycle)
3.	Executive forms -subscriber's no. -subscriber's name -subscriber's address -subscriber charge and so forth	30,000	[Auditing & Reviewing sec.] 1. Receive executive forms from centers. 2. Check each executive form.	10		
	Executive forms -subscriber's no. -subscriber's name -subscriber's address -subscriber charge and so forth	30,000	[Data entry sec.] 1. Enter the data of executive form from terminals into VAX system.	4x3	Hard disk recorded information of executive form	36,000
	Hard disk recorded information of executive form		[Operating & Maintenance sec.] 1. Printing the entry data of executive form from VAX. (Repeat until errors equal to zero)		Verification List (to check & correct error)	
	Executive forms Verification List (to check & correct error)	30,000	[Auditing & Reviewing sec.] 1. Check the entry data of executive form and correct them with pens using Verification List.	10	Verification List (to check & correct error) (corrected)	36,000
	Verification List (to check & correct error) (corrected)		[Data entry sec.] 1. Enter the corrected data using special machines ("singer") into magnetic tapes.	4x3	Hard disk recorded information of executive form	
			Repeat			

Figure 10.4.5-6 Input / Output CHART for Bill Issuance

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per cycle)	[Programming & Developing sec.]			(per cycle)
4.	Magnetic tape recorded calls' information International, National or Operator call (AMA)	MTs for 500,000 subscribers	1. Receive MTs from centers. 2. Check each MT about from which center and of which cycle it is. 3. Make some processes with magnetic tapes by Novell Network System –Convert binary data into decimal data –Calculate amount and charges –Sorted by subscriber's number, the output file is CALLS FILE, which makes detail information report –Each subscriber's records are made into one record for printing bills, the output file is CALTOT –Write CALLS FILE and CALTOT on MT		CALLS FILE CALTOT	MTs for 1,000,000 subscribers

Figure 10.4.5-6 Input / Output CHART for Bill Issuance

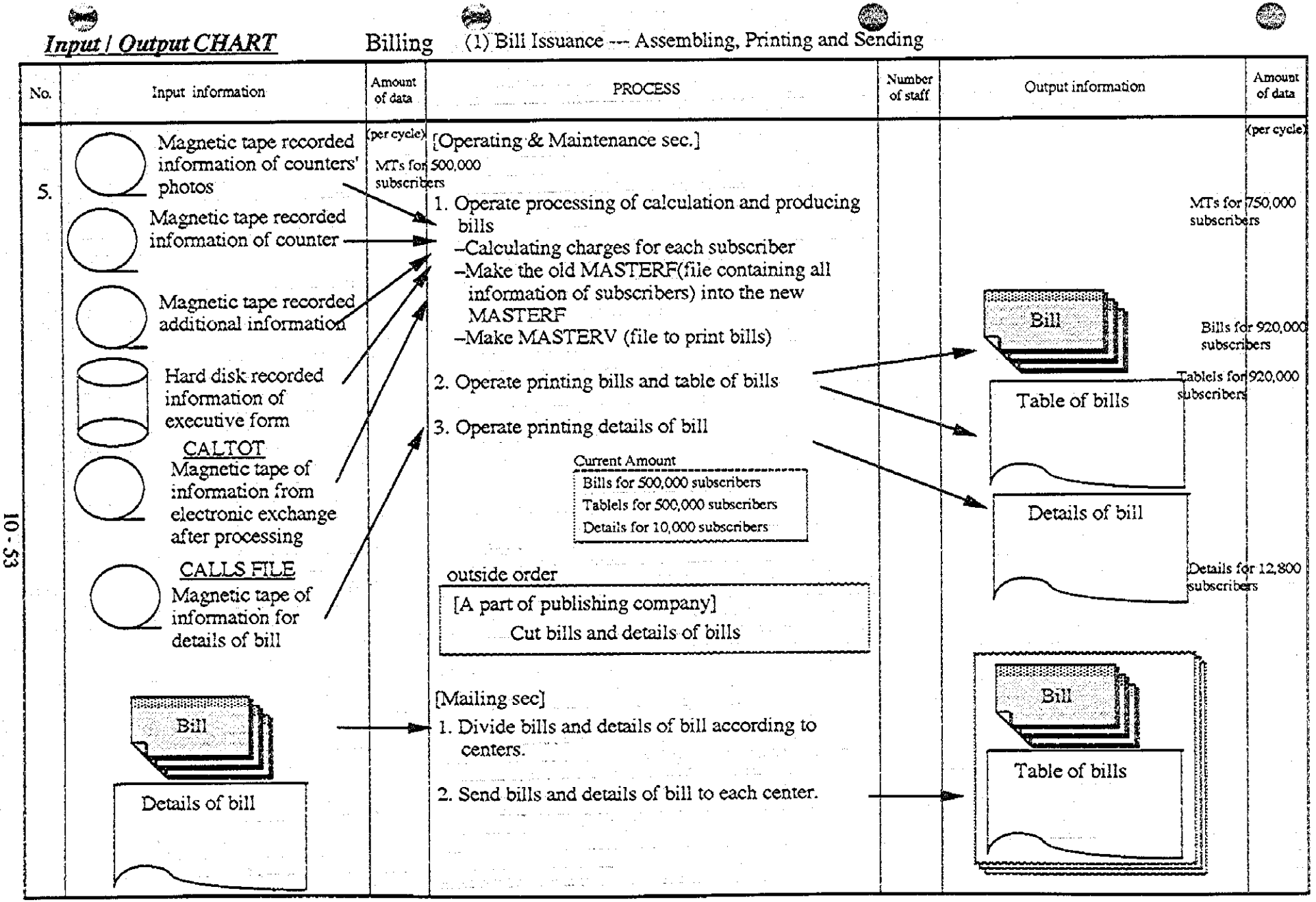
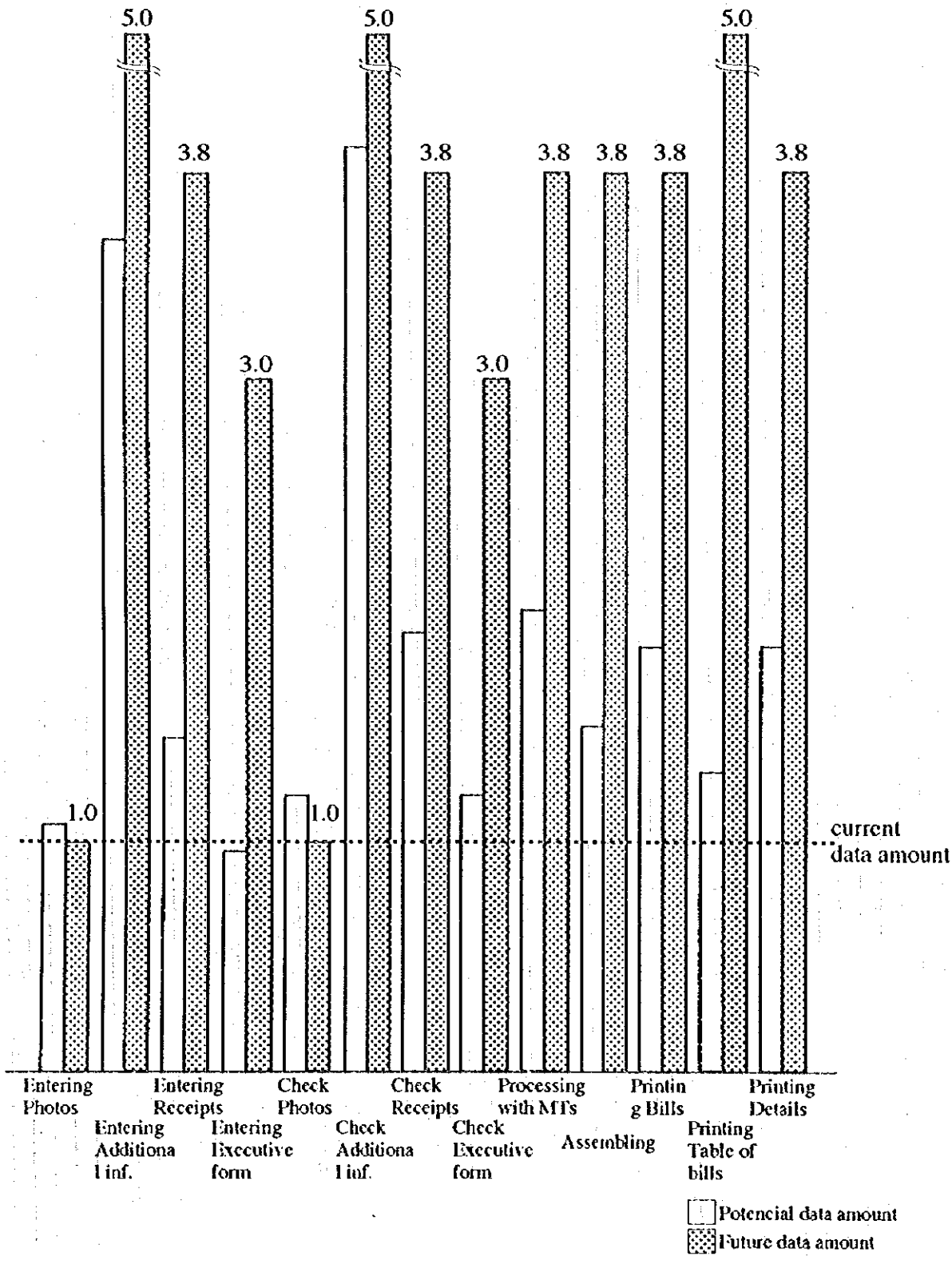


Figure 10.4.5-6 Input / Output CHART for Bill Issuance



Note: 1. Each figure indicates the ratio to the current data amount.

2. Entering and check receipts are included because those are some parts of billing system.

Figure 10.4.5-7 Anticipatory shortage of the current billing system capacity

Principal matters to be improved in bill issuance

In the present billing procedure, the principal matters to be improved are as follow.

- Issuing bills is seriously delayed because of the five-cycles' backlog.
- The performance of issuing bills has no unused capacity.
- Executive-form completion with checking and corrections takes a long time.
- Printing bills and their details is highly time consuming.

Also, taking into consideration the addition of new subscribers:

- Bill-issuance performance will totally run behind, especially for executive-form completion and printing.

Necessary improvements in bill issuance are as follow.

Table 10.4.5-2 Necessary Improvements

Matters	Improvement
Much delay because of 4 or 5 cycles' backlog	-Temporary concentrating issuing bills until all backlog has been processed
Issuing bills with none left undone	-To upgrade billing system performance and -To obtain reliable and rapid maintenance service
Long time for completing executive form with checking and corrections	-To increase terminals for data entry -To enhance the function of checking entry data by the computer or -To complete executive forms in contract sections of centers
Long time for printing bills and details of bills	-To introduce high-speed printers -To print bills at each center or -To distribute printing to some provinces
Anticipatory deficiency in total issuance of bills	-To introduce equipment with high performance or -To distribute billing system to some provinces

Other billing tasks

In addition to bill issuance, we outlined other representative tasks in billing by preparing Office Work Charts (Figures. 10.4.5-8 and 10.4.5-9).

Office Work Chart in case of Billing (Collection & Dunning)

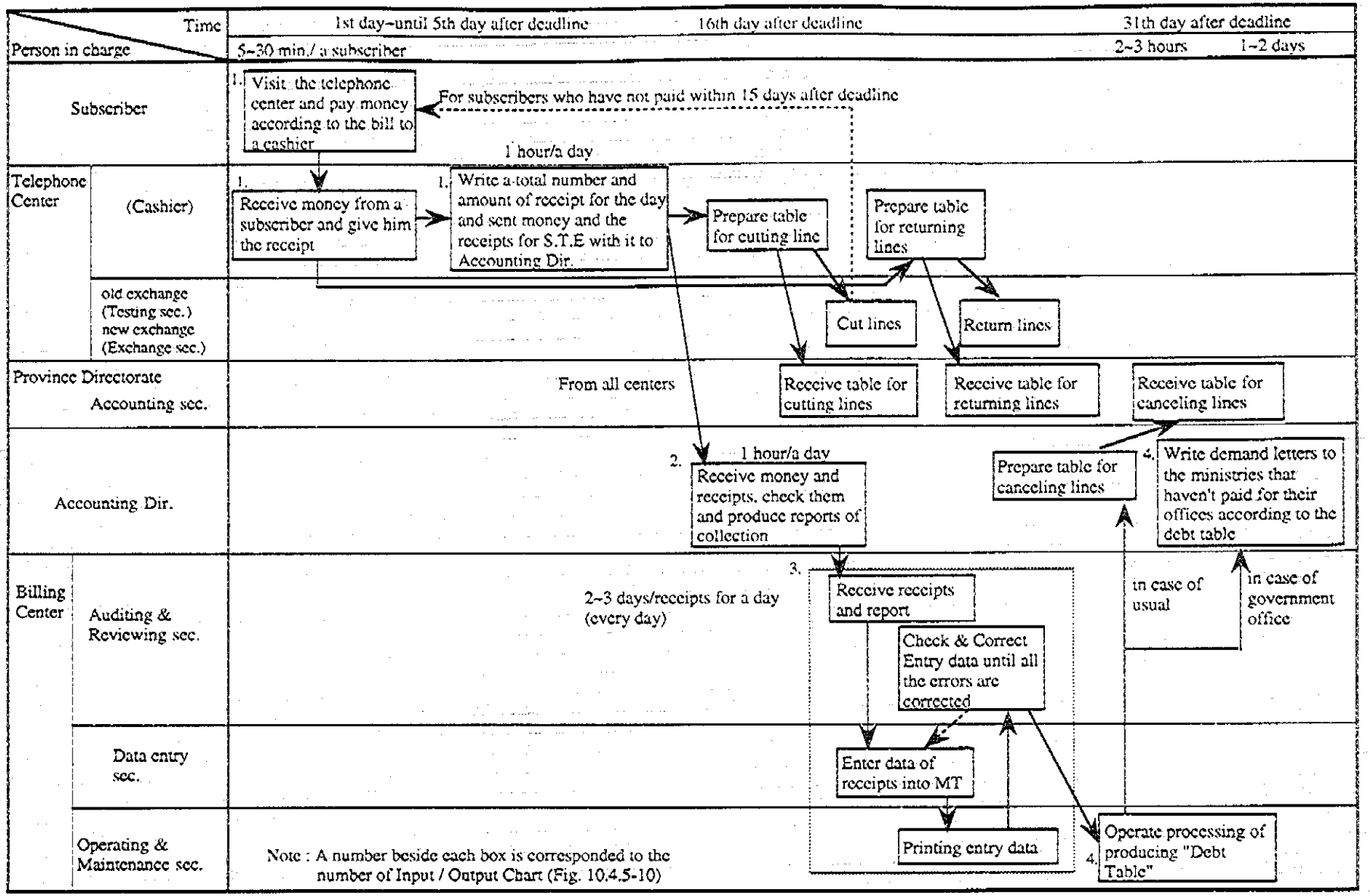


Figure 10.4.5-8 Office Work Chart for Collection & Dunning

Office Work Chart in case of Billing (Complaints) — Example of Damascus

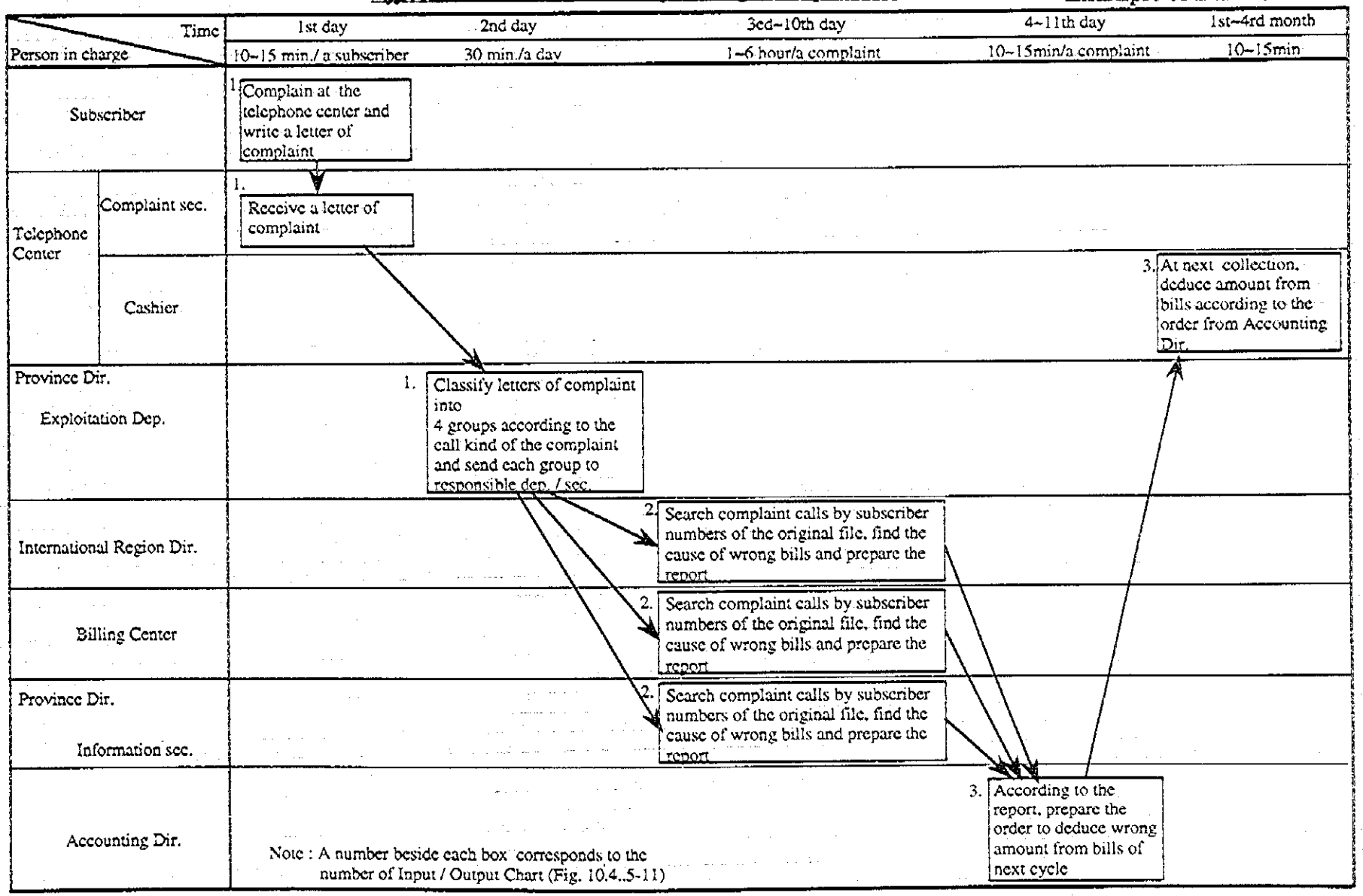


Figure 10.4.5-9 Office Work Chart for Handling billing complaints

Next we prepared Input/Output Charts to elucidate the tasks in detail (Figures. 10.4.5-10 and 10.4.5-11).

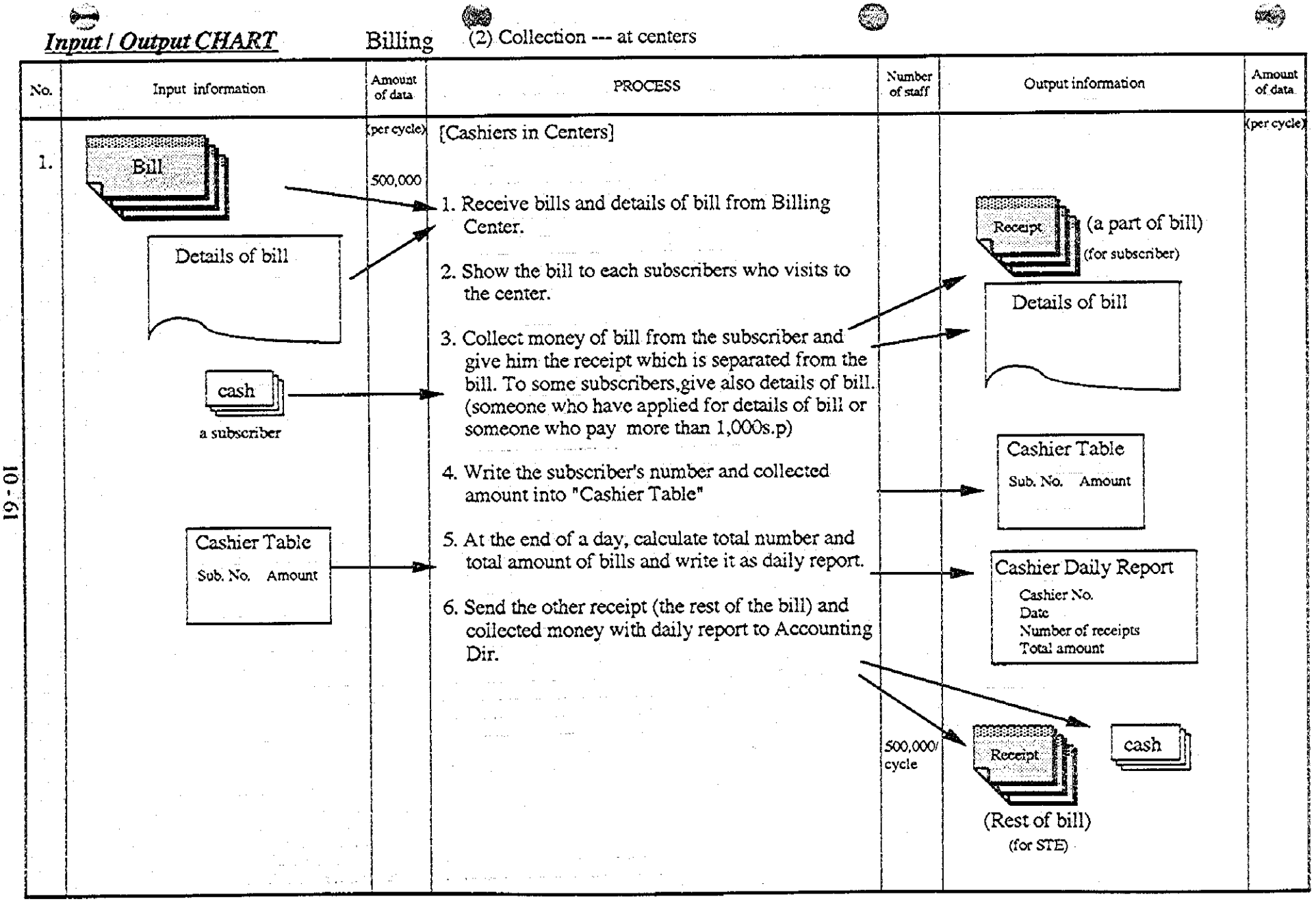


Figure 10.4.5-10 Input / Output CHART for Collection

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per cycle)				(per cycle)
2.	Receipt (for STE) cash	500,000	[Accounting dir.] 1. Receive receipts and cash from cashiers. 2.Check(insure) receipts & collected money. Money must be equal to the total amount of receipts.. 3. Calculate total number and amount of receipt , prepare the report of collection by that and order I / T dir. produce "debt table"to insure the report . To do it, pass the report and receipts to I / T Dir.		Collection table (Amount, Date, Center No.) Report of collection Total amount to be paid Total amount paid (income) Total amount not to have been paid (debt) Receipt	
	Collection table (Amount, Date, Center No.)					

Figure 10.4.5-10 Input / Output CHART for Collection

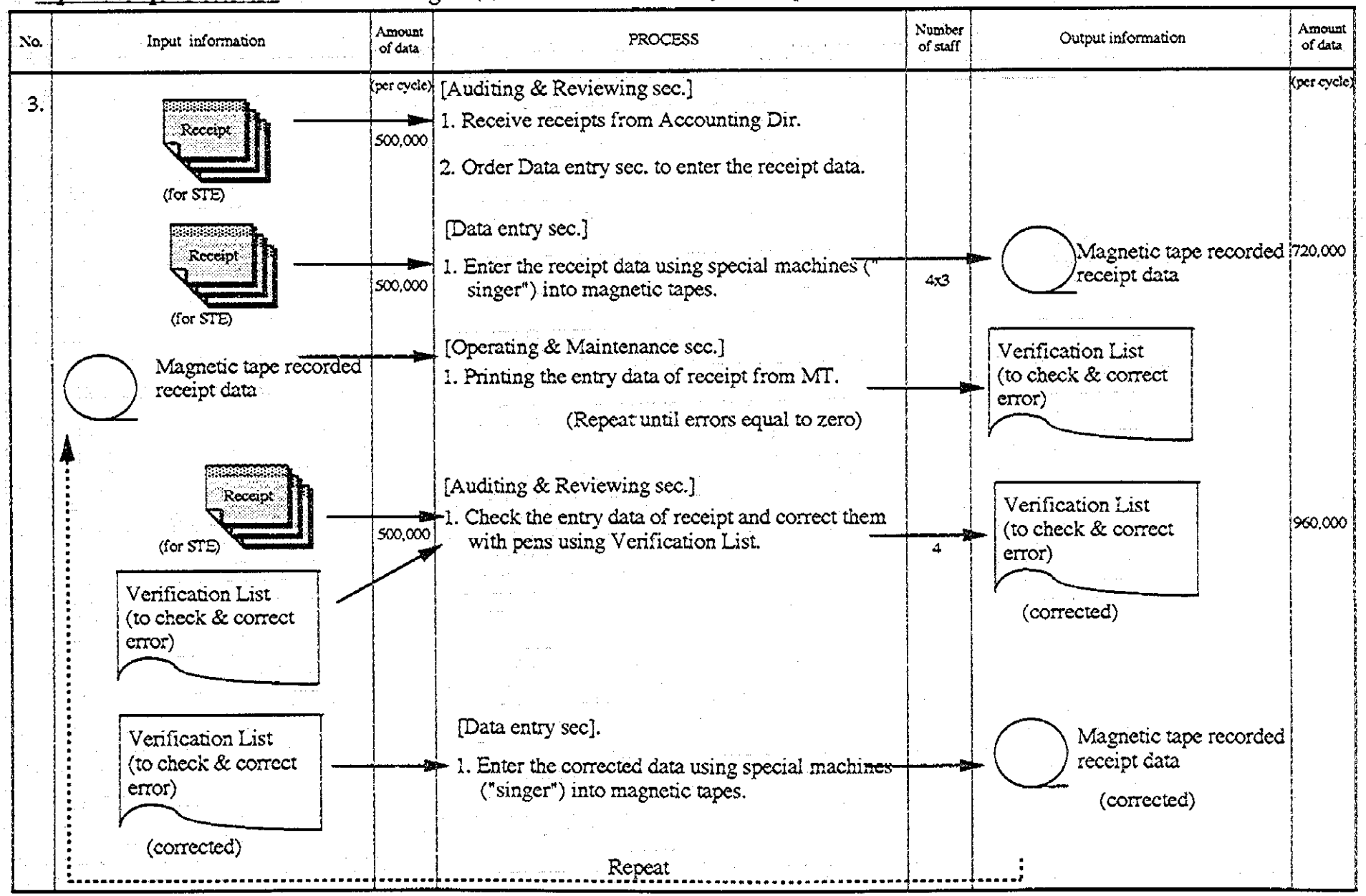


Figure 10.4.5-10 Input / Output CHART for Collection

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per cycle)	[Operating & Maintenance Sec.]			(per cycle)
4.	Magnetic tape recorded receipt data		1. Operating process to produce "Debt Table" –Compare "Debt File" (recorded debt and amount of the current bill for each subscriber)with MT file recorded receipt data) and produce new " Debt File" by omitting subscribers who have no debt. –Print it as "Debt Table". 2. Pass "Debt table" to Accounting Dir.		Debt Table subscriber No. name debt	
	Debt Table subscriber No. name debt		[Accounting Dir.] 1. Receive "Debt table" from Operating & Maintenance sec. 2. According to "Debt table", write and send letters to ministers to ask to pay telephone charges of their offices. (send letters also to General Minister to let him tell to the ministers to pay)		To ..... Minister Please pay telephone charges ...million S.T.E	

Figure 10.4.5-10 Input / Output CHART for Collection

Input / Output CHART Billing (5) Handling Billing Complaints 1

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per cycle)				(per cycle)
1.	A subscriber A letter of complaint		[Contract sec. in Center] 1. Receive a letter of complaint from a subscriber. 2. Send it to Exploitation Department in Province Dir.		A letter of complaint	
	A letter of complaint		[Exploitation Department in Province Dir.] 1. Receive all letters of complaint from subscribers in the city through centers. 2. Classify them according to the call kind of the complaint (1) Operational call (2) Additional (3) Metering[counter] call (4) Direct call 3. Send letters following department / section according to classification above (1) ... International Department (2)or(3) ... Billing Center (4) ... Information Section in Province Dir. (a part of billing center functionally)		A letter of complaint To International Dep. To Billing Center To Information Sec.	
2.	A letter of complaint To International Dep.		[International Dep.] 1.Receive letters of complaint related to operational call. 2. Search complaint calls by operator I.Ds of the original file and find the cause of wrong bills. 3. Send reports of wrong bills to Accounting Dir.		Report of wrong bills	

Figure 10.4.5-11 Input / Output CHART for Handling Billing Complaints

Input / Output CHART Billing (11) Hamdling Billing Complaint s 2

No.	Input information	Amount of data	PROCESS	Number of staff	Output information	Amount of data
		(per cycle)	[Billing Center]			(per cycle)
2.	A letter of complaint To Billing Center		1. Receive letters of complaint related to additional inf.. or metering [local] calls. 2. Search complaint calls by subscriber numbers of the original file and find the cause of wrong bills. 3. Send reports of wrong bills to Accounting Dir.		Report of wrong bills	
	A letter of complaint To Information Sec.		[Information sec. in Province Dir.] 1. Receive letters of complaint related to direct calls. 2. Search complaint calls by subscriber numbers of the original file and find the cause of wrong bills. 3. Send reports of wrong bills to Accounting Dir.		Report of wrong bills	
3.	Report of wrong bills		[Accounting Dir.] 1. Receive reports of wrong bills from International Dep.,Billing Center or Information sec. in Province Dir. 2. According to the reports, prepare the order to reduce wrong amount from bills of next cycle. 3. Send the order to each center.		Order to reduce wrong amount	

Figure 10.4.5-11 Input / Output CHART for Handling Billing Complaints

Through the Office Work Chart (Figures. 10.4.5-8 and 10.4.5-9) and the Input/Output Chart (Figures. 10.4.5-10 and 10.4.5-11), we detect inefficient processes.

- Data entry of receipts in the collection process
- Management of debts and dunning
- Handling complaints

When we plan to improve billing, it is important to make these jobs more efficient as well as to improve bill issuance.

- Enhance efficiency of receipts' data entry.
- Enhance efficiency of collection and debt management.
- Make dunning more effective.
- Accelerate settlement of complaints.

A personal computer system has recently been employed to assist in the collection process in some telephone centers in Damascus (Figure 10.4.5-12). This has the following benefits.

- Enhanced efficiency of receipts' data entry in each center
- Assisting collection by cashiers; for example, by preparing daily reports
- Speedy handling of complaints and inquiries by PC data searches, etc.

The PC system, however, will not succeed because it takes longer to handle both bills on paper and the PCs when PC operation is added to the workload. It is therefore necessary to improve billing-related jobs in an integrated manner.

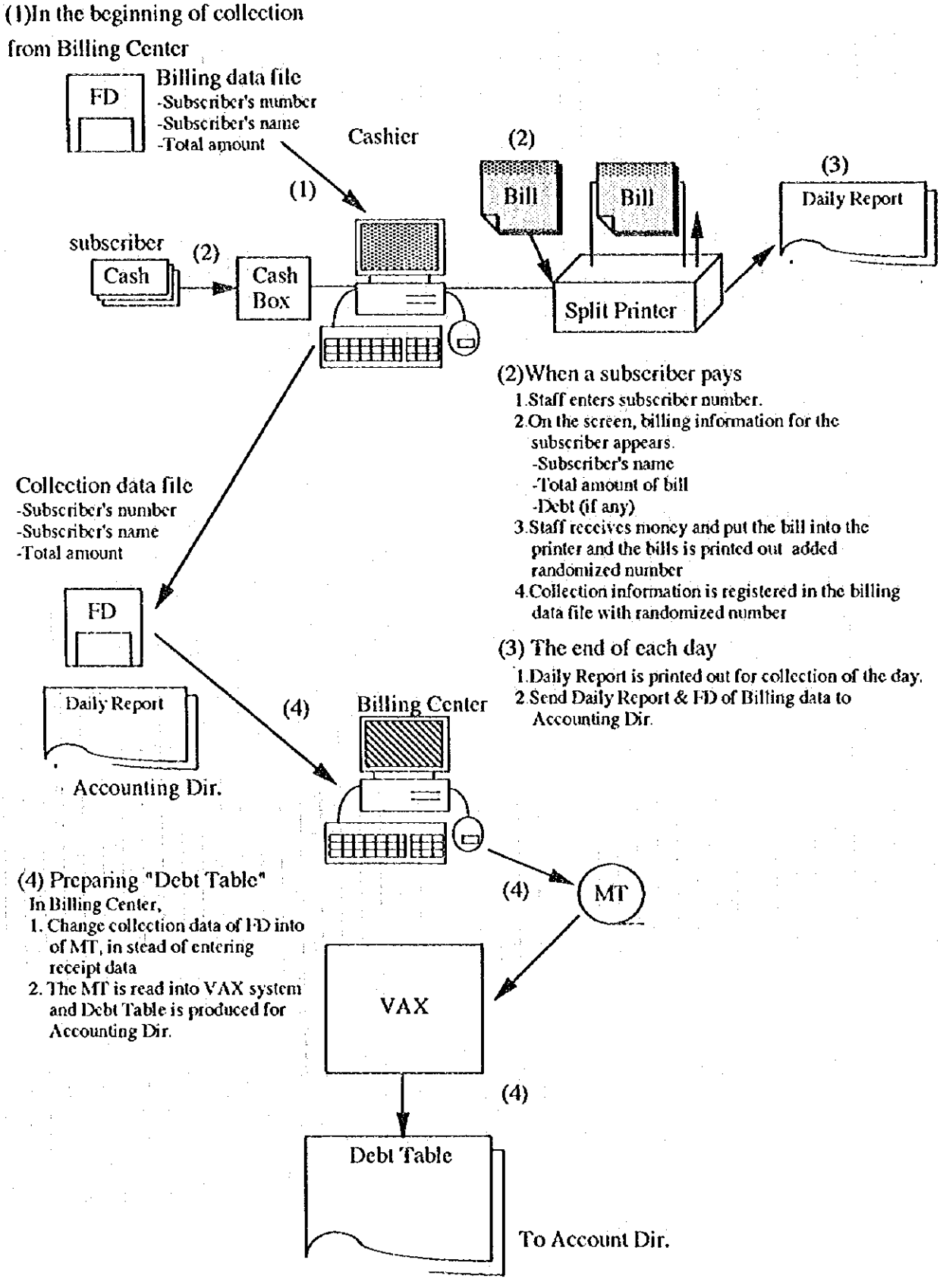


Figure 10.4.5-12 Collection System

10.4.6 Computerized System Under Development in 1995

(1) Objective

Syria's public telephone services have evolved rapidly during the last two decades. Moreover, the STE is presently implementing a new major project that aims at more than doubling the capacity of the network. New telephone exchanges will be put into service and the capacity of existing exchanges will be significantly increased. As a consequence, it will become extremely difficult to manage the network-information flow and to maintain the integrity and consistency of its information. To improve network management, STE intends to introduce modern information technology that would guarantee efficient and rapid information processing.

(2) Contractor

The main contractor for this computerization project is the Bull Group. This is one of the world's largest suppliers of information systems with a presence in more than 100 countries. Established in France in 1931, it is today one of the three remaining indigenous European computer manufacturers. Bull's partners for this computerization project are:

- CII, Bull's exclusive distributor in Syria
- CNI (Centre National de l'Informatique), Tunisia
- Soft & CAD, a well-established software house in Syria

Among these partners, Bull is acting as the main contractor for this project.

(3) Computerized tasks

Requiring computerization are STE's major administrative and technical tasks. These are mainly the following.

- Processing and following-up subscription requests from the time an application is received until satisfying the request
- Managing subscribers and services including following-up subscriber requests such as transferring lines, changing phone numbers, and changing the type of service
- Issuing subscribers' bills
- Collecting bills and processing subscriber complaints
- Managing subscriber accounts
- Receiving and adjusting complaints from the time of notification until problem resolution
- Following-up telephone-network changes including line reservations and trunk assignments
- Issuing telephone books
- Providing electronic-information services
- Providing statistical and organizational reports at center and governance levels

(4) Locations in which the computerized system has been installed

The computerized system has been installed in a billing center in Damascus and in all (14) telephone centers in Damascus City.

(5) System Overview

The overall system consists of 14 different Local Area Networks (LANs) with one LAN at each STE center. These LANs are linked mutually and with the central billing system via the SYRIAPACK X.25 Network.
Each of the 14 LANs consists of a high-performance computer server, workstations, cash registers, printers, and peripherals. All workstations along with cash registers access the center's server via the Ethernet LAN. The center's system as well as the integrated application software will guarantee proper processing for the automated procedures at each center. Conversely, the central Billing System consists of two high-performance computers that are mutually connected via a small LAN and linked with the SYRIAPACK X.25 Network. The Billing System is dedicated to governance-level operations such as centralized billing, electronic directory, and telephone-information system. Each of the 14 centers' systems will be dedicated to telephone-center operations and procedures.
All of the hardware and application software at each telephone center and at the billing center will form an integrated system that will guarantee proper operations at all levels, and will be capable of handling STE's procedures and operations.
Figure 10.4.6-1 provides an overview of the integrated system.

(6) Expected benefits of the computerized system

The delay in issuing bills will be ameliorated, and if the new system is sufficiently successful there will be no delays by the end of 1995. Moreover, it is expected that applications to telephone centers and bill issuance at the Billing Center will be improved by 50%. Streamlining will affect:

- Data-entry volume
- Data-processing speed
- Printing speed
- Equipment readiness
- Equipment maintenance
- Facilities provided for subscribers

(7) Cost

The program costs $1,317,000 including hardware, software, installation, program repairs, training, and two years of operating and maintenance.

(8) Schedule for implementation

The total term for implementation is nine months and the schedule is divided into four stages as follows.

- Stage 1: Three months for preliminary studies
- Stage 2: One month for suggestions from study
- Stage 3: Four months for preparation of application software
- Stage 4: One month for testing and implementation

The changeover was scheduled for August 1995 but was delayed because of the delay in purchasing UPS.

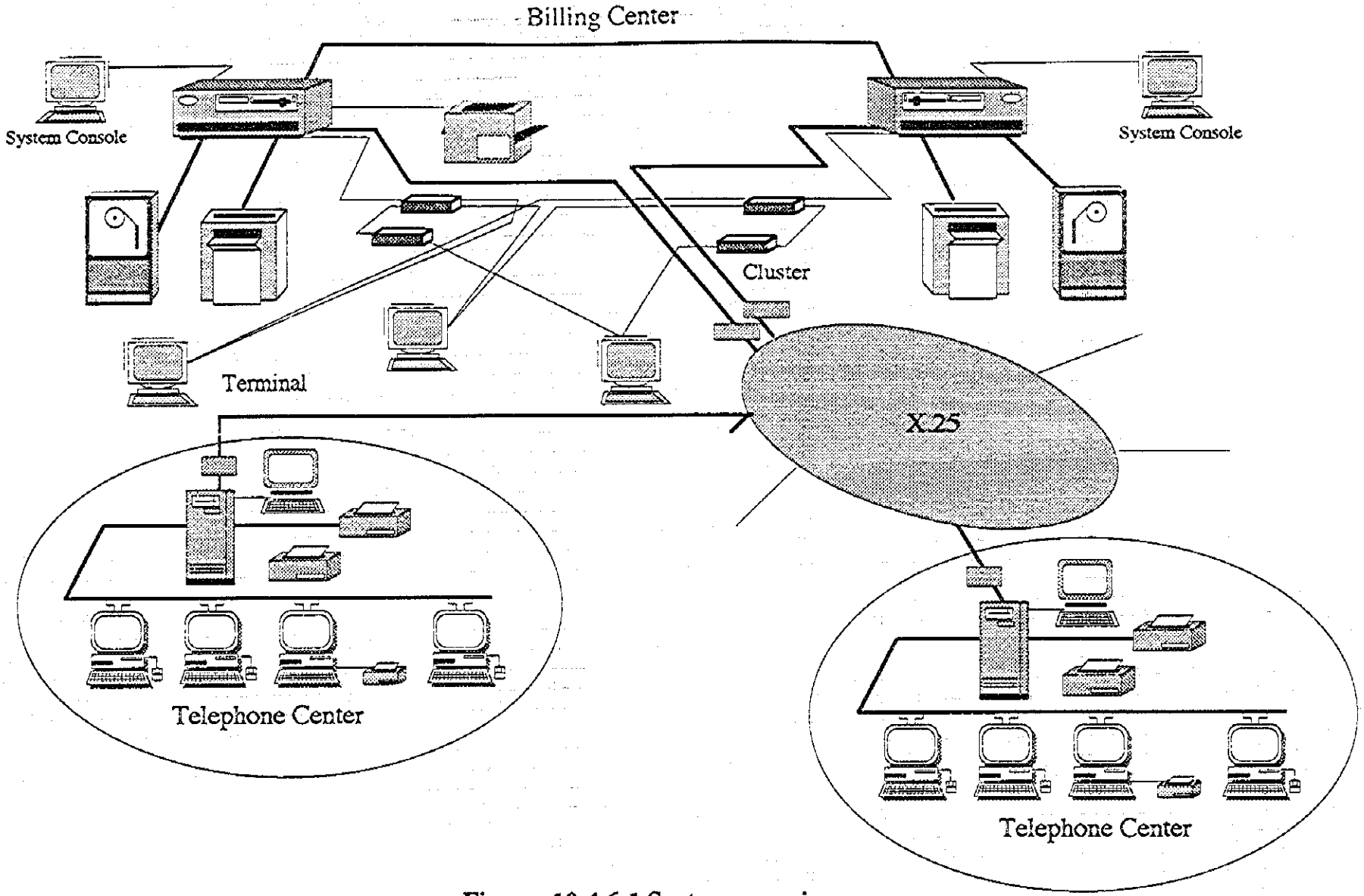


Figure 10.4.6-1 System overview

10.5 Objective and Effects of Computerization

10.5.1 Objective of Service-order System

The objective of the service-order system is to improve the productivity of the telephone center's work for telephone subscriptions. In this system we try to improve the contract work that is the bottleneck of the process. The expected effect of the system is that staff in telephone centers will be able to deal with the work attendant to telephone-network expansion without increasing the members.

We show the work flow after introducing the system as follows.

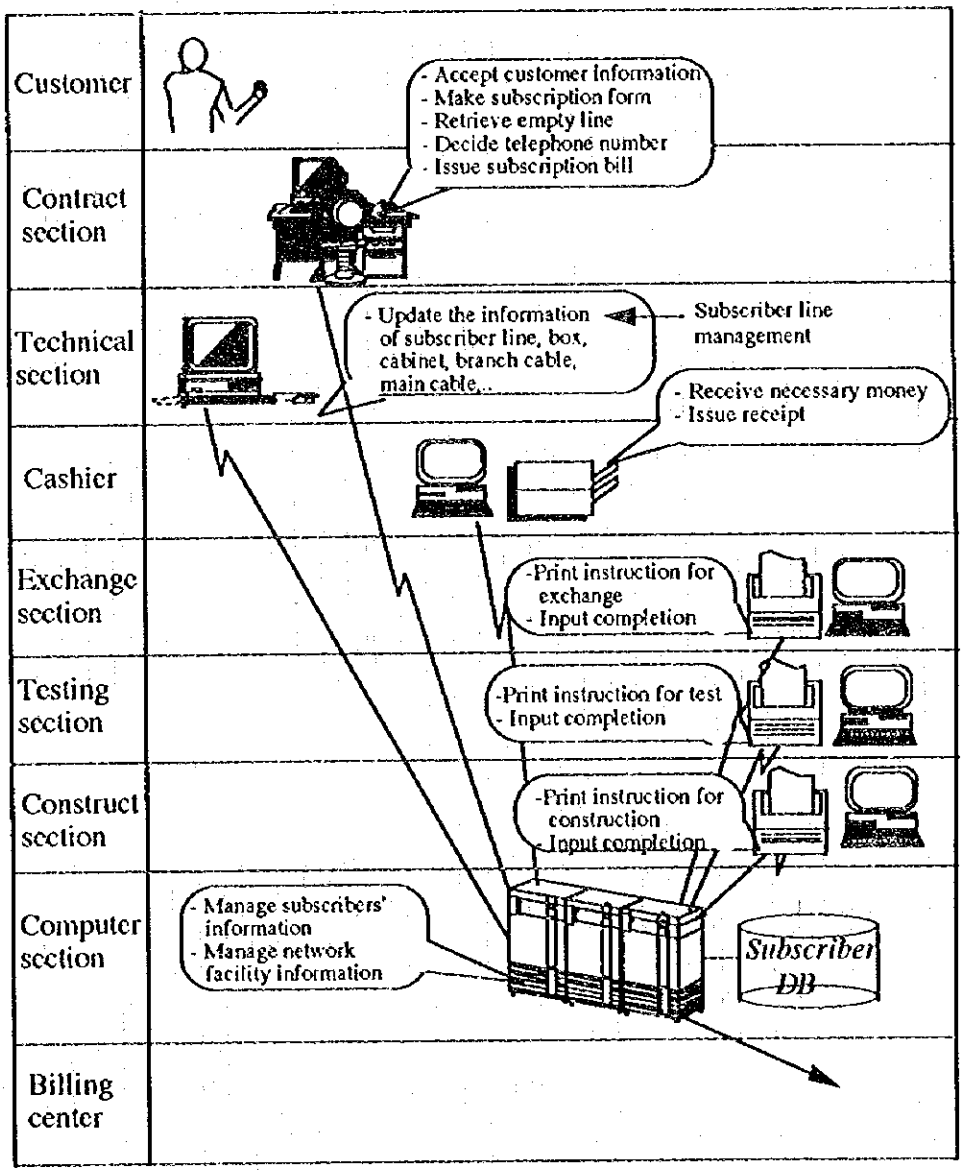


Figure 10.5.1-1 Work Flow after Systematization

10.5.2 Billing-System Objectives

According to the examination of present service operation, the present billing system is inadequate for issuing additional bills promptly and efficiently, as described in Section 10.4 (10.4.5). The New Billing System is thus necessary for issuing bills as soon as possible, at least within the next cycle following the finish of a cycle. This is the essential objective. The points to be improved in issuing bills by the New Billing System are as follow.

(1) Entering executive-form data
Even in the present situation, entering executive-form data with checking and corrections causes a bottleneck in the bill-issuance process. Moreover, the number of executive forms to be completed is continuing to increase because of additional subscriptions and other applications. Resolution of this issue is the important point of the New Billing System.

(2) Printing bills
Printing bills and details of bills takes the longest time in issuing bills, and often disturbs the printing of reports necessary in the bill-issuance process. Bill printing is therefore one of the main points needing improvement.

(3) Anticipated shortfalls in performance and equipment capacity
The performance and the capacity of equipment are expected to decay as the number of subscribers rises. Resolving this problem is vital. In addition, the New Billing System must enhance the efficiency of collection, dunning, complaint handling, and other billing-related tasks.

To improve these factors, the billing process or equipment should be changed as follows.

(1) Enter executive-form data at telephone centers
To relieve the first bottleneck, executive-form data should be transferred automatically through the network from the telephone centers' Contract Sections. Also effective for centers' personnel would be computer-data entry to cope with new applications—especially for new subscriptions. Accordingly, executive-form entry will become superfluous in billing.

(2) Introducing a high-speed printer and keeping another printer available
To cope with additional bills and their details, at least one high-speed printer is needed. Moreover, to print other reports necessary in the billing process, another printer is needed. Although this printer need not be high speed, such a sophisticated device would be useful as a spare for bill printing.

Optionally, it would be possible to print bills and their details in a distributed manner. For example, printing could be done in the eight main provincial centers. Or printing could be executed in telephone centers when a subscriber visits to pay a bill.
Accordingly, considering the volume of bills and their details, the need for operating in provinces or telephone centers, etc., we consider that two high-speed printers would be better.

(3) Introducing equipment with sufficient performance and capacity.
Next, because of additional subscribers and call volume, equipment should be introduced having greater performance and capacity. To utilize the equipment as efficiently as possible—to make the MTBF (MeanTime Between Failure) as extensive as possible—reliable maintenance service is indispensable.

(4) Transferring call information by network
Data on counters must to be entered at the Billing Center. There exist alternative means for this: for example, by OCR and by PC. Additional information should be (a) entered in telephone centers when providing service that entails additional billing information, and (b) network transferred.
Call information recorded into MTs as at present could be transferred by network. This would make it faster to send data from exchanges to the Billing Center. Processing with MTs in the Billing Center would be streamlined.

(5) Transferring collection information by network
When a subscriber pays a bill, cashier personnel in the telephone center enter the collection information, which is transferred to the Billing Center. With a network, Billing Center personnel will no longer have to enter collection data. Both for the cashier personnel and for the Accounting Directorate, collection and debt management will become easier. This is because searches for slow-paying subscribers will be efficient and accessible to the Accounting Directorate. Dunning for collection will be rationalized.

(6) Integrating billing-related tasks
After computerizing tasks in telephone centers by network, the efficiency will be enhanced of the other bill-related tasks, integrating them with the billing system by network and diminishing the amount of manual work and documentation. In settling complaints, Contract Section personnel in telephone centers can use the network to inquire in detail about bill complaints. According to these requirements, the New Billing System's outline is considered as shown in Figure 10.5.2-1.

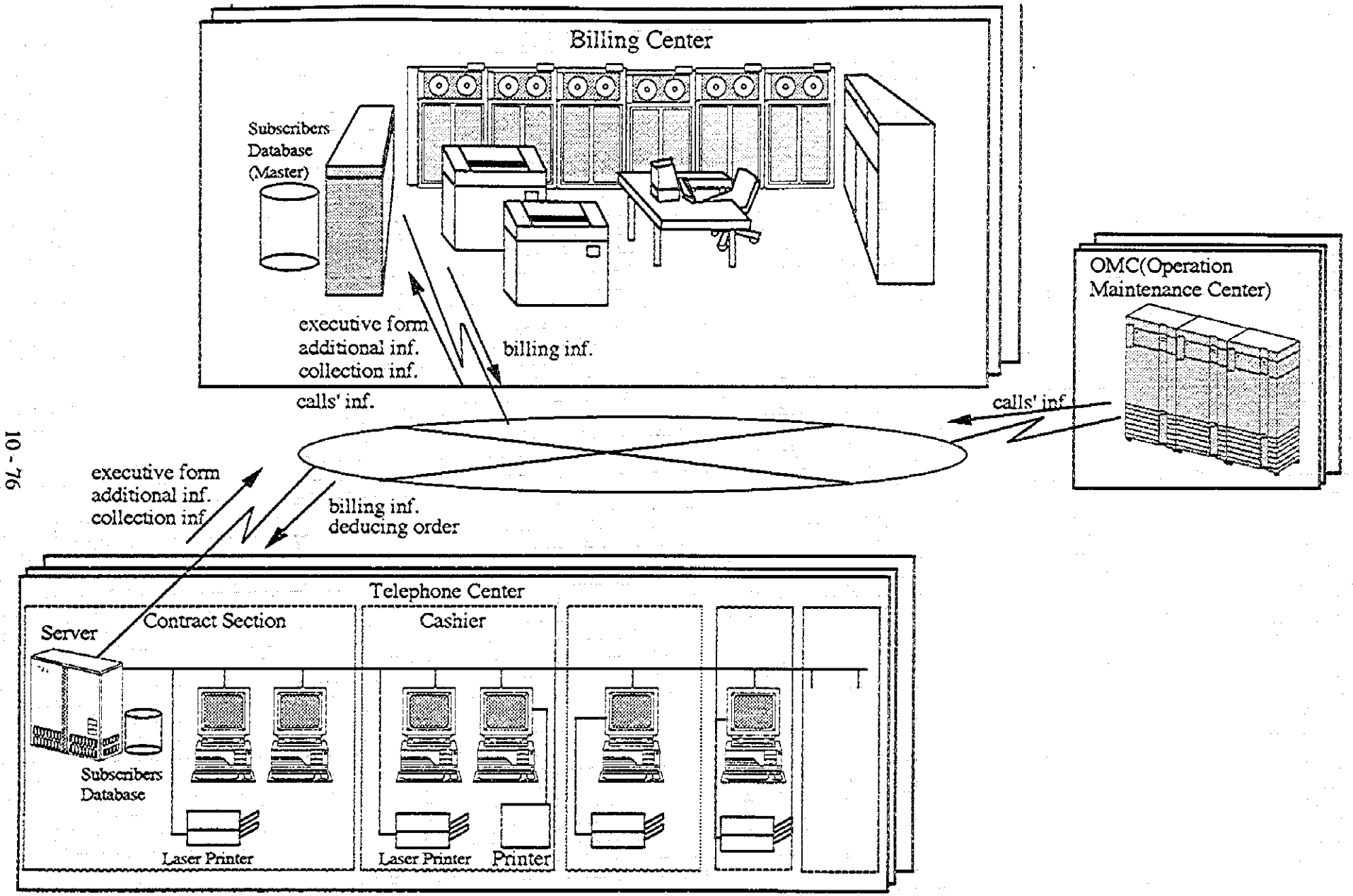


Figure 10.5.2-1 New Billing System

Other bill-issuance considerations

To issue bills for all of Syria as soon as possible after a cycle finished, it should be natural (a) that personnel must work much harder just after a cycle has finished than after completion of bill issuance, and (b) that the capacity and performance of the computer and printer must be adequate for near-simultaneous issuance of bills for the entire nation.

To distribute billing volume to both staff and machines, one method would be to introduce a distributed system by dividing Syria into districts. Another method would be to change the billing-cycle pattern into different cycle patterns by provinces, as follows:

- Pattern A: The first cycle is from January to March; the last is from October to December.
- Pattern B: The first cycle is from February to April; the last is from November to the following January.
- Pattern C: The first cycle is from March to May; the last is from November to the following February.

Provinces are divided into the above three patterns, thus distributing provincial bill-issuance. For an example, see Figure 10.5.2-2.
We are proposed these different cyclical patterns because they can make optimal use of both staff and machines. Bills can be issued soon after each province's cycle completion.

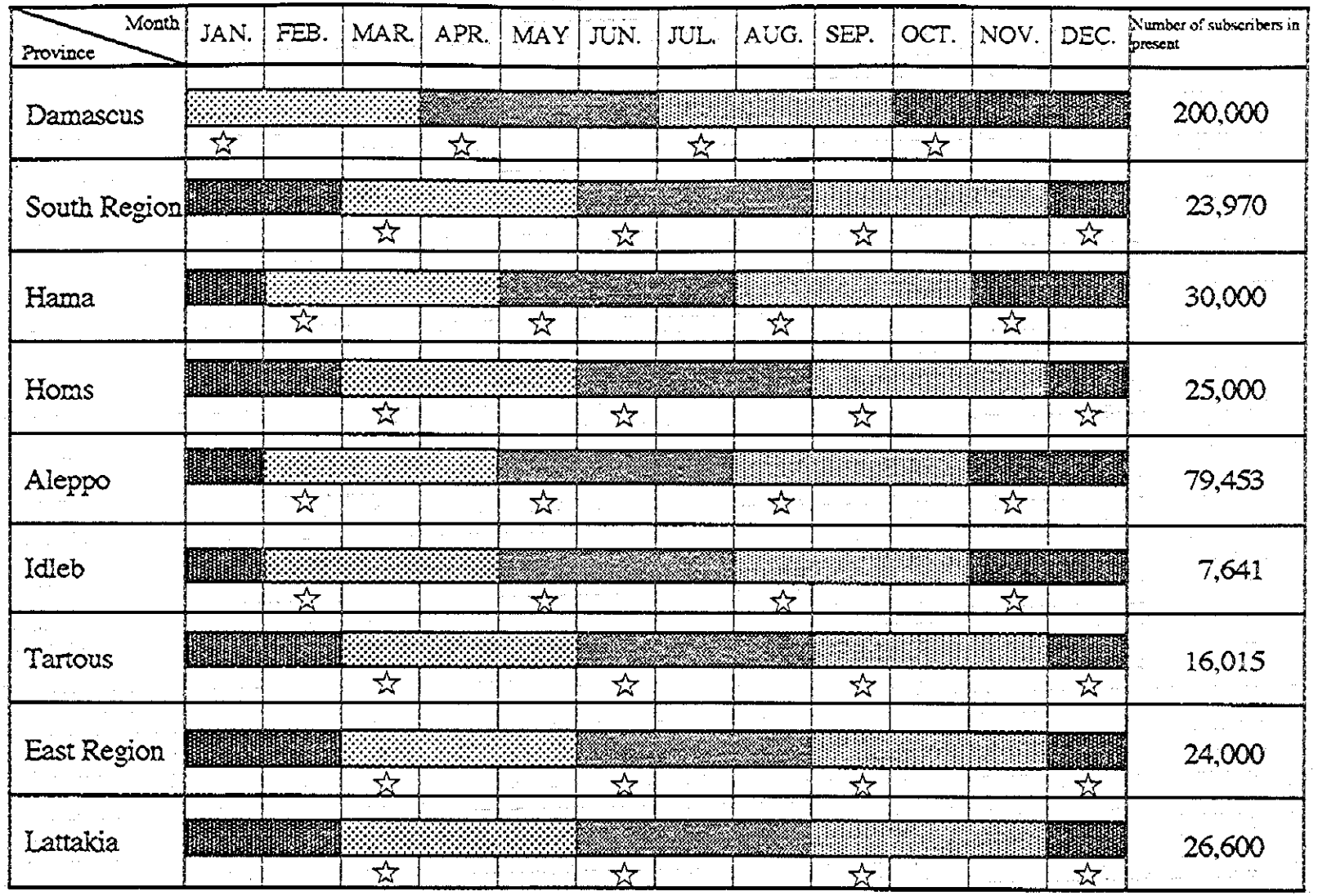


Figure 10.5.2-2 New Billing Cycle (Example)