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Deals with planning as seen from the stand-point of engineers and economists. Also outlines the objectives, features and philosophies common to telecommunication plans. Amic 007457 d.

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TELECOMMUNICATION PLANNING

GENERAL PLANNING CONCEPTS

INTRODUCTION

The Basic Planning of the Telecommunication Planning is primarily concerned with planning as seen from the engineers and economists standpoint, and deals with features and philosophies which are common to the majority of telecommunication plans. Other parts deal with specialised aspects such as Networks, Transmission, etc., and should be consulted for technical planning details.

Broadly, the planning function with which we are mostly concerned is the provision of the right amount of equipment, of the necessary quality, to meet expected development demand and new or improved services. To a large extent an administration's service objectives are considered to be a matter of policy rather than plans. For instance if higher management sets a target that 90% of all international distance calls should be completed automatically within a 5-year planning period, then this is regarded as input data for the planning program, not subject to modification, and the purpose of planning is to provide the necessary equipment and ensure its satisfactory interworking with existing plant. Nevertheless, it has to be admitted that such a policy should not be put into action until costs have been estimated and the revenues and other advantages appraised. The planning department that we envisage, therefore, at least collaborates in policy decisions and must not limit its work strictly to objective planning. Furthermore, there are many other plans, such as financial plans, which are of vital interest to the engineering planning although they are prepared by other department. We have, therefore, considered that a sufficient description of other plans and constraints must be included in this section to equip the engineering planner with the knowledge he will need to work harmoniously with other departments of the administration. This inter-relationship is illustrated in a simplified form in Figure 1

Figure 1.—"Planning" as it fits in the organization of a telecommunication administration

A large part of planning consists of selecting from a choice of possible schemes to achieve system development those which are the most economic. This is indeed an important feature, but it is not the only one. Planning extends to the organization and training of the work force, to controlling the flow of work, to considering the effect of tariff changes, to assisting with the determination of quality of service objectives, and to helping other departments to estimate over-all profitability and cash-flow requirements and financial prospects. In many cases, plans which are economically sound may need to be cancelled or deferred because money or other resources are not available to carry them out. In other cases, money may be in hand and the planner will be asked to say how it should best be spent to encourage development and/or improve quality of service. Engineering planning is, thus, a part of a complex cycle of operations which is designed, in toto, to keep the business running efficiently and in a sound financial condition.

Figure 2.—Flow Chart—Planning and accounting relations in an operating administration

The flow chart, Figure 2, shows, in simplified form, the main components of the financial and planning operation. The starting points are development and traffic forecasts, which should include long- and short-term figures.

The long-term figures result in fundamental plans which guide the general policy of plant and service expansion. From the short-term figures the need for immediate action to meet expected demand is deduced and plans evolved to meet predicted shortages. These plans are assembled into a series of yearly Capital Expenditure Programmes (CEP's).

The CEP's are submitted to the Accounting Department, which will make estimates of revenue and expenses. These are based on past records modified to take account of the additional development foreseen in the programs.

From all these figures, profitability and cash flow are estimated for the present and future years, and a proposed budget is passed with supporting data to higher management. A budget covers all expenditures and revenues whether operational or not whereas a CEP, as its name implies, deals only with plant expansion. The management reaction may be to approve the programme as presented, but is more likely to be a request for reduction or modification, in which case the cycle is repeated until a satisfactory compromise is reached.

In practice collaboration between departments and management will usually ensure that major CEP modifications are avoided thus preventing undue repetition.

SCOPE OF THE BASIC PLANNING SECTION

The treatment of Basic Planning has been divided into the following subsections:

1. General Planning Concepts.

Serves mainly to define concepts and the various types of plans normally current in operating Administrations. Also discusses planning objectives and philosophy.

2. Financial Background to Planning.

Deals with the relationship between planning and budgeting. Discusses policy aspects such as service improvement, effects of tariffs, and profitability.

3. Plant Extension Planning.

Describes the planning process and objectives.

4. Forecasting.

A detailed description of standard methods of forecasting demand for service and traffic.

5. Economics.

A detailed description of standard engineering economics. This is supported by explanations of accounting procedures.

Forecasting and Economics are subjects which stand by themselves and can be studied separately. Planning assumes that forecasts are available and that economic studies will guide the planning process.

NOTES ON GENERAL PLANNING

Formation of Plans

Planning is especially important to telecommunication Administrations because of the large amount of money which an administration invests each year in the expansion of its system. This investment buys plant which has a long life and both its type and quantity need to be carefully controlled if operating costs are to be held down and the administration run successfully. The long life makes this doubly important because it is unlikely that there will be an early opportunity to correct an error

A plan may be defined as a series of steps designed to lead to a desired objective. Plans may be controlled in a simple manner by progress schedules and charts. In other cases where several steps interact, modern methods may be advisable.

Each separate element of a plan must be consistent with the whole. In the telecommunication business interactions are often complicated. For instance bulk-billing with periodic pulse metering may, among other effects, reduce the holding time of calls and alter the proportion of common control to conversation equipment. The advice of experts should be sought whenever a completely new technical arrangement is proposed. For large projects a pilot scheme is often advantageous.

The formation of a plan should proceed as follows:

- a) Define the objective
- b) List the steps necessary to attain it. Make a note of any alternatives.
- c) Obtain as much basic input data as possible.
- d) Extend the data by forecasts.
- e) Apply the data to the step-by-step plan and decide on feasibility and probable costs.
- f) Select among possible alternatives.
- g) Review, checking for consistency of each step with the whole.
- h) Assess reliability of data.
- i) Provide flexibility when data is unreliable.
- j) Adopt the plan if the expected results justify the expected costs

It is worthwhile noting that planning is based on measurement. None of the above steps can be valid for telecommunication planning unless a method of measurement has been established, and the results of measurements on existing plant have been analysed

Telecommunication Planning Objectives

in so far as it is possible to define the criteria for planning within operating administrations, the following can be considered pre-eminent.

- a) Economy.
- b) Compatibility.
- c) Even work-load.

Economy is, of course, the criterion which most people would consider of prime importance. At lower levels of planning this is correct, but at higher levels discretion may be necessary, especially in relation to service improvement. As techniques are improved and modern scientific discovery applied, it becomes possible and desirable to give better service

to subscribers. For instance, improved transmission can be offered or quicker connection of calls. These improvements should increase the use of the service, and hence the revenue. They are capable of economic evaluations which will enter into planning calculations. However, it is entirely possible that a planned improvement will cause such an increased demand that existing plant will be obsolete before the end of its planned life, that financial or other resources may be strained, or that maintenance staff cannot be trained in time. In such cases means must be found to control the rate of expansion or change. In other words operational planning should go hand in hand with economic planning.

Fundamental Planning

The principles of fundamental planning have been established for many years. It is surprising how little real change has occurred since those days, although computers are now widely employed to relieve the planner of tedious repetitive calculations.

Fundamental plans are divided into two classes:

- a) Fundamental Development Plans.
- b) Fundamental Technical Plans.

The fundamental development plans deal with quantities of equipment required and the technical plans with the performance expected from the equipment.

A technical plan is usually applicable to the whole of an operating area and ensures progressive substitutions and interconnectability. For instance, the transmission plan aim is to p e r m i t satisfactory conversation (and possibly data transmission) between any two subscribers on the system and also between any subscriber and another in any part of the world. For this latter reason there is a necessity for worldwide agreement on transmission and other standards, which is achieved through the CCITT (Comite C o n s u l t a t i f International Telegraphique et Telephonique), and the CCIR (Comite Consultatif I n t e r n a t i o n a l

de Radiocommunication). The initials CCI are often used to imply these organisations jointly. Their recommendations form the basis for much of technical planning but, because economic conditions vary in different countries, the CCI's limit themselves to specifying no more than is needed to insure interconnection and leave the specific details of how their recommendations should be carried out to each individual administration. These recommendations, therefore, need to be incorporated into the Fundamental Technical Plans prepared by each administration and part of the art of planning consists in finding the most economical method of meeting CCI requirements. Furthermore, the national system will generally be planned to a different series of limits, advantage being taken of the easier conditions to offer a higher quality of service, tempered by the possibility of economies. Finally the planner will note that CCI limits represent in general the conditions which all nations are prepared to meet, that many already do better, and that the limits may be tightened in future. Therefore, good planning for years ahead will prepare the way for betterments and will improve upon CCI recommendations in many cases.

Planning Philosophy

Planning philosophy is straightforward. An ultimate plan is made for the development expected say 20 years ahead. This plan is the economic optimum based on present day costs and technology and assuming that no existing plant remains in service. It represents a target towards which shorter-term plans should be aimed. Those areas where immediate relief is required are next identified and plans prepared for providing this. The relief is made sufficient to meet the expected development during the "economic planning period." This period depends on the type of plant and the growth rate. It is shorter for high growth rates, thus partly compensating for the greater likelihood of an error in forecasting large growths.

The "lead time" between planning date and completion of the installation is taken into account and added to the economic planning period to determine expected development at the planned exhaustion date.

FINANCIAL BACKGROUND TO PLANNING

CONTROL OF EXPENDITURES

Capital Expenditure Programmes (CEP)

One result of fundamental planning is to show when and where plant additions will be required. In the case of a new exchange the time between the initial decision to install and the cutover into service may amount to three years so that it is not sufficient to wait until facilities approach exhaustion. Cable may take a shorter period to complete, but if new ducts are needed, the delay is still likely to be over a year.

In addition to showing when, the fundamental plan and associated development forecast will also show how much, this being the result of applying economic planning periods or individual economic studies.

The basic planning questions of "why, when, where, and how" having been answered, the planning department should next prepare a lucid summary of the financial implications of its planning, in the form of annual CEP's for the next two or three years, a five-year plan and possibly notes regarding financial commitments for the more distant future.

The annual and 5-year CEP's will be divided into sections. A typical subdivision may be :

I. Local Cables

Subscriber cables, with specific items for cables of 300 pairs and above, plus a bulk item (laterals = branch cables) for smaller sizes. Junction cables.

II. Long Distance Lines, Cables and Related Transmission Equipment

Coaxial and other buried cables.

Aerial Cables.

Open-wire lines.

Transmission equipment - Carrier, etc.

Special equipment - Radio links (Line-of-sight microwave).

- Ground stations for satellite communication.

- Submarine cables.

III. Land and Buildings

Land and buildings used wholly or in part for local and trunk exchanges.

Land and buildings used wholly for long distance services.

Other land and buildings - administration, stores, pole yards, etc.

IV. Exchange Equipment

Local exchanges — automatic.

Long distance exchanges.

Other exchange equipment.

V. Subscriber Service & Installations

Ordinary subscriber's telephone lines and drop wires.

PBX and PAEX switchboards.

Coin boxes and kiosks.

Open-wire lines for subscriber service in rural areas or for extended drops.

VI. Reconstruction (Outside Plant)

Schemes for reconditioning outside plant.

Substitution of open-wire by aerial cable.

Schemes involving a high proportion of recoveries.

VII. Miscellaneous

Transport.

Office equipment.

VIII. Special Services

Mobile telephone service.

Data services.

Other special subscriber facilities.

Provision for private wires and hired circuits
(leased lines) not forming part of regular plant.

Broadcast services.

The subdivisions should bear in mind the plant types as defined in the accounting system, but are made for convenience and easy reference and need not be rigid. As far as possible each scheme, which will be engineered as a whole, should appear as one CEP item.

Administrations will be advised to keep their suppliers suppliers informed of their longer term plans to ensure that their requirements can be met at the time required and to avoid peaks and troughs in demand for particular product lines. By so doing, Continuous and economical production and regular employment will be assured, and plant will be available when required and as cheaply as possible. Moreover, if it becomes necessary to increase or decrease production rates, the negotiations can be made with a minimum of disturbance.

Within each section specific items are listed and the estimated cost given. Small and bulk items such as distribution cables are allocated figures, based on unit costs and the number of lines involved. A small amount is allowed in each section for "miscellaneous schemes" and for "contingencies." Miscellaneous items are those which are, or might be, foreseen but are too nebulous or insignificant for detailed treatment. Contingencies are for unforeseen items. The miscellaneous heading provides money which is expected to be spent. Contingency funds, it is hoped, will not be needed, nor the money spent. If they are needed, they will be in the form of specific specified schemes covered by detailed estimates and not a conglomeration of small items.

Where an administration is divided into several more or less autonomous areas, a separate CEP is prepared for each and usually separate financial forecasts are made.

The CEPs are supported by cost analyses, and show gross and net expenditure, value of recovered plant, original cost, and cost of recovery. Also, in many cases, material costs are subdivided into imported, locally manufactured, and ex-store. A series of charts will also be required showing, for major items, the sequence of ordering, preparation, installation and cutover. From these a list of future commitments is drawn up so that orders may be authorized where necessary although the actual expenditure will not take place until later years.

Many schemes will not be completed within an accounting year and will need to be carried over from one year to the next. In some accounting practices a scheme once approved needs no further authorization if it is carried over in this manner, but in others re-approval is necessary, and a "carry-forward" program is prepared for this purpose. In either case an estimate of the probable percentage completion and expenditure position of each scheme at the end of the current year will be needed. The work of coordinating this usually falls on the planning department.

Financial Analysis

After the CEP's have been prepared, they are passed to a separate department which will consider:

- Expected revenue and expenses
- Profitability
- Source of capital

Revenue and expenses are estimated and analysed both globally and in relation to particular new services. They should be based on the same development forecasts as were used for fundamental planning. In some companies these forecasts are prepared by the commercial department, but more usually by the engineering department. In either case both should agree on results and the forecast should be consolidated into a complete document, frequently revised, and distributed to all interested.

The result of analysing estimated revenue and operating expenses is to show profitability. New business should ensure a satisfactory trend of profits (or operating margins). If not, it may be necessary to analyse more deeply and possibly to prepare for an increase in tariffs.

After checking the expected operational results the next question is that of obtaining the capital required. The answer will depend on the type of ownership and operation, that is, whether the company is government controlled or private enterprise. In either case careful estimates of cash flow will be required, and it may be that original budget proposals have to be modified in order to conform to the money market conditions.

Telephone operations rarely self-financing and although it is sometimes the practice to charge high connection fees for new lines and subscriber installations, it is rarely possible to satisfy demand without borrowing capital.

It is important to recognize that there are important feedback effects between commercial considerations and planning. Development estimates for new lines will normally have been made on the basis that service will continue to be given at rates comparable to those of the past. If tariffs are to be increased, it may be necessary to review forecasts of new lines. Many administrations have waiting lists for service and the effects of tariff adjustments may be small, but in the long run some reduction in demand will result if tariffs increase disproportionately to the cost of living. For this reason it is recommended that detailed development estimates be prepared in such a way that they can be adjusted to conform to changes in over-all tendency without needing complete re-work.

Figure 2. SCPC Transmit - Receive Station

Figure 1: Thin-route satellite communications link

Actual equipment to be set up at the remote station depends largely on its site location and its reciprocating earth station. Nevertheless typical remote earth station equipment set up is as shown in Fig 2. Normally, the remote earth station shall be equipped for wide range of communications services such as telephony, telex data and facsimile.

SCOPE OF WORK

Two alternatives may be selected in the implementation of the thin-route network, they are

a). Shared Central Earth Station Network.

In this case the remote earth station communicates with the central earth station which is linked to many other similar remote earth station. The main advantage of this system is due to the fact that the central earth station normally operate with larger transmitting power and better G/T than those of the remote station. This could mean substantial reduction in the equipment cost of the reciprocating remote earth station. However, Since the remote user has to share the cost of this central earth station so the system will prove to be economical if sufficient number of remote earth station access the system.

b). Individual Remote Earth Station Network.

In this case the central earth station itself acts as another remote station. The system is mostly suitable for the case when small amount of traffic is anticipated at the central earth station and the configuration of Shared Central Earth Station does not justify the cost.

It is generally recommended that if there are sufficiently large number of remote earth stations the sharing of the central earth station facilities will prove to be more economical than the case of Individual Remote Earth Station Network.

Example of actual proposal proposed to customer in September 1979

Thin Route Transmission via Satellite

PURPOSE

To provide domestic, bothway, ~~thin route~~ telecommunications link between the remote area to another remote area (remote/remote) and/or between the remote area to the central office in Bangkok (remote/central) via satellite.

DESCRIPTION

Satellite communications system is by far considered to be one of the most economical and efficient means in providing small traffic link between two distant locations. Numerous reasons can be cited for in favor of satellite communications as follows.

a). Small size antenna (4-5 m diameter) together with the transportable equipment shelter ~~makes~~ it readily available to be transferred to any location even in the remote area.

b). Satellite communications is similar to the microwave system but can be extended beyond the horizon without the need of any terrestrial repeater. Multidestination transmission capability as well as point-to-point transmission is also available.

c). Transportability of the earth station and the fact that the earth station look angle towards the satellite is elevated to certain degree renders flexibility in site selection. In most cases it is not difficult to set up ~~the~~ earth station at the places free of path obstacle and free of radio interference.

d). The domestic satellite communications system employs the Single Channel per Carrier (SCPC/FM) technique which provides flexibility in circuit reallocation. Extra circuit can be added on per channel basis together with the system growth.

The main objective in the thin-route satellite communication is to provide small traffic (not exceeding 24 channels) between two remote locations or between the remote and central location. These circuits can be used for telephony telex, facsimile and data etc.... The overall view of satellite communication network for thin route application is as shown in Fig 1. The remote earth station may choose to communicate with the central ~~station~~ or with another remote earth station.

There is also feedback due to the average rate of interest on capital. The economic comparisons and planning periods used in selecting schemes for inclusion in the CEP will have been based on assumed rates of interest and if the final result shows that new finance will entail a different rate, the schemes may need to be reviewed. This is rarely of practical importance during any one year, but may be significant over several years. Schemes are selected (that is, alternatives chosen) on the basis of a long term average rate of interest and this should be agreed with management and revised periodically. The effect of immediate changes in interest rates is mainly on profitability and rarely has a significant effect on past planning decisions. However, an increase in interest rates implies a shorter planning period and may, to some extent, justify smaller cable sizes or switching equipment extensions.

Costing

An efficient and equitable costing system is an essential adjunct to good planning. All construction (and maintenance) expenses should be carefully controlled and each job reported separately. At job completion it should be possible to say exactly what work has been done and what the costs were: — material, direct labour, supervision and overhead.

Analysis of jobs completed in the past provides the planning section with costs for future schemes. In many companies these take the form of "unit costs", for example, a cost per kilometer for placing a certain size of cable in duct. Such unit costs are of great help in preparing CEPs. However, with increasing use of computers, detail estimates for standard types of projects are often prepared automatically, or with a minimum of manual intervention, and CEP items can be costed in detail. This saves the separate preparation of a unit-costed scheme and of a detailed estimate just before starting work.

PROVISION OF TELECOMMUNICATION SERVICES TO MASS MEDIA

Telegram Service

A worldwide and popular day-to-day service which have been utilized among mass media as well as medium size business enterprises for decades. Cost of transmission is inexpensive but very slow when compare with other modern services.

Telex Service

At present it is a must to have at least one telex installation in your premise. It is regarded as a minimum requirement communication system of a newly setup-business firm. Some parts of Capital city where telephone trunks and exchange are very congested, telex call can be an easy way to relieve all tension you have. In Thailand, total number of telex subscribers are about 2000 sets in which 95% are in Bangkok and metro area the rest are in provinces. Most of the mass media have chosen telex as a news exchange domestically as well as internationally. There is approximately increase of demand for 30-40 percents each year.

Press Bulletin Service (PBS)

According to our regulation, PBS could only render to mass media sector. The subscriber can enjoy the great 50% reduced rate (from international leased telegraph circuit service) plus the advantage of very fast and exclusive satellite channel of transmission. Main of our subscribers are the big international press companies, i.e. UPI, AP, AFP, REUTERS, VOA.