



INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

E.508

(10/92)

**TELEPHONE NETWORK AND ISDN
QUALITY OF SERVICE,
NETWORK MANAGEMENT AND TRAFFIC
ENGINEERING**

**FORECASTING NEW TELECOMMUNICATION
SERVICES**



Recommendation E.508

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation E.508 was revised by Study Group II and was approved under the Resolution No. 2 procedure on the 30th of October 1992.

CCITT NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized private operating agency.

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Recommendation E.508

FORECASTING NEW TELECOMMUNICATION SERVICES

(revised 1992)

1 Introduction

The operation and administration of a telecommunications network should include the consideration of subscriber demands for new services which may have different characteristics than the traditional traffic (i.e. peak busy hours, bandwidth requirements, and average call durations may be different). By addressing these new demands, Administrations can be more responsive to customer requirements for innovative telecommunications services. Based on the type of service and estimated demand for a service, network facilities and capacity may have to be augmented. An augmentation of the network could require large capital investments and additional functions and responsibilities.

Forecasting of new services can be done in the context of an overall approach illustrated in Figure 1/E.508.

Section 2 of this Recommendation classifies and discusses the definition of new services for the purpose of forecasting. The parameters (base data) related to the new services are outlined in Section 3. Section 4 introduces methods for use in forecasting new services. Section 5 describes methods for combining forecast results and Section 6 methods to evaluate forecast results.

Figure 1/E.508 includes an iteration loop with measurement of actual traffic. This type of loop is implicit in all forecasting processes, but it is particularly important where the uncertainties of original forecasts can be reduced by frequent updates.

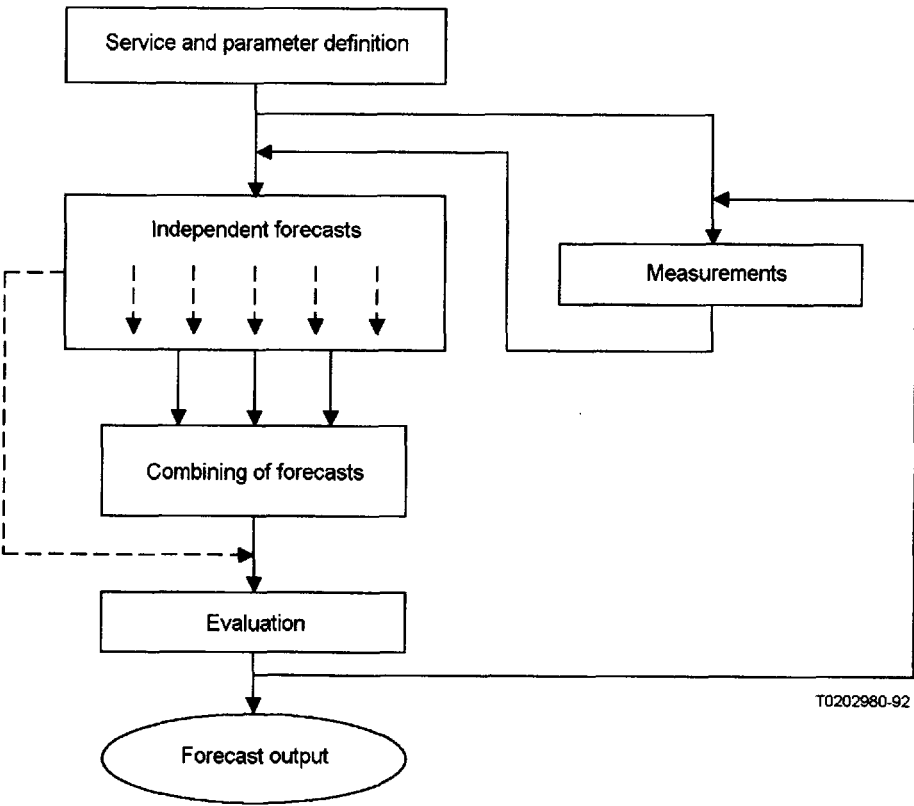


FIGURE 1/E.508
New services forecasting approach

2 New service classification

2.1 General

A distinction between those services which are enhancements of existing services carried on the existing telephone network and those services which are novel is useful.

Many of the services in this latter category will be carried on the Integrated Services Digital Network (ISDN). It is not the purpose of the section to provide an exhaustive list of services but rather to establish a framework for their classification. This framework is required because different base data and forecasting strategies may be necessary in each case.

2.2 Enhanced services offered over the existing network

These are services which are offered over the existing network, and which offer an enhancement of the original use for which the network was intended. Services such as the international freephone service, credit card calling and Closed User Groups are examples of enhancements of voice services, while facsimile Telefax and Videotex are examples of non-voice services. These services may be carried out over the existing network and, therefore, data will concern usage or offered load specific to the enhancement. Arrangements can be established for the measurement of this traffic, such as the use of special network access codes for non-voice applications or by sampling outgoing circuits for the proportion of non-voice to voice traffic. Examples of enhanced services are presented in Table 1/E.508.

TABLE 1/E.508
Examples of enhanced services

Enhancement of existing services
Teletex
Facsimile
Videotex
Message handling systems
International freephone
Automatic credit cards calling
Closed User Groups

2.3 Novel services

Novel services are defined as totally new service offerings many of which may be carried over the ISDN. In the case of ISDN, Recommendation I.210 divides telecommunications services into two broad categories: bearer services and teleservices. Recommendation I.210 further defines supplementary services which modify or supplement a basic telecommunications service. The definition of bearer services supported by the ISDN is contained in Recommendations I.210 and I.211, while that for teleservices is found in Recommendations I.210 and I.212. Bearer services may include circuit switched services from 64 kbit/s to 2 Mbit/s and packet services. Circuit switched services above 2 Mbit/s are for further study.

Teleservices may include Group 4 facsimile, mixed mode text and facsimile, 64 kbit/s teletex and videotex, videophone, videoconferencing, electronic funds transfer and point of sale transaction services. These lists are not exhaustive but indicate the nature and scope of bearer services and teleservices. Examples of novel services are presented in Table 2/E.508.

TABLE 2/E.508

Examples of novel services

"Novel" services	
Bearer services	Teleservices
Packet switched services Circuit switched services – 64 kbit/s – 2 Mbit/s – Multipoints – 64 kbit/s	Group 4 facsimile Mixed mode Videophone Videoconferencing Electronic funds transfer Point of sale transactions Teletex (64 kbit/s) Videotex (64 kbit/s)

For some novel services the demand will arise from new communication needs. These needs and their technical solutions are still rather uncertain and also influence the network architecture. Therefore it is essential to know the user applications, which represent the content of the service. This is partly a result of the technological development and partly a result of the new regulatory regime. The traditional chain of production: supplier industry-operator-user, develops into a far more complicated structure. The chain of production becomes in a certain sense longer, roughly like: supplier industry-bearer service – Value Added Network Services (VANS) – information services-user. The chain is complicated by a number of "spin-offs" supplying hardware, software and system services. Along with the more complicated structure, there is a shift in the dominating element in the chain: the information service supplier tends to be the dominating element structuring the whole chain. This is exactly what necessitates the knowledge of the user applications. As an illustrative example, some of the problems connected with forecasting of the demand for ISDN can be listed.

- The price elasticity for Plain Old Telephone Service (POTS) appears to be relatively low in the industrialized countries. This will probably not be the case for new services like ISDN. First of all because they will be more expensive than POTS (at least in the short run) but also because a number of alternatives exist (e.g. data networks, leased lines or means of communications based on systems other than telecommunications).
- Although the tariffs for ISDN will be of major importance in the users investment decision, the costs related to the introduction of ISDN include many other factors. New equipment has to be acquired and installed, personnel has to be trained and organizational changes may be necessary. The initial benefits, primarily savings on the payment for other telecommunication services, must outweigh the total of these costs or new applications must be very convincing.
- The fast technological development in the field of telecommunications reduces the lifetime of the users investments in ISDN. The fast decreasing prices on telecommunication equipment also reduce the economic lifetime of the hardware investments.
- The benefit of a certain service increases with the number of users connected to it [2]. This market externality makes the regulatory framework of particular importance. In a deregulated environment no guarantee is given that ISDN will ever be the dominating standard for data transmission services. Competing service solutions running on virtual private networks will constrain this development and reduce the demand.
- The demand for ISDN depends not only on the price of alternatives but also on their quality. Thus, the interest for ISDN has been much more pronounced in countries without well functioning data networks.

3 Forecasting parameters

3.1 *Measurement of enhanced services*

Measurements for existing services are available in terms of numbers of calls, call duration, erlangs, etc. These procedures are covered in Recommendation E.506, § 2. In order to measure/identify enhanced service data from other traffic data on the same network it may be necessary to establish sampling or other procedures to aid in the estimation of this traffic, as described in § 4 and § 5.

3.2 *Novel services*

Novel services, as defined in § 2, may be carried on the ISDN. In the case of the ISDN, circuit switched bearer services and their associated teleservices will be measured in 64 kbit/s increments. Packet switched bearer services and associated teleservices will be measured by a unit of throughput, for example, kilocharacters or kilopackets per second. Other characteristics will be needed when the uses of these services as discussed in § 2 may require additional statistical characterization beyond that used for telephony and enhanced services.

4 Independent forecasting methods

4.1 *General*

The absence of historical data is the fundamental difference between forecasting new services and forecasting existing services. The same forecast methodologies are dependent on the base data. For example, for a service already in existence in some countries, forecasting procedures for its introduction to a new country will involve historical data on other countries, its application to the new country and comparison of characteristics between countries. Other methods based on expert opinions or socio-economic analysis apply for both cases.

4.2 *Market research*

Market research is conducted to test consumer response and behaviour. This research employs the methods of questionnaires, market analysis, focus groups demonstration, trials and interviews. Its purpose is to determine consumers' intentions to purchase a service, attitudes towards new and existing services, price sensitivity and cross-services elasticities. Market research helps make decisions concerning which new services should be developed. A combination of the qualitative and quantitative phases of market research can be used in the initial stages of forecasting the demand for a new service.

The design of market research considers a sampling frame, customer/market stratification, the selection of a statistically random sample and the correction of results for non-response bias. The sample can be drawn from the entire market or from sub-segments of the market. In sampling different market segments, factors which characterize the segments must be alike with respect to consumer behaviour (small intragroup variance) and should differ as much as possible from other segments (large intergroup variance); each segment is homogeneous while different segments are heterogeneous.

The market research may be useful in forecasting existing services or the penetration of new services. The research may be used in forecasting novel services or any service which has no historical series of demand data. It is important that potential customers be given a complete description of the new service, including the terms and conditions which would accompany its provisioning. It is also important to ask the surveyees whether they would purchase the new service under a variety of illustrative tariff structures and levels. This aspect of market research will aid in redimensioning the demand upon final determination of the tariff structure and determining the customers' initial price sensitivity.

4.2.1 *Forecasting procedures*

4.2.2 *Sampling and questionnaire design*

The forecasting procedure for novel services based on market research is made up of five consecutive steps. The first of these consists in defining the scope of the study.

The second step involves the definition and selection of a sample from the population, where the population includes all potential customers which can be identified by qualitative market research developed through interviews at focus groups. The research can use stratified samples which involves grouping the population into homogeneous segments (or strata) and then sampling within each stratum. Stratification prevents the disproportionate representation of some parts of the population that can result by chance with simple random sampling. The sample can be structured to include specified numbers of respondents having characteristics that are known, or believed, to affect the subject of the research. Examples of customer characteristics would be socio-economic background and type of business.

The third step is the questionnaire design. A trade-off exists between obtaining as much information as practical and limiting the questionnaire to a reasonable length, as determined by the surveyor. Most questionnaires have three basic sections:

- 1) qualifying questions to determine if a knowledge person has been contacted;
- 2) basic questions including all questions which constitute the body of the questionnaire;
- 3) classification questions collecting background on demographic information.

The fourth step involves the implementation of the research – the actual surveying portion. Professional interviewers, or firms specializing in market research should be employed for interviewing.

The fifth and final step is the tabulation and analysis of the survey data.

4.2.3 Conversion ratios for the sample

Conversion ratios are used in estimating the proportion of respondents expressing an interest in the service who will eventually subscribe.

The analysis of the market research data based on a sample survey, where a stratified sample is drawn across market segments, for a service that is newly introduced or is planned, is discussed below:

Let

X_{1i} be the proportion of firms in market segment i that are very interested in the service.

X_{2i} be the proportion of firms in market segment i that are interested in the service.

X_{3i} be the proportion of firms in market segment i that are not interested in the service.

X_{4i} be the proportion of firms in market segment i that cannot decide whether they are interested or not.

The above example has four categories of responses. Greater or fewer categories may be used depending on the design of the questionnaire.

Notice that

$$\sum_j X_{ij} = 1 \quad (4-1)$$

for each i , where j is the index of categories of responses.

Market research firms sometimes determine conversion ratios for selected product/service types. Conversion ratios depend on the nature of the service, the type of respondents, and the questionnaire and its implementation. Conversion ratios applying to the sample will estimate the expected proportion of firms in the survey that will eventually subscribe, over the planning period. For studies related to the estimation of conversion ratios, refer to [3], [4] and [5].

Then,

$c_1 X_{1i}$ is the proportion of firms in market segment i that expressed a strong interest and are expected to subscribe

$c_2 X_{2i}$ is the proportion of firms in market segment i that expressed an interest and are expected to subscribe.