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SECTION 2

RECOMMENDATIONS APPLICABLE IN LATIN AMERICA

Recommendation D.400 R

ACCOUNTING RATES APPLICABLE IN TELEPHONE RELATIONS BETWEEN COUNTRIES IN LATIN AMERICA

When, in full exercise of their sovereignty, the Administrations of the countries of Latin America negotiate agreements to determine the accounting rates to be applied in their telephone relations, it is recommended that they consider the provisions below:

1 Long-distance relations

It is desirable to achieve some coordination and, as far as possible, standardization of the accounting rates applicable in telephone relations over similar distances between countries of the Latin America region. To this end, it has been considered advisable to establish a scale of accounting rates based on distance, with steps corresponding to distance ranges. This scale was established on the basis of:

a) accounting rates already in use;

b) the principle that the increase in rate at each step in the tariff scale is proportionately less the greater the distance, since the costs which vary with distance do not do so in direct proportion to the distance;

c) the fact that the distance ranges become broader with distance;

d) the adoption of the tariff step corresponding to the greatest distance (more than 4000 km) as the reference step and the application to it of a maximum rate per minute of 12.2440 gold francs;

e) the attribution of a coefficient to each distance range, the coefficient 1 being attributed to the reference step and a decreasing coefficient to the other steps.

For each step in the tariff scale it is recommended that the maximum accounting rates below be applied:

The accounting rate, as defined in CCITT Recommendation D.000 is the rate unit agreed between Administrations in a given relation that is used for the establishment of international accounts.

Table [T1.400] p.

Telephone relations between countries of Latin America through direct circuits via satellite are included — for international accounting purposes — in the highest rate above, regardless of the geodesic distance separating the international centres involved.

2 Frontier telephone relations

The determination of accounting rates and collection charges in frontier telephone relations between countries of Latin America should be governed by the following provisions:

a) *Local connections*

For telephone connections using no trunk exchange of any type, the local telephone rates of the *originating* exchange will be applied, with no remuneration of the *receiving end* .

b) *Trunk connections*

For regional telephone connections using some type of trunk exchange, accounting rates and collection charges will be established by agreement between Administrations; collection

charges should under no circumstances exceed the collection charges approved for telephone calls between the main exchanges of each of the two countries.

Whenever possible, frontier telephone relations should not entail the exchange of international accounts, and the collecting Administration should keep the entire amount collected. It should undertake, however, to supply all traffic information required to the Administration of the country of destination.

Recommendation D.401 R

ACCOUNTING RATES APPLICABLE TO TELEX RELATIONS BETWEEN COUNTRIES IN LATIN AMERICA

When in full exercise of their sovereignty the Administrations of the countries of Latin America negotiate agreements to determine the accounting rates to be applied in their telex relations, it is recommended that they consider the provisions below:

It is desirable to achieve some coordination and, as far as possible, standardization of accounting rates applicable in telex relations over similar distances between countries of the Latin America region.

To this end it has been considered advisable to establish a scale of accounting rates based on distance, with steps corresponding to distance ranges. This scale was established on the basis of:

a) accounting rates already in use;

b) the principle that the increase in rate at each step in the tariff scale is proportionately less the greater the distance, since the costs which vary with distance do not do so in direct proportion to the distance;

c) the fact that the distance intervals increase with distance;

The accounting rate, as defined in CCITT Recommendation D.000 is the rate unit agreed between Administrations in a given relation that is used for the establishment of international accounts.

d) the adoption of the tariff step corresponding to the greatest distance (more than 2500 km) as the reference step and the application to it of a maximum rate per minute of 9.1830 gold francs;

e) the attribution of a coefficient to each distance range , the coefficient 1 being attributed to the reference step and a decreasing coefficient to the other steps.

For each step in the tariff scale, it is recommended that the maximum accounting rates below be applied:

Table [T1.401], p.

Telex relations between countries of Latin America through direct circuits via satellite are included (for international accounting purposes) in the highest rate above, regardless of the geodesic distance separating the international centres involved.

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SECTION 3

RECOMMENDATIONS APPLICABLE IN ASIA AND OCEANIA

Recommendation D.500 R

ACCOUNTING RATES APPLICABLE TO TELEPHONE RELATIONS

BETWEEN COUNTRIES IN ASIA AND OCEANIA

(Malaga-Torremolinos, 1984)

When, in full exercise of their sovereignty, the Administrations of the countries in Asia and Oceania negotiate among themselves agreements to determine the accounting rates to be applied in their telephone relations, it is recommended that they give consideration to the provisions detailed below.

1 Determination of accounting rates applicable in telephone relations between countries in Asia and Oceania

1.1 It is desirable to achieve some coordination and, as far as is possible, standardization of the accounting rates applicable in telephone relations over similar distances between countries in Asia and Oceania using the ‘‘ synthetic method ´taking into account:

a) accounting rates already in use;

b) the desirability to confine rate standards to an indication of the maximum accounting rates applicable within the region.

1.2 It is recommended to adopt a distance-related zonal pattern rather than adhere to a rigid distance-based pattern.

1.3 For each relation, the following maximum accounting rates are recommended:

Zone	*Distance*	*Maximum accounting rate per minute*
1	0 to 3000 km	6 | gold francs or 1.96 SDR
2	3001 to 6000 km	7.5 gold francs or 2.45 SDR
3	over 6000 km	9 | gold francs or 2.94 SDR

1.4 The distances indicated in the above scale are those between the appropriate international exchanges in the originating and destination countries.

1.5 It is also recommended that each country should normally constitute a single area for the purpose of fixing accounting rates. However in relations between adjacent countries, a country may be divided into several areas. In this case, the number of such areas for international traffic should be reduced to a minimum.

1.6 It is recognized that in some cases, such as transit switched services, Administrations may apply rates which reflect additional costs.

1.7 The present Recommendation may be implemented in a gradual manner, subject to agreements that might be reached bilaterally between the Administrations concerned.

2 Frontier relations between countries in Asia and Oceania

The accounting rates to be applied to frontier relations should be fixed by agreement between the Administrations concerned.

Recommendation D.501 R

ACCOUNTING RATES APPLICABLE TO

TELEX RELATIONS BETWEEN COUNTRIES IN ASIA AND OCEANIA

(Malaga-Torremolinos, 1984)

When, in full exercise of their sovereignty, the Administrations of the countries in Asia and Oceania negotiate among themselves agreements to determine the accounting rates to be applied in their telex relations, it is recommended that they give consideration to the provisions detailed below.

1 Determination of accounting rates applicable in telex relations between countries in Asia and Oceania

1.1 It is desirable to achieve some coordination and, as far as is possible, standardization of the accounting rates applicable in

telex relations over similar distances between countries in Asia and Oceania To this end, a scale of accounting rates has been established using the ‘‘synthetic method ´account:

a) accounting rates already in use;

b) the desirability to confine rate standards to an indication of the maximum accounting rates applicable within the region.

1.2 It is recommended to adopt a distance-related zonal pattern rather than adhere to a rigid distance-based pattern.

1.3 For each relation, the following maximum accounting rates are recommended:

Zone	*Distance*	*Maximum accounting rate per minute*
1	0 to 3000 km	6 | gold francs or 1.96 SDR
2	3001 to 6000 km	7.5 gold francs or 2.45 SDR
3	over 6000 km	9 | gold francs or 2.94 SDR

1.4 The distances indicated in the above scale are those between the appropriate international exchanges in the originating and destination countries.

1.5 It is also recommended that each country should normally constitute a single area for the purpose of fixing accounting rates. However, in relations between adjacent countries, a country may be divided into several areas. In this case, the number of such areas for international traffic should be reduced to a minimum.

1.6 It is recognized that in some cases, such as transit switched services, Administrations may apply rates which reflect additional costs.

1.7 Ideally, the accounting rate for telex should be less than the corresponding accounting rate for telephone in order that it may reflect the lower cost involved in the provision of facilities for that service.

1.8 The present Recommendation may be implemented in a gradual manner, subject to agreements that might be reached bilaterally between the Administrations concerned.

2 Frontier relations between countries in Asia and Oceania

The accounting rates to be applied to frontier relations should be fixed by agreement between the Administrations concerned.

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SECTION 4

RECOMMENDATIONS APPLICABLE TO THE AFRICAN REGION

Recommendation D.600 |

DETERMINATION OF ACCOUNTING RATE SHARES AND COLLECTION CHARGES IN TELEPHONE RELATIONS BETWEEN COUNTRIES IN AFRICA

Introduction

When, in full exercise of their sovereignty, the Administrations of the countries of Africa negotiate among themselves agreements for determining the accounting rate shares and when they fix the collection charges to be applied in their telephone relations, it is recommended that they take into consideration:

— for the determination of accounting rate shares and accounting rates, the provisions of § 2 (Determination of accounting rates) of this Recommendation;

— for fixing the collection charges, the provisions contained in § 3 of this Recommendation;

— for fixing tariffs and remuneration for the facilities used for international telephone traffic routed via satellite, the provisions of § 4 of this Recommendation;

— for fixing tariffs for frontier relations, the provisions contained in § 5 of the Recommendation.

1 Explanation of some of the terms used in this Recommendation

An explanation of some of the terms used in this Recommendation is given in Recommendation D.000.

2 Determination of accounting rate shares in telephone relations between countries in Africa

2.1 *General*

2.1.1 Since the setting up of any international call involves both the international network and the national networks of the terminal countries, the accounting rate share for each country is derived from three basic elements, to which separate standard rates are applied:

— the *line* (transmission) part of the international network, which includes the various transmission systems used and is a function of the distance;

— the international exchange, i.e. the *switching* part of the international circuit, plus the terminal transmission equipment;

— the *national extension* , which denotes that part of the national network of each terminal country involved in completing the connection.

2.1.2 In special cases where the *line* (transmission) part of an international connection is:

— a tropospheric scatter link,

— a radio link, or

— a satellite link,

the provisions of this Recommendation with regard to the determination of an accounting rate share in relation to the length of the international circuit are not applicable, and accounting rate shares should be agreed upon between the Administrations concerned.

2.2 *Charging zones*

For calculating accounting rate shares, each country may be divided into charging zones. If need be, different charging zones may be fixed in a given country for traffic exchanged with different countries.

It is desirable that the number of charging zones for international traffic, in any one country, should be reduced to a minimum. As a general rule, in services between non-adjacent countries, each country should constitute one single zone.

2.3 *Calculation of distances* (*line part*)

2.3.1 *Distances to be taken into consideration*

2.3.1.1 *General case*

2.3.1.1.1 In determining the share payable to a country for the use of international circuits, the distance to be taken into consideration is:

in a terminal country

— *the crowflight distance* between:

a) the point at which the international circuit crosses the frontier, and

b) the international exchange at which the circuit terminates;

in a transit country

— *the crowflight distance* | between the two frontier points at which the international circuit enters and leaves the country in question.

2.3.1.1.2 The same provisions apply to the determination of crowflight distances for groups and supergroups.

The above provisions for the calculation of distances apply to international circuits both on radio-relay links and on land cables.

2.3.1.2 *Special cases*

2.3.1.2.1 *Radio-relay links crossing the sea or a third country*

When a frontier is crossed by a radio-relay section of an international circuit passing over a third country or over the sea, without an intermediate relay station, the frontier point for measuring the circuit length shall be the point mid-way between the two relay stations on either side of the frontier.

2.3.1.2.2 *Submarine cables*

With regard to international circuits which are routed in submarine cables, the distance to be used for accounting shall be calculated as follows:

a) for the land section of the circuit to the submarine cable station, the distance shall be calculated in accordance with the general principles (i.e. the crowflight distance), it being assumed that the point at which the circuit crosses the frontier is the cable station;

b) for the submarine cable section, the distance used shall be the actual route distance between the submarine cable stations, as determined and agreed by the owners of the cable; the distance will be divided appropriately (normally 50/50) between the countries at the extremities of the cable.

2.3.1.2.3 *Special itineraries*

In exceptional circumstances, multiplication factors may be applied to the crowflight distance, from which the terminal and transit charges are calculated, to take account of special itineraries. For example, in the case of a direct transit country, the crowflight distance between the points on the frontier at which the circuit enters and leaves the country may (in exceptional circumstances) be replaced by a length representing the sum of two crowflight segments making up a broken line, etc.

2.3.2 *Possibility of weighting distances*

For calculation of the crowflight distances for the international section, a weighting according to the number of circuits is normally applied in a given relation to simplify accounting:

— when there are several international arteries with different itineraries terminating at an international exchange;

— when there are several international exchanges in a country for the relation concerned.

This weighting serves to determine a length (crowflight distance) for fixing the accounting rate shares relating to the international section and it would remain in force as long as the structure of the network was not significantly changed. This length of the international section would then be used to fix the *international section* element for the charges for international telephone circuits, groups and supergroups.

2.3.3 *Rounding off distances*

2.3.3.1 For the determination of accounting rate shares, the distances measured as indicated above shall be rounded up to 50 km or to the *next highest* multiple of 50 km.

2.3.3.2 This rounding rule applies to the distances in each of the terminal countries and in each of the transit countries and is applied to the total distance calculated for any one country. It is applicable to the remuneration of Administrations both on the basis of a flat-rate price for the facilities made available and on the basis of traffic units.

2.3.3.3 When distances are weighted in accordance with the provisions of § 2.3.2 above, the rounding shall be applied only after the weighted distance has been calculated.

2.3.4 *Existence of several routes in a given relation*

When, in a given relation, there are several routes traversing different transit countries, these transit countries shall in all cases receive the share or flat-rate price normally due to them for the distance between the points of entry and exit; any cost of equalizing collection charges in a relation comprising different routes shall be borne solely by the Administration of the country of origin and no deduction shall be made from the remuneration due to the transit countries.

2.4 *Standard rates to be applied for international accounting*

For international accounting purposes, there are two methods of remuneration for the facilities made available by Administrations:

— on the basis of traffic units;

— on the basis of a flat-rate price for the facilities made available.

2.4.1 *Remuneration on the basis of traffic units*

To determine the accounting rate shares for each country, the following standard rates, *per minute of conversation time* , are recommended; however, these rates represent a maximum which Administrations undertake not to exceed:

1) *International network*

a) *Manual operation* — *per 100 km* | of international circuit (excluding any national circuit required for connecting the international exchange to the national exchange serving the subscriber) 17 gold centimes

— for the manual international exchange in the country of origin or destination 60 gold centimes | ua)

— for a manual international exchange in a transit country 65 | ub) gold centimes | ua)

b) *Semi-automatic and automatic operation* — *per 100 km* | of international circuit (excluding any national circuit required for connecting the international exchange to the national exchange serving the subscriber) 16 gold centimes

— for the semi-automatic international exchange in the country of origin: Operating cost c) gold centimes Switching cost c) gold centimes | ua)
Total 60 gold centimes

— for the automatic international exchange in the country:

of origin 46 gold centimes | ua) of destination 46 gold centimes | ua)

— for an automatic international exchange (in a transit country) 58 gold centimes | ua)

a) This share includes the cost of the transmission equipment for one extremity in terminal operation and for two extremities in transit operation.

b) This sum is derived from that relating to the manual international exchange, by adding 5 gold centimes to the latter.

c) These amounts will be provided when the next cost study is made.

2) *National extension*

When determining the accounting rates, an amount may be added to cover the costs of the extension of calls over the national network. This amount should be determined by the Administration of each country after consideration of the volume and distribution of traffic on the national extension in that country for each relation concerned. It is recommended that as a general rule this amount should not exceed 90 gold centimes per minute. This amount is considered as

Use of charged time instead of conversation time for international accounting According to their equipment, some Administrations may have to use charged time data for international accounts instead of conversation time, the charged time being given, for example, by the operator's ticket. In such a case, the Administration of origin will consult with the Administration of destination and, when necessary, with the Administration of transit countries to see whether it is necessary to adjust the number of minutes entered in the international accounts to make allowance for the small difference which may exist between the charged time they use and the conversation time they should use for accounting according to Recommendation D.150 and the present Recommendation.

covering the costs of switching and accounting operations and, normally, of transmission over the national extension.

2.4.2 *Remuneration on the basis of a flat-rate price for the facilities made available*

2.4.2.1 *Remuneration of a direct transit country*

2.4.2.1.1 To determine the flat-rate price for remuneration for the transmission facilities made available by Administrations, the following standard rates are recommended; however, these rates represent a maximum which Administrations undertake not to exceed:

Per year and per 100 km
of transmission channel

(*line* part)

— per group 40 | 00 gold francs | ua)

— per supergroup 120 | 00 gold francs | ua)

— per telephone circuit 4 | 00 gold francs | ua)

a) Including, wherever applicable, the use of modulation and demodulation equipment or throughband filters in the direct transit country.

2.4.2.1.2 When a circuit leased to a private user passes through a direct transit country, the Administration of this country will be remunerated by the Administrations of the terminal countries with a flat-rate price on the same basis as if the circuit were an ordinary public service circuit applying the rate in § 2.4.2.1.1 above.

2.4.2.2 *Remuneration of a country of destination*

To determine the flat-rate price for remuneration of the country of destination for the facilities made available by Administrations, the following standard rates are recommended; however, these rates represent a maximum which Administrations undertake not to exceed:

1) *For the transmission channel* | (line *part*)

Per year and per 100 km

— for a telephone circuit 4 | 00 gold francs

— for a group 40 | 00 gold francs

— for a supergroup 120 | 00 gold francs

2) *For the international exchange* | (including the terminal transmission equipment)

— per year and per international circuit connected

Manual operation	*Automatic operation*
0.60 | ua) × 35 | 00 | ub)	0.46 | ua) × 40 | 00 | uc)
= 21 | 00 gold francs	= 18 | 00 gold francs

3) *For the national extension*

— per year and per international circuit connected

Manual operation	*Automatic operation*
PN [d] × 35 00 [b]	PN [d] × 40 00 [c]

[a] The cost of the transmission equipment for one extremity is included in the amounts of 60 and 46 gold centimes.

[b] Average number of minutes of traffic routed per year and per manual international telephone circuit.

[c] Average number of minutes of traffic routed per year and per semi-automatic or automatic international telephone circuit.

[d] PN represents the amount, per minute of conversation time, of the share to be fixed by each Administration for the extension of the connection on national territory.

4) The remuneration for terminal transmission equipment has been included in the preceding point 2) based on annual costs per extremity of:

— . | | | | | supergroup | ue)

— . | | | | | group | ue)

— . | | | | | circuits | ue)

e) The amounts will be provided when the next cost study is made.

2.4.3 All the amounts given in § 2 above are reproduced in the three tables in Annexes A, B and C.

3 Determination of collection charges in telephone relations between countries in Africa

3.1 *General*

The establishment of the collection charge is a national matter. Although, in general, Administrations correlate collection charges and accounting rates, the two will not necessarily be the same for a number of reasons, for example:

a) in most countries, collection charges and accounting rates will be expressed in different currencies;

b) collection charges and accounting rates may be based on different traffic units;

c) the value of national currencies may fluctuate relative to the gold franc;

d) collection charges may be influenced by government fiscal policies;

e) Administrations frequently establish common collection charges for geographical zones or groups of countries;

f) in many relations there will be different routes with different accounting rates to which a single collection charge will be applied.

3.2 *Charging zones*

For the determination of collection charges each country may be divided into charging zones. If need be, different charging zones may be fixed in a given country for traffic exchanged with different countries.

It is desirable that the number of charging zones for international traffic, in any one country, should be reduced to a minimum. As a general rule, in services between non-adjacent countries, each country should constitute one single zone.

The fixing of zones for collection charges does not imply the same measure for accounting rate shares which can be weighted appropriately to make allowances for a zonal structure. Similarly, the fixing of zones for accounting rate shares (§ 2.2 above) does not imply any requirement for fixing zones for collection charges.

3.3 *Determination of collection charges*

3.3.1 The collecting charge, in principle, should be the equivalent in national currency of the accounting rate. If, taking into account the factors in §§ 3.1 and 3.2 above, an Administration wishes to fix a collection charge at a higher or lower amount than the direct equivalent of the accounting rate, it may apply a multiplication factor K. This factor K should not be more than 1.5 when applied to the accounting rate in the relation concerned.

As a general principle, Administrations should make every effort to avoid too large a dissymmetry between the collection charges applicable in each direction of the same relation and should endeavour to agree upon application of the same factor K. Collection charges should be fixed at reasonable levels and the factor K = 1.5 is a maximum which should not be applied automatically. The factor K may be different for the different relations operated by an Administration.

Note — It is emphasized that the application of a factor K should have no effect on international accounting.

3.3.2 In considering the collection charges for a relation in which automatic and semi-automatic working both exist, each Administration should decide to fix its charges:

— either by establishing different charges for each method of operation; or

— by establishing a single collection charge weighted according to the volume of each type of traffic.

3.4 *Examples of how to apply the standard rates mentioned in § 2 above for determining collection charges in gold francs*

The following tables give examples of the application of standard rates to calculate collection charges and show how the latter can be used to establish scales of collection charges (in gold francs) for application in the African region.

These scales are based on the principle of a sliding scale according to distance and therefore consist of rate steps corresponding to distance steps of 500 km and 1000 km.

To avoid excessive differences between collection charges and accounting charges for small distances (for example, in the relations between neighbouring countries) a factor K slightly more than 1 was applied, while for longer distances a higher factor K appeared suitable.

3.4.1 *International manual telephone operation*

H.T. [T1.600]

Distance steps | ua)	Accounting rates			Collection charges			Factor K
	{ { Total (in gold francs) { Total (in gold francs)	{					
0 | (hy | 500 km	3.00 | ub)	0.85	3.85	3.18	0.90	4.08	1.06
500 | (hy | 000 km	3.00	1.70	4.70	3.18	1.80	4.98	
1000 | (hy | 500 km	3.00	2.55	5.55	3.18	2.70	5.88	
1500 | (hy | 000 km	3.00	3.40	6.40	3.18	3.60	6.78	
2000 | (hy | 000 km	3.00	5.10	8.10	3.18	5.40	8.58	
3000 | (hy | 000 km	3.00	6.80	9.80	3.18	7.20	10.38	
>4000 km (5000 km)	3.00	8.50	11.50	3.45	9.77	13.22	1.15

{
a)

To calculate the accounting rate share based on distance, the maximum distance in each step was taken.
}
{
b)

This share was calculated as follows:
}

Country of origin	Country of destination	
National extension	0.90	0.90
International exchange	0.60	0.60
Total	1.50	1.50

Table [T1.600], p.

3.4.2 *International semi-automatic telephone operation*

H.T. [T2.600]

Distance steps | ua)	Accounting rates			Collection charges			Factor K
	{ { Total (in gold francs) { Total (in gold francs)	{					
0 | (hy | 500 km	2.86 | ub)	0.80	3.66	3.03	0.84	3.87	1.06
500 | (hy | 000 km	2.86	1.60	4.46	3.03	1.69	4.72	
1000 | (hy | 500 km	2.86	2.40	5.26	3.03	2.54	5.57	
1500 | (hy | 000 km	2.86	3.20	6.06	3.03	3.39	6.42	
2000 | (hy | 000 km	2.86	4.80	7.66	3.03	5.09	8.12	
3000 | (hy | 000 km	2.86	6.40	9.26	3.03	6.78	9.81	
>4000 km (5000 km)	2.86	8.00	10.86	3.20	8.96	12.16	1.12

{
a)

To calculate the accounting rate share based on distance, the maximum distance in each step was taken.
}
{
b)

This share is calculated as follows:
}

Country of origin	Country of destination	
National extension	0.90	0.90
International exchange	0.60	0.46
Total	1.50	1.36

_

Table [T2.600], p.

4 Tariffs and remuneration for facilites used for international telephone traffic in Africa routed via satellite

Some provisions on the fixing of tariffs and remuneration for the facilities used for international telephone traffic routed via satellite are contained in Annex D to this Recommendation.

5 Frontier relations between African countries

The conditions governing the establishment and operation of frontier relations depend largely on the structure of the national networks in the frontier areas. These conditions tend to alter, particularly as a result of network automation, which leads in turn to automation of frontier relations. Consequently, the collection charges applied to these relations are tending to become increasingly subject to the limitations imposed by the automatic charging equipments used. The collection charges and accounting rates to be applied to frontier relations should therefore be fixed by agreement between the Administrations concerned.

Whenever the situation permits, there should be no exchange of international accounts for frontier calls, the entire charge being retained by the Administration which collects it.

ANNEX A
(to Recommendation D.600 R)

Standard rates to be applied in Africa

in determining accounting rate shares in the telephone service
(traffic unit basis)

A — Accounting rate shares applicable in *terminal countries*
| per *minute* of conversation time

H.T. [T3.600]
lw(30p) | lw(36p) sw(30p) | lw(36p) sw(30p) | lw(36p) sw(30p) , ^ | l | l | l | l | l | l.
cw(30p) | cw(36p) sw(30p) | cw(36p) sw(30p) | cw(36p) sw(30p) , ^ | c | c | c | c | c | c. Direction of operation Manual operation Semi-automatic operation Automatic operation { Transmission (per 100 km of circuit)
} { International exchange | ua)
} { Transmission (per 100 km of circuit)
} { International exchange | ua)
} { Transmission (per 100 km of circuit)
} { International exchange | ua)
} _ lw(30p) | cw(36p) | cw(30p) | cw(36p) | cw(30p) | cw(36p) | cw(30p) . Outgoing 17 gold centimes 60 gold centimes 16 gold centimes 60 gold centimes 16 gold centimes 46 gold centimes lw(30p) | cw(36p) | cw(30p) | cw(36p) | cw(30p) | cw(36p) | cw(30p) . Incoming 17 gold centimes 60 gold centimes 16 gold centimes 46 gold centimes 16 gold centimes 46 gold centimes _

Table A [T3.600], p.

B — Accounting rate shares applicable in *transit countries* | per *minute* of conversation time

H.T. [T4.600]
lw(42p) sw(36p) | lw(78p) sw(72p) , l | l | l | l. cw(42p) sw(36p) | cw(78p) sw(72p) , c | c | c | c. Direct transit Switched transit Manual Automatic Manual Automatic _ cw(42p) | cw(36p) | cw(42p) | cw(36p) | cw(42p) | cw(30p) .
{ Transmission (per 100 km of circuit)
} { Transmission (per 100 km of circuit)
} { Transmission (per 100 km of circuit)
} { International exchange | ua)
} { Transmission (per 100 km of circuit)
} { International exchange | ua)
} _ cw(42p) | cw(36p) | cw(42p) | cw(36p) | cw(42p) | cw(30p) . 17 gold centimes 16 gold centimes 17 gold centimes 65 gold centimes 16 gold centimes { 58 gold centimes [a] Including the cost of the transmission equipments for one extremity in terminal operation and for two extremities in transit operation.
} _

Table B [T4.600], p.

ANNEX B
(to Recommendation D.600 R)

Standard rates to be applied in Africa in remuneration for

transmission facilities made available by Administrations in a direct transit country
(flat-rate basis)
H.T. [T5.600]

Unit element considered	{ {
Supergroup	120 | 00 | ua)
Group	40 | 00 | ua)
Telephone circuit	4 | 00 | ua)

a) Including, wherever applicable, use of modulation and demodulation equipments or throughband filters in the direct transit country.

TABLEAU [T5.600], p.

ANNEX C

(to Recommendation D.600 R)

Standard rates to be applied in Africa in remuneration for facilities made available

by Administrations in a destination country (flat-rate price basis)

H.T. [T6.600]

<table>
<tr><th>Unit element considered</th><th>{</th><th>National extension
Operation
Manual</th><th>Automatic</th><th>Operation</th><th>Manual</th></tr>
<tr><td>International circuit</td><td>4 | 00 gold francs</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Group</td><td>40 | 00 gold francs</td><td>{</td><td></td><td></td><td></td></tr>
<tr><td>0.60 | ua) | (mu | 5 | 00 | ub) |
21 | 00 gold francs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>}</td><td>{</td><td></td><td></td><td></td><td></td></tr>
<tr><td>0.46 | ua) | (mu | 0 | 00 | uc) |
18 | 00 gold francs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>}</td><td>{</td><td></td><td></td><td></td><td></td></tr>
<tr><td>PN | ud) × 35 | 00 | ub)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>}</td><td>{</td><td></td><td></td><td></td><td></td></tr>
<tr><td>PN | ud) × 40 | 00 | uc)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>}</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Supergroup</td><td>120 | 00 gold francs</td><td></td><td></td><td></td><td></td></tr>
</table>

a) The cost of the transmission equipment for one extremity is included in the amounts of 60 and 46 gold centimes.

b) Average number of minutes of traffic routed per year and per manual international telephone circuit.

c) Average number of minutes of traffic routed per year and per semi-automatic or automatic international telephone circuit.

d) PN represents the amount, per minute of conversation time, of the share to be fixed by each Administration for the extension of the connection on national territory.

Table [T6.600], p.

ANNEX D

(to Recommendation D.600 R)

Tariffs and remuneration for the facilities used for international

telephone traffic in Africa routed via satellite

D.1 *Tariffs*

Contrary to what may be observed with regard to relations depending on land circuits, the distance factor has little effect on the cost of the facilities used to set up satellite links. Nevertheless, it is generally desirable for a number of reasons (uniformity of rates regardless of the transmission medium used, concept of service rendered, political considerations, etc.) to establish a rates system based on distance in relations using these transmission facilities, i.e. to apply the same scale of collection charges as in relations established on land transmission systems.

D.2 *Remuneration for facilities*

D.2.1 *Direct links between terminal countries*

When satellite circuits are used, remuneration for the facilities made available in the country of destination may be based, in accordance with Recommendation D.150, on either of the following:

— the accounting revenue division procedure, or

— the traffic unit price procedure.

D.2.1.1 *Accounting revenue division procedure*

When the accounting revenue division procedure is applied, it is generally agreed that the revenue should be shared on a 50/50 basis, regardless of the mode of operation.

D.2.1.2 *Traffic unit price procedure*

When the traffic unit price procedure is used, the accounting rate share might initially be fixed as indicated below; however, this share represents a maximum which Administrations undertake not to exceed:

— Share per minute: 4 gold francs.

This share covers only the path between the satellite and the international exchange (excluding that exchange). The shares for the international exchange and the national extension, as laid down in § 2, should therefore be added.

The share of 4 gold francs per minute mentioned above is based on the assumption that the earth station provides 60 circuits, each of which handles an average of 40 | 00 minutes of conversation time per year. On the same assumption, the cost of the space segment (1/2 circuit) has been fixed at 15 | 00 gold francs per year.

D.2.2 *Transit links*

D.2.2.1 *Direct satellite link set up in transit via an earth station in a third country*

The Administration operating the earth station in the third country is remunerated on the flat-rate price basis. This remuneration might be fixed initially at *70 | 00 gold francs per year per circuit* . However, this amount represents a maximum which Administrations undertake not to exceed.

This amount covers the costs of the earth station (excluding the space segment) and the extension to the international exchange in the third country. It is based on the assumption that the earth station would set up 60 circuits.

D.2.2.2 *Switched transit link*

The remuneration of the country providing switched transit and of the country of destination may be based either on the accounting revenue division procedure using an agreed key or on the traffic unit price procedure. In the latter case the shares to be considered are those given in this annex and in the Recommendation itself.

Recommendation D.601 |

DETERMINATION OF ACCOUNTING RATE SHARES AND COLLECTION CHARGES

IN TELEX RELATIONS BETWEEN COUNTRIES IN AFRICA

Introduction

When, in full exercise of their sovereignty, the Administrations of the countries of Africa negotiate among themselves agreements for determining the accounting rate shares and when they fix the collection charges to be applied in their telex relations, it is recommended that they take into consideration:

— for the determination of accounting rate shares and accounting rates , the provisions of § 2 (Determination of accounting rate shares) of this Recommendation;

— for fixing the collection charges , the provisions contained in § 3 of this Recommendation;

— for fixing tariffs and remuneration for the facilities used for international telex traffic routed via satellite, the provisions of § 4 of this Recommendation.

1 Explanation of some of the terms used in this Recommendation

An explanation of some of the terms used in this Recommendation is given in Recommendation D.000.

2 Determination of accounting rate shares in telex relations between countries in Africa

2.1 *General*

2.1.1 Since the setting up of any international call involves both the international network and the national networks of the terminal countries, the accounting rate share for each country is derived from three basic elements, to which separate standard rates are applied:

— the *line* (transmission) part of the international network, which includes the various transmission systems used and is based on distance;

— the international exchange, i.e. the *switching* part of the international circuit plus the terminal transmission equipment;

— the *national extension* , which denotes that part of the national network of each terminal country involved in completing the connection.

2.1.2 In special cases where the *line* (transmission) part of an international connection is:

— a tropospheric scatter link,

— a radio link, or

— a satellite link,

the provisions of this Recommendation with regard to the determination of an accounting rate share in relation to the length of the international circuit are not applicable and accounting rate shares should be agreed upon between the Administrations concerned.

2.2 *Calculation of distances* (line *part*)

2.2.1 *Distances to be taken into consideration*

2.2.1.1 *General case*

In determining the share payable to a country for the use of international circuits, the distance to be taken into consideration is, in principle:

in a terminal country

— *the crowflight distance between:*

a) the point at which the international circuit crosses the frontier, and

b) the international exchange at which the circuit terminates;

in a transit country

— *the crowflight distance* between the two frontier points at which the international circuit enters and leaves the country in question.

The above provisions for the calculation of distances apply to international circuits both on land cables and on radio-relay links.

2.2.1.2 *Special cases*

2.2.1.2.1 *Radio-relay links crossing the sea or a third country*

When a frontier is crossed by a radio-relay section of an international circuit passing over a third country or over the sea, without an intermediate relay station, the frontier point for measuring the circuit length shall be the point midway between the two relay stations on either side of the frontier.

2.2.1.2.2 *Submarine cables*

With regard to international circuits which are routed in submarine cables, the distance to be used for accounting shall be calculated as follows:

a) for the land section of the circuit to the submarine cable station, the distance shall be calculated in accordance with the general principles (i.e. the crowflight distance), it being assumed that the point at which the circuit crosses the frontier is the cable station;

b) for the submarine cable section, the distance used shall be the actual route distance between the submarine cable stations, as determined and agreed by the owners of the cable; the distance will be divided appropriately (normally 50/50) between the countries at the extremities of the cable.

2.2.1.2.3 *Special itineraries*

In exceptional circumstances, multiplication factors may be applied to the crowflight distance, from which the terminal and transit charges are calculated, to take account of special itineraries. For example, in the case of a direct transit country, the crowflight distance between the points on the frontier at which the circuit enters and leaves the country may (in exceptional circumstances) be replaced by a length representing the sum of two crowflight segments making up a broken line, etc.

2.2.2 *Possibility of weighting distances*

For calculation of the crowflight distances for the international section, a weighting according to the number of circuits is normally applied in a given relation to simplify accounting:

— when there are several international arteries with different itineraries terminating at an international exchange;

— when there are several international exchanges in a country for the relation concerned.

This weighting serves to determine a length (crowflight distance) for fixing the accounting rate shares relating to the international section and shall remain in force as long as the structure of the network is not significantly changed. This length of the international section is then used to fix the *international section* element for the charges for international telex circuits.

2.2.3 *Rounding off distances*

2.2.3.1 For the determination of accounting rate shares, the distances measured as indicated above shall be rounded up to 50 km or to the next highest multiple of 50 km.

2.2.3.2 This rounding rule applies to the distances in each of the terminal countries and in each of the transit countries and is applied to the total distance calculated for any one country. It is applicable to the remuneration of Administrations both on the basis of a flat-rate price for the facilities made available and on the basis of traffic units.

2.2.3.3 When distances are weighted in accordance with the provisions of § 2.2.2 above, the rounding shall be applied only after the weighted distance has been calculated.

2.2.4 *Existence of several routes in a given relation*

When, in a given relation, there are several routes traversing different transit countries, these transit countries shall in all cases receive the share or flat-rate price normally due to them for the distance between the points of entry and exit; any cost of equalizing collection charges in a relation comprising different routes shall be borne solely by the Administration of the country of origin and no deduction shall be made from the remuneration due to the transit countries.

2.3 *Standard rates to be applied for international accounting*

For international accounting purposes, there are two methods of remuneration for the facilities made available by Administrations:

— on the basis of traffic units;

— on the basis of a flat-rate price for the facilities made available.

2.3.1 *Remuneration on the basis of traffic units*

To determine the accounting rate shares for each country, the following standard rates, *per minute of telex call* , are recommended; however, these rates represent a maximum which Administrations undertake not to exceed:

2.3.1.1 *Remuneration of the international network in semi-automatic and automatic operation*

— *per 100 km* .PS 10 of international circuit (excluding any national circuit required for connecting the international exchange to the national exchange serving the subscriber) 2 gold centimes | ua)

— for the semi-automatic international exchange in the country of origin: operating cost | uc) gold centimes switching cost | uc) gold centimes | ub)
Total 50 gold centimes

— for the automatic international exchange in the country: of origin 32 gold centimes | ub) of destination 32 gold centimes | ub)

— for an automatic international exchange in a transit country 50 gold centimes | ub)

a) Where, in order to establish a telex circuit, telegraph channels are connected in a direct transit country, an additional charge of 10 gold centimes shall be made for the translating equipment used to connect them.

b) This share includes the cost of the transmission equipment for one extremity in terminal operation and for two extremities in transit operation.

c) These amounts will be provided when the next cost study is made.

2.3.1.2 *Remuneration of the national extension*

An amount may be added to cover the costs of the extension of calls over the national network. This amount should be determined by the Administration of each country after consideration of the volume and distribution of traffic on the national extension in its country for each relation concerned. It is recommended that as a general rule this amount should not exceed 80 gold centimes per minute. This amount is considered as covering the costs of accounting operations as well as the costs of switching and transmission over the national extension.

2.3.2 *Remuneration on the basis of a flat-rate price for the facilities made available*

2.3.2.1 *Remuneration of a direct transit country*

2.3.2.1.1 To determine the flat-rate price for remuneration for the transmission facilities made available by Administrations, the following standard rates are recommended; however, these rates represent a maximum which Administrations undertake not to exceed:

Per year and per 100 km

of transmission channel
(*line* part)

— per 50-baud telegraph channel 400 gold francs | ua)

— per VFT bearer circuit 4000 gold francs

a) Where, in order to establish a circuit, two telegraph channels in a direct transit country are connected, an additional charge shall be made for the lease of the transmission equipment for two telegraph channel extremities, i.e. 1000 × 2 = 2000 gold francs, irrespective of the number of such connections in the direct transit country.

2.3.2.1.2 When a circuit leased to a private user passes through a direct transit country, the Administration of this country will be remunerated by the Administrations of the terminal countries with a flat-rate price on the same basis as if the circuit were an ordinary public service circuit applying the rate in § 2.3.2.1.1 above.

2.3.2.2 *Remuneration of a country of destination*

To determine the flat-rate price for remuneration of the country of destination for the facilities made available by Administrations, the following standard rates are recommended; however, these rates represent a maximum which Administrations undertake not to exceed:

1) *For the transmission channel* (line *part* |

Per year and per 100 km

— per 50-baud telegraph channel 400 gold francs

— per VFT telephone bearer circuit 4000 gold francs

2) *For the international exchange* (including the terminal transmission equipment)

— per year and per 50-baud international circuit connected

Automatic operation

0.32 × 25 | 00 | ua) = 8000 gold francs | ub)

a) Average number of minutes of traffic routed per year and per international telex circuit.

b) The cost of the terminal telex transmission equipment for one extremity is included in the amount of 32 gold centimes.

3) *For the national extension*

— per year and per 50-baud international circuit connected

Automatic operation

PN | ub) × 25 | 00 | ua)

a) Average number of minutes of traffic routed per year and per international telex circuit.

b) PN represents the amount, per minute of telex call, of the share to be fixed by each Administration for the extension of the connection on national territory.

2.3.3 All the amounts given in § 2 above are reproduced in the three tables in Annexes A, B and C.

3 Determination of collection charges in telex relations between countries in Africa

3.1 *General*

The establishment of the collection charge is a national matter. Although, in general, Administrations correlate collection charges and accounting rates, the two will not necessarily be the same for a number of reasons, for example:

a) in most countries, collection charges and accounting rates will be expressed in different currencies;

b) collection charges and accounting rates may be based on different traffic units;

c) the value of national currencies may fluctuate relative to the gold franc;

d) collection charges may be influenced by government fiscal policies;

e) Administrations frequently establish common collection charges for geographical zones or groups of countries;

f) in many relations there will be different routes with different accounting rates to which a single collection charge will be applied.

3.2 *Determination of collection charges*

3.2.1 The collection charge, in principle, should be the equivalent in national currency of the accounting rate. If, taking into account the factors in § 3.1 above, an Administration wishes to fix a collection charge at a higher or lower amount than the direct equivalent of the accounting rate, it may apply a multiplication factor K. This factor K should not be more than 1.8 when applied to the accounting rate in the relation concerned.

As a general principle, Administrations should make every effort to avoid too large a dissymmetry between the collection charge applicable in each direction of the same relation and should endeavour to agree upon application of the same factor K. Collection charges should be fixed at reasonable levels and the factor K = 1.8 is a maximum which should not be applied automatically. The factor K may be different for the different relations operated by an Administration.

Note — It is emphasized that the application of a factor K should not affect international accounting.

3.2.2 In considering the collection charges for a relation in which automatic and semi-automatic working both exist, each Administration should decide to fix its charges:

— either by establishing different charges for each method of operation; or

— by establishing a single collection charge weighted according to the volume of each type of traffic.

3.3 *Examples of how to apply the standard rates mentioned in § 2 above for determining collection charges*

Table 1/D.601 R gives examples of the application of standard rates for semi-automatic operation to calculate collection charges and shows how the latter can be used to establish scales of collection charges (in gold francs) for application in the African region.

These are on the principle of a sliding scale according to distance and therefore consist of rate steps corresponding to distance steps of 1000 km.

To avoid excessive differences between collection rates and accounting rates for small distances (for example, in the relations between neighbouring countries) a factor K slightly more than 1 was applied, while for longer distances a higher factor K appeared suitable.

H.T. [T5.601]

TABLE 1/D.601R

Distance steps | ua)	Accounting rates { { Total (in gold francs) { Total (in gold francs)	{		Collection charges			Factor K
0 | (hy | 000 km	2.42 | ub)	0.20	2.62	3.15	0.26	3.41	1.30
1000 | (hy | 000 km	2.42	0.40	2.82	3.15	0.52	3.67	
2000 | (hy | 000 km	2.42	0.60	3.02	3.15	0.78	3.93	
3000 | (hy | 000 km	2.42	0.80	3.22	3.15	1.04	4.19	
>4000 km (5000 km)	2.42	1.00	3.42	4.36	1.80	6.16	1.80

T&
l s .
{
a)

In calculating the accounting rate share based on distance, the maximum distance in each step was taken.
}
{
b)

This share is calculated as follows:
}

Country of origin	Country of destination	
National extension	0.80	0.80
International exchange	0.50	0.32
Total	1.30	1.12

Table [T5.601], p.

4 Tariffs and remuneration for facilities used for international telex traffic in Africa routed via satellite

Some provisions on the fixing of tariffs and remuneration for the facilities used for international telex traffic routed via satellite are given in Annex D to this Recommendation.

ANNEX A

(to Recommendation D.601 R)

Standard rates to be applied in Africa

in determining accounting rate shares in the telex service

(traffic unit basis)

A — Accounting rate shares applicable in *terminal countries* per *minute* of telex call

Table [T1.601], p.

B — Accounting rate shares applicable in *transit countries* per *minute* of telex call

Table [T2.601], p.

ANNEX B
(to Recommendation D.601 R)

Standard rates to be applied in Africa in remuneration

for transmission facilities made available by Administrations
in a direct transit country
(flat-rate price basis)

Table [T3.601], p.

ANNEX C
(to Recommendation D.601 R)

Standard rates to be applied in Africa in remuneration for facilities

made available by Administrations in a destination country
(flat-rate price basis)

Table [T4.601], p.

ANNEX D
(to Recommendation D.601 R)

Tariffs and remuneration for the facilities used for international

telex traffic in Africa routed via satellite

D.1 *Tariffs*

Contrary to what may be observed with regard to relations depending on land circuits, the distance factor has little effect on the cost of the facilities used to set up for satellite links. Nevertheless, it is generally desirable for a number of reasons (uniformity of rates regardless of the transmission medium used, concept of service rendered, political considerations, etc.) to establish a rates system based on distance in relations using these transmission facilities, i.e. to apply the same scale of the collection charges as in relations established on land transmission systems.

D.2 *Remuneration for facilities*

D.2.1 *Direct links between terminal countries*

When satellite circuits are used, remuneration for the facilities made available in the country of destination may be based, by analogy with Recommendation D.150, on either of the following:

— the accounting revenue division procedure, or

— the traffic unit price procedure.

D.2.1.1 *Accounting revenue division procedure*

When the accounting revenue division procedure is applied, it is generally agreed that the revenue should be shared on a 50/50 basis, regardless of the mode of operation.

D.2.1.2 *Traffic unit price procedure*

When the traffic unit price procedure is used, the accounting rate share might initially be fixed as indicated below; however, this share represents a maximum which Administrations undertake not to exceed:

— share per minute: 27 gold centimes.

This share covers only the path between the satellite and the international exchange (excluding that exchange). The shares for the international exchange and the national extension, as laid down in § 2, should therefore be added.

The share of 27 gold centimes per minute mentioned above is based on the assumption that the earth station provides 60 telephone circuits, each VFT telephone bearer circuit serving to establish about 10 telegraph channels, each of which handles an average of 25 | 00 minutes of calls per year. On the same assumption, the cost of the space segment (1/2 telephone circuit) has been fixed at 15 | 00 gold francs per year.

D.2.2 *Transit links*

D.2.2.1 *Direct satellite link set up in transit via an earth station in a third country*

The Administration operating the earth station in the third country is remunerated on the flat-rate price basis. This remuneration might be fixed initially at 10 | 00 gold francs per year per telegraph circuit. However, this amount represents a maximum which Administrations undertake not to exceed.

This amount covers the costs of the earth station, the space segment and the extension to the international exchange in the third country. It is based on the assumption that the earth station would set up 60 telephone circuits. For the channel extension from the international exchange, the rates referred to in § 2.3.2.1.1 are applied.

D.2.2.2 *Switched transit link*

The remuneration of the country providing switched transit and of the country of destination may be based either on the accounting revenue division procedure using an agreed key or on the traffic unit price procedure. In the latter case the shares to be considered are those given in this annex and in the Recommendation itself.

Recommendation D.606 |

PREFERENTIAL RATES IN TELECOMMUNICATION RELATIONS

BETWEEN COUNTRIES IN AFRICA

(Malaga-Torremolinos, 1984)

The CCITT,

considering

that for some time now the telecommunication Administrations of African countries have been subject to solicitation on the part of a number of international organizations or specialized agencies with a view to the granting of preferential rates,

considering further

(a) that the telecommunication Administrations of Africa have an important role to play in the socio-economic development of each individual country and of the continent as a whole, which entitles them to a reasonable rate of return on investment to enable them to fulfill their mandate and practice some degree of self-financing ;

(b) that these Administrations should also be able to reimburse the loans contracted for the modernization and development of their telecommunication networks out of the revenue from the services they provide,

recommends

that the conclusions adopted by the Plenary Meeting of the TAF Group be applied, namely that as a general rule preferential rates shall not be granted to users in international relations between countries in Africa.

Blanc

PART III

SUPPLEMENTS TO SERIES D RECOMMENDATIONS

Page Paire = BLANCHE

Supplement No. 1

COST AND TARIFF STUDY METHOD

(At the present time this method is applicable only to the countries in

Europe and the Mediterranean Basin)

1 Introduction

1.1 In the past, before 1970, the CCITT made a number of studies of international telephone and telex service costs. Those studies usually referred, however, only to parts of the services and the Recommendations prepared on the subject of tariffs applied only to the European region. Those Recommendations were based on the principle that, in a given relation, the accounting rate consisted of terminal and transit shares which were the same for all the routes used. When a detour was used, the hypothetical terminal and transit shares had therefore to be reduced proportionally. The collection charges corresponded more or less to the amounts of the accounting rates converted into national currencies.

1.2 Between 1964 and 1968, a new philosophy based on a commercial principle was worked out. Recommendation D.150, adopted by the IVth Plenary Assembly of the CCITT (1968), made a clear distinction between the accounting rate and the collection charge. The accounting rate was regarded as a matter to be settled between Administrations, each Administration being reimbursed according to the cost of the equipment it made available. The fixing of collection charges became, within certain limits, a national matter. Each terminal Administration was expected to fix a collection charge in such a way that it covered at least the average of the accounting rates applicable to the various routes used.

1.3 In order to put this new conception into practice, it was necessary to undertake detailed cost studies for the technical facilities and the work involved in setting up telephone and telex calls, in sending telegrams, and in establishing sound-programme and television transmissions in the international service. For that purpose the IVth Plenary Assembly of the CCITT decided to set up four regional tariff groups, namely:

— the TAF Group for the African Region,

— the TAL Group for the Latin American Region,

— the TAS Group for the Asia and Oceania Region,

— the TEUREM Group for the Region of Europe and the Mediterranean Basin.

2 Methods used for establishing tariffs

In carrying out their task, the Tariff Groups used either a simple and purely pragmatic method, called the *synthetic method* , or a complex method, based on cost studies, called the *analytic method* .

2.1 *Synthetic method*

2.1.1 When the Administrations in a region do not have the necessary data for calculating the costs of the technical facilities and the work involved in the provision of their services (for example, when they do not have an analytical cost accounting system), or when they decide for other reasons not to make a detailed study, a Tariff Group can confine itself to making a synthesis of the tariffs applied by the various Administrations in its region. On the basis of this synthesis, the group establishes, by charging zone, a scale of overall rates for international accounting and, where appropriate, for establishing collection charges in national currencies. The overall charge used for international accounting is called the *accounting income* . It is normally shared between the Administrations of the terminal countries on a 50-50 basis. If, however, the facilities made available by the two terminal countries are not more or less equivalent, a proportion other than 50-50 may be adopted. In principle, the Administration of each terminal country pays a suitable share (normally half) of the remuneration, if any, due to the Administrations of the transit countries.

2.1.2 It is obvious that this synthetic method does not solve the fundamental problems of rate-fixing. It is incapable of establishing a rate for a service a priori, on a theoretical basis, but only a posteriori, on the basis of experience.

2.2 *Analytic method*

2.2.1 When the Administrations of a region are in a position to analyze the costs involved in the provision of a given service (amortization, financial charges, labour costs, cost of consumable materials for maintenance, taxes, costs of the services provided by third persons), a Tariff Group normally

uses the so-called *analytic* method. This consists in laying down — on a rational basis and, in particular, on the basis of cost studies — standards for the fair remuneration of the various facilities made available by an Administration in providing a given service (telephone or telex call, telegram, etc.). For calculating costs, Administrations usually possess data derived from an analytical cost accounting system, which they supplement, as required, with more detailed studies and data provided by statistics.

2.2.2 By means of a questionnaire, the Tariff Group collects the data obtained by the Administrations in its region, synthesizes them, calculates average costs taking account of the special conditions prevailing in the various countries, and determines the standards to be recommended for remunerating the facilities made available by Administrations in international telecommunications services. These standards can then be used by the Administrations in the region in fixing their accounting shares for purposes of international accounting, their accounting rates and, hence, their collection charges. They take account not only of actual costs, but also of criteria recommended by the CCITT for rate-fixing purposes (e.g., the concept of services rendered).

2.2.3 The standards recommended for determining accounting rates are used for remunerating the Administrations of the terminal and transit countries by the so called *flat-rate price* or *traffic unit price* methods, explained in the relevant CCITT Recommendations.

It is only by the analytic method, therefore, that all the requirements of rate fixing can be met. This is the method traditionally used by the CCITT.

3 Cost studies

3.1 *General*

3.1.1 To carry out a detailed tariff study in international telecommunications services, a Tariff Group must know the cost of the services supplied by the Administrations and the factors affecting the provision of these services. The Tariff Group must therefore collect the detailed data from the Administrations in its region, synthesize them, calculate the average costs of the various factors and determine the standards to be adopted in remunerating the facilities made available by Administrations in providing a service in the international telecommunications services. Administrations must, of course, be assured that the data collected are treated absolutely confidentially.

3.1.2 The numerical data provided by Administrations should be expressed in a universally recognized currency. For this purpose, it is desirable to use the monetary units mentioned in Article 30 of the International Telecommunication Convention (Nairobi, 1982), i.e. either the monetary unit of the International Monetary Fund which is at present the special drawing right (SDR), or the gold-franc (G.Fr.).

In the event that the same monetary unit is not used by all Administrations, the Tariff Group should:

a) choose the monetary unit in which costs are calculated and present the results. The monetary unit used by the majority of Administrations having responded to the questionnaire will generally be used. Data given in the other monetary unit will be converted into the unit adopted by the Tariff Group;

b) convert the tariff standards established in the chosen monetary unit into the other monetary unit used by the minority of Administrations. For the conversion from SDR to G.Fr. or vice-versa, the Tariff Group shall use the conversion rate recommended in Recommendation D.195 and in the International Telecommunication Regulations adopted by the World Administrative Telegraph and Telephone Conference, 1988, i.e. 1 SDR = 3.061 G.Fr. or 1 G.Fr. = 1/3.061 SDR.

In view of the problems which may arise in rounding off the values obtained, Appendix I indicates the methodology used by the TEUREM Group to convert into SDR the tariff standards calculated in G.Fr. This methodology can also be used to convert from SDR to G.Fr.

3.1.3 The numerical data provided by Administrations should refer to the same reference year. The Tariff Group must bring them up to date for the period during which the tariffs will be applied. For this purpose the average annual variations of unit prices are taken into account, i.e. possible price increases due to inflation and reductions obtained through technical improvements or the more efficient use of facilities. In determining tariff standards, account will also be taken of a rate of interest sufficiently high to ensure the expected return on the invested capital and of the existing standby facilities made available by Administrations.

3.1.4 The values adopted by the Tariff Group are not ''averages'' in the strict mathematical sense, but represent values which are generally acceptable for all the countries concerned in the region. The determination of ''acceptable'' or ''reasonable'' values thus involves a considerable element of judgement and approximation.

3.2 *Working method*

In making cost studies and establishing tariff standards to be applied for paying for the facilities made available by Administrations in supplying services to users of the international telecommunication services, Tariff Groups generally use the method described below.

3.2.1 *Preparation of a questionnaire*

3.2.1.1 A detailed questionnaire is prepared for the service in question, namely for:

— the telephone service,

— the telex service,

— the public telegram service, or

— sound-programme and television transmissions, etc.

The questionnaire first refers to the *international* part of relations. If necessary, a special questionnaire may be drawn up to collect data referring to the *national extension* , i.e. that part of the connection linking the international centre with the national centres to which users' stations are connected.

3.2.1.2 Each questionnaire is divided, according to need, into several *parts* and *chapters* .

i) *Division into parts* | ccording to the functions performed or other criteria such as:

— general information,

— transmission,

— switching and operation,

— national extension (for the case where a separate study is not carried out).

ii) *Division into chapters* | ccording to accounting or statistical criteria, such as:

— investment costs,

— annual charges (capital charges, maintenance costs, building costs, operational costs),

— statistical information.

3.2.1.3 *Comments*

The telephone service and the telex service are, in many respects, extremely similar, even if the service supplied is different. There are, therefore, many resemblances between cost studies of these two services. The same applies, though to a lesser extent, to studies of sound-programme and television transmissions.

On the other hand, the public telegram service is, by its very nature, very different from the two above-mentioned services, primarily because it involves the handing in and delivery of telegrams, operations which usually call for the employment of considerable numbers of staff. Cost studies of this service therefore involve a number of specific characteristics.

For the ‘‘transmission’’ part, the same questionnaire (usually that for the telephone service) can be used for the various services (telephone, telex, sound-programme transmissions) for determining the costs:

— of a supermastergroup ,

— of a mastergroup,

— of a supergroup,

— of a group ,

— of a carrier telephone circuit , or

— of a voice-frequency telegraphy channel

An example of the type of questions included is given in Annex A.

3.2.2 *Circulation of questionnaires and collection of data*

The questionnaires are circulated by the CCITT Secretariat to all Administrations in the region. The Administrations are invited to complete them as accurately as possible and return them to the CCITT Secretariat by a given date. It is unquestionably a delicate and difficult task for Administrations to prepare replies to these questionnaires, because the data are not always immediately available in the required form or presentation; research is, therefore, usually necessary to extract them from accounting and statistical documents and calculations are often required.

3.2.3 *Analysis of the replies and presentation of the results*

The CCITT Secretariat analyzes the replies provided by Administrations and presents the numerical data *anonymously* in the form of tables.

Tariff Group meetings make an itemized examination of the analysis results of each of the items in the questionnaires, and for each item a standard reply is formed. These standard replies constitute the basic data for the cost study.

A whole series of detailed calculations are made on the basis of the data thus arrived at. The model tables given in Annex B, used for recording the results of calculations, give an idea of the procedure followed, the order in which the data are considered and the sequence of calculations carried out.

The result of this procedure is the establishment of costs, standards of remuneration to be applied between Administrations and accounting rates for the various facilities made available and the services provided to users in the international telecommunication services, e.g.:

— per supermastergroup, mastergroup, supergroup or group of circuits;

— per telephone, telegraph, sound-programme, etc. circuit;

— per minute of telephone, telex, etc. call; or

— per word of a telegram.

The standards thus determined are included in the CCITT Recommendations applicable at the regional level.

3.3 *Analysis of certain problems relating to cost studies*

3.3.1 *Methods for calculating average costs*

According to the nature of the services provided by the Administrations, it is recommended that one of the methods described below be used to calculate the average costs for a region.

3.3.1.1 *Comparison by analytical costs*

In determining the average cost of the *international part* of a service provided (charges relating to technical equipment used exclusively for the international service and operating costs), it is customary to compare the *detailed numerical data* provided by the Administrations.

These numerical data refer to:

— investment costs,

— maintenance costs,

— building costs,

— operating costs.

The aim of the study being to calculate, for a given year, the average annual charges of the equipment made available and the average costs per traffic unit (for example per minute of telephone call), the procedure described below should be followed.

3.3.1.1.1 *Investment costs*

First, the average investment costs are calculated per given unit or element on the basis of the numerical data supplied by Administrations for the reference year (for example, per 100 km of actual length of an installed supergroup). Next, the investment cost is calculated for equipment *in service* in the form established and for the year in which the tariff rates are to be applied. To obtain these results, coefficients are applied bearing in mind:

— standbys (installed apparatus/apparatus in service),

— price increases (annual variation rates),

— composition of the standard network (relative importance of coaxial cables, radio-relay links, etc.),

— the ratio: actual length/crowflight distance of the transmission facilities.

3.3.1.1.2 *Financial charges*

The average investment costs are used to calculate the annual *financial charges* per piece of equipment in service, on the basis of the weighted average life assumed for this equipment and the interest rate assumed for remunerating invested capital. For this purpose the ‘‘Table giving amortization coefficients as a function of amortization period and interest rate’’, contained in Annex C, is used. These annual charges are generally called ‘‘capital charges’’ or ‘‘financial charges’’.

3.3.1.1.3 *Maintenance costs*

The average annual maintenance costs are calculated per given unit or element (installed circuit or group of circuits) on the basis of numerical data supplied by the Administrations for the reference year. If Administrations cannot specify actual amounts, agreement is reached on a percentage to be applied to the investment cost to calculate the annual maintenance costs.

The annual maintenance costs are then calculated per equipment *in service* in the form established and for the year in which the tariff rates are to be applied, following the procedure described in ‘‘Investment costs’’.

In evaluating maintenance costs, particular account should be taken of the following types of cost: staffing and labour, consumable materials, electricity and transport.

3.3.1.1.4 *Building costs*

Since some premises either belong to or are rented by the Administrations and equipment is generally installed in premises together with other equipment or services, building costs are usually calculated in the form of an *annual rental* . Exceptions to this rule are buildings which essentially have one purpose only, for example, radio-relay stations. In cases such as these, buildings are included in investment costs.

Annual building costs per piece of equipment *in service* , in the form established and for the year in which the tariff rates are to be applied, are calculated in the same way as annual maintenance costs.

3.3.1.1.5 *Operation costs*

For the purpose of cost studies, the only expenses considered as operation costs are the costs of the staff responsible for the setting up of calls, the international information service, the processing of telegrams, etc. Operation costs also include supervisory and senior staff. Overheads are included in these expenses.

With regard to the telephone and telex services, operation costs are calculated per circuit in service per year.

Average operation costs are determined on the basis of numerical data supplied by the Administrations for the reference year. They are brought up to date to correspond to the period in which the tariff rates are to be introduced by applying an increase coefficient to take account of the increase in salaries during the period in question, i.e. the annual variation rate in the total wage bill.

3.3.1.1.6 *Total annual charges*

The total annual charges per telecommunication circuit or circuit group are calculated by adding the amounts obtained for the ‘‘Transmission’’ part and the ‘‘Switching and operation’’ part under the headings:

— financial charges,

— maintenance costs,

— building costs,

— operation costs.

3.3.1.1.7 *Traffic unit cost*

To calculate the traffic unit cost (minute of telephone or telex call, etc.) the total annual charges for an international circuit are divided by the average number of traffic units routed by the circuit per year.

3.3.1.2 *Direct comparison of national costs*

In determining the average cost of the *national extension* of a service provided (telephone or telex communication), i.e. the part of the connection extending from the international centre to the national centres of the subscribers, it would be difficult to employ the method described under ‘‘Comparison by analytical costs’’. There are considerable differences between countries with regard to:

— the structure, as well as technical and operating conditions, of national networks;

— telephone and telex subscriber density;

— the distribution of international traffic within each country;

— the organization of the Administration;

— the methods and means of financing;

— the cost of living.

3.3.1.2.1 *Method employed*

In this case a simplified method is normally used i.e. the *costs calculated by Administrations for their respective countries are compared directly* per traffic unit (minute) for one of the elements or services listed below:

— a national local or trunk exchange;

— a terminal transmission equipment;

— 100 km (crowflight) of a national circuit;

— billing of subscribers, international accounting, management of international services (administrative costs).

To calculate the average total cost of the *national extension* of a region per traffic unit, the Administration should also provide statistical and financial data, namely:

— the number of national exchanges, trunk and local (weighted average) used to route an incoming and outgoing telephone or telex call;

— the number of terminal transmission equipments (weighted average) used to route an incoming and outgoing international telephone or telex call between the international centre and the national terminal centre;

— the crowflight distance (weighted average) of the national circuit used between the international centre and the national terminal centre in setting up an incoming and outgoing international telephone or telex call;

— the rate of interest on invested capital;

— the estimated average annual cost variation rate until the year in which the tariff rates are to be applied.

The procedure described below is then followed.

3.3.1.2.2 *Calculation of average costs per element*

A preliminary adjustment should be made of the numerical data supplied by each Administration for the reference year, taking into account the uniform interest rate allowed by the Tariff Group for remuneration of invested capital (this is necessary as there is usually a difference between the rate adopted by an Administration for its analytical accounting and the rate allowed by the Tariff Group). To calculate the proportion of the financial charges in the total costs, data can be extracted from the study of the costs (analytical cost comparison) of the international part of the service in question.

In the second stage of the calculation, the average costs adopted for the reference year are multiplied by a coefficient to take account of the variation in costs between the reference year and the period in which the tariff rates are to be applied, in order to obtain the average amounts to be applied during this period.

3.3.1.2.3 *Calculation of total average prices for the national extension*

From the statistical data supplied, it is possible to establish the weighted average number of elements (exchanges, terminal transmission equipments, length of national circuits) utilized in the given region for the *national extension* involved in international calls. These values are used to calculate the total average costs of the *national extension* per minute of incoming and outgoing international calls. The cost for each element is multiplied by the average number of elements utilized; the sum of these results is then calculated and the administrative costs added.

3.3.2 *Considerations relating to the calculation of investment costs and financial charges*

3.3.2.1 *General considerations*

Expenditure associated with acquiring and owning property sometimes referred to as ‘‘initial investment costs’’, constitutes what is usually termed investment costs. Initial investment costs generally refer to the one-time expenditure needed to acquire at a substantial cost property and plant which normally has a long life expectancy.

Investment costs are a major component in cost studies. They are entered into the accounts over the period during which the material will be used and determine one of the most important items making up the annual charges, i.e. the financial charges, or ‘‘amortization costs’’.

Economically, the concept of amortization lays stress on the renewal of the assets which is necessary if the initial value of the capital is to be preserved and the enterprise is not to suffer a loss of substance. Thus, the basis is generally the ‘‘replacement value of the fixed assets to the condition they were in on being put into service’’.

3.3.2.2 *Considerations relating to the study in question*

In a telecommunications service cost study, it is customary to:

— evaluate investments relating to equipment and installations according to the replacement value or purchasing price of this material at the time of the study;

— include the *overheads* | of the Administrations (costs for administrative, research, information and training services, etc.) in the investment costs.

3.3.2.2.1 *Residual value of equipment*

Generally, at the end of its normal service period, telecommunication equipment is no longer usable and its residual value is consequently negligible.

3.3.2.2.2 *Weighting of certain basic numerical data*

International land networks frequently make use of transmission media of different kinds, i.e. symmetric pair cables, coaxial cables, radio-relay systems, for each of which separate data are required for the cost study. However, as the cost has to be determined for a combined network, weighting is necessary at some stage. To arrive at a single cost price, weighting is carried out at the investment level as a function of the relative importance of the different types of cable used (expressed as a percentage in an item of the questionnaire).

3.3.2.2.3 *Basis for calculating the investment cost of telephone circuits on carrier systems*

Since there are differences in the maximum capacity of carrier systems (6 MHz, 12 MHz, 60 MHz), the usual basis used for calculating the investment cost of carrier system circuits is the supergroup (60 channels) actually installed rather than the maximum capacity of the route. To do this, the average cost per 100 km of the route is divided by the average number of supergroups installed. The investment cost per group (12 channels) and per telephone circuit installed is then calculated by dividing this amount by 5 and 60 respectively.

ANNEX A

Examples of questions asked in the questionnaire to collect

basic data for a cost study of telecommunication services

I Investments relating to transmission systems

I.1 *Telephone circuits on carrier systems*

I.1.1 *Supergroups* | (60 channels) — (Take into account only the supergroups actually installed and not the maximum capacity).

What average construction and installation costs (in gold francs) does your Administration allow for components A and B (see Note 1 below) in the case of a supergroup installed in a:

A B

a) coaxial or symmetric pair land cable, - | | gold fr. - | | gold fr.

b) radio-relay link, - | | gold fr. - | | gold fr.

c) coaxial submarine cable (other types of submarine cable are excluded) (component A is included in component B) - | | gold fr.

I.1.2 *Groups* | (12 channels)

What average construction and installation costs (in gold francs) does your Administration allow for component A in the case of a group installed in a:

A

a) coaxial or symmetric pair land cable, - | | gold fr.

b) radio-relay link. - | | gold fr.

(With regard to component B, see Note 2 below.)

I.1.3 *Carrier telephone circuits*

What average construction and installation costs (in gold francs) does your Administration allow for component A of a carrier circuit: - | | gold fr.

(With regard to component B, see Note 2 below.)

Note 1 — The cost of international telecommunication circuits should be expressed in the form:

$$A + B \times \frac{fIl}{00}$$

A represents all costs relating to terminal transmission equipment *for one end of the international circuit* ;

B represents the costs per 100 km of real length, *l* of the circuit.

Note 2 — Component B should include the cost of intermediate repeaters, the cost of terminal repeaters to an amount not exceeding that of the intermediate repeaters and the cost of translation equipments used for the transfer from one telecommunication route to another. The cost of construction and installation per supergroup, group and circuit is a straightforward division from one step to the next.

II Investments relating to switching centres

II.1 What is the average construction and installation cost, for your Administration, of an international switching centre, including the operator's position, expressed as cost per circuit (in use or spare) for circuits operated:

Gold francs a) manually b) semi-automatic outgoing c) semi-automatic or automatic incoming d) automatic outgoing e) automatic transit

III Annual costs relating to switching centres

III.1 *Amortization costs*

What weighted average useful life do you take to calculate one year's amortization instalment for:

Useful life

(years) a) manual switching equipment (including the operator's position) b) semi-automatic switching equipment (including the operator's position) c) automatic switching equipment

H.T. [T3.Suppl.1]

ANNEX B
TABLE B-1
{
Calculation of the weighted mean value of investments
for the ‘‘transmission’’ part
}

				Annual rate	Coefficient					
{										
{										
{										
{										

Component
Cost of transmission system independent of length (cost of terminal equipment)

Component
Cost of transmission system in proportion to its length (cost of cable and intermediate repeaters)

coax. Coaxial cable

RR Radio-relay

SS Symmetric pair cable

SM Submarine cable

Tableau B-1 [T3.Suppl.1], p. à l'italienne

TABLE B-2

{

Calculation of annual costs for maintenance and buildings
(transmission part)

}

Unit considered	Component A								Component B							
	{															
Supergroup																
Group																
Telephone circuit																
Telegraph circuit 50 bauds 100 bauds 200 bauds }	{															

Tableau B-2 [T4.Suppl.1], p. à l’italienne

TABLE B-3
{
Total annual costs for the ‘‘transmission part’’
}

{				A	B	A	B	A	B		
Supergroup	A B										
Group	A B										
Telephone circuit	A B										
Telegraph circuit	50 bauds 100 bauds 200 bauds	A B A B A B									

i = interest on the remuneration of capital.

Tableau B-3 [T5.Suppl.1], p. à l’italienne

H.T. [T6.Suppl.1]

TABLE B-4
{
Telephone switching — Annual capital costs
}

Mode of operation	Investments						Useful life (years)	{	
				Annual rate	Coefficient	{			

Manual operation
{
Outgoing
or incoming circuit
}
Transit circuit									

{
Semi-automatic operation
}
Outgoing circuit
Incoming circuit									

Automatic operation Outgoing circuit Incoming circuit Transit circuit									

Tableau B-4 [T6.Suppl.1], p. à l'italienne

H.T. [T9.Suppl.1]

TABLE B-5 { **Telephone switching and operation — Total annual costs** }

Mode of operation	{	Switching													Operation			
															Coefficient	Annual rate {		
Manual operation { Outgoing or incoming circuit } Transit circuit																		
{ *Semi-automatic operation* } Outgoing circuit Incoming circuit																		
Automatic operation Outgoing circuit Incoming circuit Transit circuit																		

Tableau B-5 [T9.Suppl.1], p. à l'italienne

ANNEX C

{

Table giving amortization coefficients as function of amortization period and estimated interest rate

}

{

(Annual charge to be paid at the end of each year in order to amortize a capital of 1 monetary unit during t *years*

)

}

{

t	Interest	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1.1300	1.1400	1.1500	1.2000
2	0.5378	0.5454	0.5531	0.5608	0.5685	0.5762	0.5839	0.5917	0.5995	0.6073	0.6151	0.6545
3	0.3672	0.3741	0.3811	0.3880	0.3951	0.4021	0.4092	0.4163	0.4235	0.4307	0.4380	0.4747
4	0.2820	0.2886	0.2952	0.3019	0.3087	0.3155	0.3223	0.3292	0.3362	0.3432	0.3503	0.3863
5	0.2310	0.2374	0.2439	0.2505	0.2571	0.2638	0.2706	0.2774	0.2843	0.2913	0.2983	0.3344
6	0.1970	0.2034	0.2098	0.2163	0.2229	0.2296	0.2364	0.2432	0.2502	0.2572	0.2642	0.3007
7	0.1728	0.1791	0.1856	0.1921	0.1987	0.2054	0.2122	0.2191	0.2261	0.2332	0.2404	0.2774
8	0.1547	0.1610	0.1675	0.1740	0.1807	0.1874	0.1943	0.2013	0.2084	0.2156	0.2229	0.2606
9	0.1407	0.1470	0.1535	0.1601	0.1668	0.1736	0.1806	0.1877	0.1949	0.2022	0.2096	0.2481
10	0.1295	0.1359	0.1424	0.1490	0.1558	0.1627	0.1698	0.1770	0.1843	0.1917	0.1993	0.2385
11	0.1204	0.1268	0.1334	0.1401	0.1469	0.1540	0.1611	0.1684	0.1758	0.1834	0.1911	0.2311
12	0.1128	0.1193	0.1259	0.1327	0.1397	0.1468	0.1540	0.1614	0.1690	0.1767	0.1845	0.2253
13	0.1065	0.1130	0.1197	0.1265	0.1336	0.1408	0.1482	0.1557	0.1634	0.1712	0.1791	0.2206
14	0.1010	0.1076	0.1143	0.1213	0.1284	0.1357	0.1432	0.1509	0.1587	0.1666	0.1747	0.2169
15	0.0963	0.1030	0.1098	0.1168	0.1241	0.1315	0.1391	0.1468	0.1547	0.1628	0.1710	0.2139
16	0.0923	0.0990	0.1059	0.1130	0.1203	0.1278	0.1355	0.1434	0.1514	0.1596	0.1679	0.2114
17	0.0887	0.0954	0.1024	0.1096	0.1170	0.1247	0.1325	0.1405	0.1486	0.1569	0.1654	0.2094
18	0.0855	0.0924	0.0994	0.1067	0.1142	0.1219	0.1298	0.1379	0.1462	0.1546	0.1632	0.2078
19	0.0827	0.0896	0.0968	0.1041	0.1117	0.1195	0.1276	0.1358	0.1441	0.1527	0.1613	0.2065
20	0.0802	0.0872	0.0944	0.1019	0.1095	0.1175	0.1256	0.1339	0.1424	0.1510	0.1598	0.2053
21	0.0780	0.0850	0.0923	0.0998	0.1076	0.1156	0.1238	0.1322	0.1408	0.1495	0.1584	0.2044
22	0.0760	0.0830	0.0904	0.0980	0.1060	0.1140	0.1223	0.1308	0.1395	0.1483	0.1573	0.2037
23	0.0741	0.0813	0.0887	0.0964	0.1044	0.1126	0.1210	0.1296	0.1383	0.1472	0.1563	0.2031
24	0.0725	0.0797	0.0872	0.0950	0.1030	0.1113	0.1198	0.1285	0.1373	0.1463	0.1554	0.2025
25	0.0710	0.0782	0.0858	0.0937	0.1018	0.1102	0.1187	0.1275	0.1364	0.1455	0.1547	0.2021
30	0.0651	0.0726	0.0806	0.0888	0.0973	0.1061	0.1150	0.1241	0.1334	0.1428	0.1523	0.2008
35	0.0611	0.0690	0.0772	0.0858	0.0946	0.1037	0.1129	0.1223	0.1318	0.1414	0.1511	0.2003
40	0.0583	0.0665	0.0750	0.0839	0.0930	0.1023	0.1117	0.1213	0.1310	0.1407	0.1506	0.2001
45	0.0563	0.0647	0.0735	0.0826	0.0919	0.1014	0.1110	0.1207	0.1305	0.1404	0.1503	0.2001
50	0.0548	0.0634	0.0725	0.0817	0.0912	0.1009	0.1106	0.1204	0.1303	0.1402	0.1501	0.2000

Tableau Annexe C [T8.Suppl.1], p. à l'italienne

APPENDIX I

(to Supplement No. 1)

Conversion into special drawing rights (SDRs) of the tariff

standards in the Recommendations of the TEUREM Group

Methodology

In Table I-1 the amounts in column 2 (gold francs) have been divided by 3.061 to produce the amounts in column 3 (SDRs). The amounts (SDRs) in column 4 have been determined in accordance with one of the three following cases.

Case a

Where the amount in 3 exceeded 100 , no figures after the decimal point are shown. However if the first figure after the decimal point was equal to/greater than 5, the amount before the decimal point was rounded *up* to the nearest whole number.

e.g. 2188.8271 became 2189

3920.2874 became 3920

Case b

Where the amount in 3 was less than 100 but exceeded 1.0 , the amount has been confined to 3 figures. In cases where the fourth figure was equal to/greater than 5, the preceding figures were rounded *up* .

e.g. 49.003593 became 49.0

3.7569421 became 3.76

Case c

Where the amount in 3 was less than 1.0 , the amount after the decimal point has been confined to 3 figures. In cases where the fourth figure was equal to/greater than 5, the preceding figures were rounded *up* .

e.g. 0.0065338 became 0.007

0.0588043 became 0.059

0.5880431 became 0.588

Blanc

Tableau [1T9.Suppl.1], p.

Tableau [2T9.Suppl.1], p.

Supplement No. 2

METHOD FOR CARRYING OUT A COST PRICE STUDY BY REGIONAL TARIFF GROUPS

1 Introduction

Tariffs for telecommunication services are normally established on the basis of cost incurred by the Administrations for providing the services, and of certain other factors which can be summarized as the value of service rendered or the market price. These factors are explained in Recommendation D.5.

For international services a clear distinction is made — especially since 1968 — between the accounting rate and the collection charge. Definitions and explanations of these terms and of international accounting procedures are given in Recommendation D.150. Accounting rates are regarded as a matter to be settled between Administrations, each Administration being reimbursed according to the cost of the equipment it makes available. On the other hand, the determination of collection charges is, within limits, a national matter.

While accounting rates are, or should be, based essentially on costs, collection charges depend on costs as well as on the value of service rendered and other factors.

The main tasks which the regional Tariff Groups have to perform are undoubtedly an analysis of the costs of the different telecommunication services provided, and the determination of accounting rates proposed for application by the Administrations of a region. For this purpose, each Tariff Group had to develop a suitable working method to be followed in its region. A description of such methods, especially of an analytical method, is given in Supplement No. 1 to the Series D Recommendations.

2 Methods used for establishing tariffs

Two basic methods can be used for international tariff studies, namely:

1) *The synthetic method*

This is a simple, purely pragmatic method which consists in comparing existing tariffs applied within a region and agreeing on generally applicable standards for international accounting This method leads to satisfactory results if the tariffs applied by the different Administrations reflect the actual costs of providing the services;

2) *The analytical method*

As the term implies, it is a procedure for analysing in a more or less detailed manner the cost involved in making specific equipment available to other Administrations or providing a traffic unit in a given telecommunication service. Analysis of the cost situation, the operating conditions and the available statistical data is the only way to obtain realistic standards for determining the accounting rates and, finally, the collection charges.

The analytical method has been used particularly by the regional Tariff Group for Europe and the Mediterranean Basin, the TEUREM Group. Since 1969, this Group has consistently pursued its studies and refined its working method.

3 Implementation of an analytical cost price study

Text of a lecture delivered at a seminar held in Tokyo in May 1984.

3.1 *Difficulties to be overcome and problems to be solved before undertaking a cost price study*

The Administrations belonging to a Tariff Group have to be convinced that it is in their own interest to undertake cost price studies and apply recommended standard rates , as such standards lead to harmonized tariff structures for the different telecommunication services and guarantee the most equitable remuneration of the various facilities made available by

the Administrations. Each Administration should know where the costs arise, in what direction these costs are developing and also what the situation is in other, comparable countries.

In order to conduct an international cost price study successfully, Administrations have to be assured that all data provided by them will be treated confidentially and that all problems can be discussed openly. Genuine collaboration by all parties is required in working towards the common goal.

Therefore it is essential that:

— only representatives of Administrations and recognized private operating agencies take part in the meetings of the Tariff Group;

— the meetings be conducted in an absolutely neutral and objective manner;

— the data provided and the detailed results be made available only to the parties directly concerned.

3.2 *Methodology to be adopted for conducting a cost price study*

To accomplish a cost price study, at least two meetings of the Tariff Group are necessary, and the delegates will have to carry out considerable preparation and investigation work within their Administrations.

3.3 *Preparation of questionnaires*

It is of great importance that the Group asks precisely all the questions to which it needs answers from the Administrations, giving the necessary details and explanations. This task, considered as the *first step* of the study, is normally completed during the first meeting of the Tariff Group within a study period. An example of such a questionnaire is shown in Annex A to Supplement No. 1 to the Series D Recommendations. It may also be helpful for the Administrations to obtain the numerical data collected and agreed to in a former study.

A detailed questionnaire is normally prepared for each service, namely:

— the telephone service;

— the telex service;

— the public telegram service;

— sound-programme and television transmissions;

— circuits routed via satellites, etc.

For services with similar features and conditions, such as telephone and telex, a single questionnaire may be established.

Each questionnaire should be subdivided, according to needs, into several parts and chapters dealing with:

— general information;

— cost information;

— statistical data.

Practice has shown that it is convenient to consider the telephone as the basic service, from which a great number of data can be derived and used for the studies of other services, such as telex, sound-programme transmissions, etc. *The different questionnaires should ask only for data which the Tariff Group is not able to derive itself from the basic study*

3.4 *Replying to questionnaires*

The *second step* | to be undertaken in the study is the preparation of replies by the Administrations of the region. It is a delicate and difficult task, as the data are in most cases not immediately available in the required form or presentation. Each service has to be analysed, and a great deal of research, calculations and estimates are necessary. An *analytical cost accounting system can provide only general data* for a given service, for instance the annual charges per centre or service, but it cannot provide details for the facilities made available. Specialists from the different services will have to calculate these detailed data using the general accounting system, statistics, and their own documents. In order to assure consistency between the different parts of a study, and from one study to the next, an expert representing his Administration in the Tariff Group must act as coordinator at home and explain to his colleagues how the questions have to be interpreted. *Preparing the answers to the questionnaire means team-work by generalists and specialists* , since all-rounders are rare in today’s complex telecommunications environment.

As a rule, the Administrations need several months to prepare their replies.

3.5 *Analysis of the replies and completion of the study*

This is the *third step* | which the Tariff Group has to undertake, usually during a meeting lasting several days. Its success depends mainly on the *preparation work* done by the CCITT Secretariat and the Group Chairman.

The CCITT Secretariat analyses the replies provided by the Administrations and presents the numerical data anonymously in the form of tables. Examples of such tables are given in Annex B to Supplement No. 1 to the Series D Recommendations.

It is useful for the Chairman to draw up beforehand a complete calculation model in order to determine the path to follow in order to lead the study to the best possible result. The Chairman should know in advance the likely outcome of the study. He should be able to provide the delegates with background information on each item. During the meeting, the Chairman should serve the Group as moderator, adviser and decider. It is important that everybody should be able to speak openly and that an atmosphere of confidence should reign throughout the meeting.

An international cost price study is not just a matter of calculation. It is much more a joint effort which should lead to a coherent, harmonious and durable tariff structure for the full range of the telecommunication services offered, and should reflect the actual cost and operating situation of a region. Tariffs should evolve in small steps according to the development of technology, operating procedures and economic situation. This goal can best be achieved if a study method, once adopted, is maintained and gradually improved from one study period to another.

The agenda of the meeting is drawn up with a view to guiding the study to its final goal in the most efficient possible way: draft Recommendations for the determination of accounting rate shares and collection charges. It starts with the study for the basic service in the following order:

1) A standard reply is calculated and agreed for each item of the questionnaire, based on the individual replies given by the Administrations.

2) From the data thus obtained, a whole series of detailed calculations are made in order to derive the average cost price of each equipment made available (annual cost and unit cost) for the year to which the data refer (reference year). These figures are then updated to the year when the standard rates shall become effective.

3) Generally acceptable standard rate shares are then determined which will apply during the next study period.

4) Recommendations containing these standard rates and the rules for applying them are drafted.

4 Considerations relating to an analytical cost price study

4.1 *Analysis to be made*

4.1.1 *Analysis of basic elements for the provision of a service*

Since an international telecommunication service provided to users involves both the international network and the national networks of the terminal countries, we have to distinguish between the three following basic elements:

— the line (transmission) part of the international network, which includes the various transmission systems used and is normally a function of the distance;

— the international exchanges , i.e. the switching parts of the international circuit, plus the terminal transmission equipments located in the terminal countries and, where appropriate, in the transit countries;

— the national extensions , which denote the part of the national network of each terminal country involved in completing the connection.

4.1.2 *Analysis of the cost structure*

When calculating the total cost of a given service, we have to analyse for each element the nature of the costs and their components. The following distinctions are made:

— investment costs and annual costs;

— financial charges, maintenance costs, building costs and operating costs;

— total annual charges and traffic-unit costs;

— fixed costs and variable costs;

— directly allocated costs and overhead costs.

4.1.2.1 *Investment costs*

The investment costs relating to the reference year are first calculated per given equipment (circuit) installed, and next per equipment in service. They are then updated to the year when the tariffs shall become effective. To obtain these results, coefficients are applied which take account of:

— standbys (installed apparatus/apparatus in service);

— price increases (annual rates of change);

— composition of the standard network (relative importance of coaxial cables, radio-relay links, etc.);

— the ratio: ‘‘actual length/crowflight distance’’ of transmission facilities.

4.1.2.2 *Annual costs*

The basis for completing the cost price study is the total annual charges per piece of equipment in service. These charges are compounded by adding the amounts obtained for the ‘‘transmission’’ part and the ‘‘switching and operations’’ part under the headings:

— financial charges;

— maintenance costs;

— building costs;

— operating costs.

4.1.2.2.1 *Financial charges*

The average investment costs are used to calculate the annual financial charges on the basis of the weighted average life assumed for the equipment and the interest rate assumed for return on invested capital. For this purpose the ‘‘Table giving amortization coefficients as a function of amortization period and interest rate’’ is used.

4.1.2.2.2 *Maintenance costs*

The average annual maintenance costs are calculated per given equipment. They correspond in many cases to an agreed percentage applied to the investment costs.

4.1.2.2.3 *Building costs*

These costs are usually calculated in the form of an annual rental for the space occupied by an equipment.

4.1.2.2.4 *Operating costs*

These costs refer only to costs of staff responsible for operating a service (setting up of calls, etc.)

4.1.2.3 *Traffic unit costs*

To calculate the traffic unit costs (minute of telephone or telex call, etc.) the total annual charges for an international circuit are divided by the average number of traffic units for this circuit per year. The average number of traffic units is extracted from the statistical data provided by the Administrations in their replies to the questionnaire.

4.2 *Methods used for calculating average costs*

According to the nature of the service provided, it is recommended that one of the following methods be used to calculate the average costs for a region.

4.2.1 *Analytical cost comparison*

Where the individual equipments made available for providing a service and the structure of the network are similar in the different countries, it is customary to compare the detailed numerical data provided by the Administrations and to calculate the costs for each element, step by step, according to the classical analytical method. This method is generally used for determining the average cost of the *international part* of a service.

4.2.2 *Direct comparison of national costs*

Where the equipment made available and the structure of the network differ considerably from one country to another, a simplified method is normally applied. This method is used especially for determining the average cost of the *national extension* .

In this case, the costs calculated by the Administrations for their respective countries are compared directly per traffic unit (minute) for one of the following elements or services:

— local or trunk exchange;

— a terminal transmission equipment;

— 100 km (crowflight) of national circuit;

— billing of subscribers, international accounting, management of internaitonal services (administrative costs).

To calculate the average total cost of the national extension per traffic unit, the Administrations should also provide statistical and financial data enabling the Tariff Group to make a genuine comparison.

It is pointed out that this method is not identical with the ‘‘Synthetic method’’, as *cost elements* and not *existing tariffs* are compared.

5 Examples of cost price studies

5.1 *Cost price study for the international telephone service*

5.1.1 *Determination of mean values and rules for the calculation*

Preliminary remarks

— All amounts are expressed in gold francs.

— The data have been chosen as examples and relate to the year 1980, called the *reference year* .

— The *target year* adopted is 1986, i.e. the standard rates determined would correspond to the cost situation at the beginning of 1986.

— The rate of return on capital investment provides not only for the remuneration of capital but also for a reasonable financial return.

— The annual rate of change represents the expected change in costs due to inflationary cost increases on the one hand, and cost savings due to technological developments on the other hand.

5.1.1.1 *Financial data*

Rate of return | on capital investment 15%

Annual rate of change:

— for capital investment +4%

— for staff costs +5%

5.1.1.2 *Costs for the line (transmission) part (simplified example)*

5.1.1.2.1 *Investment*

a) *Supergroups (installed) in a:*

— coaxial land cable:

(terminal equipment) A 20 | 00

(100 km real length) B 200 | 00

— radio-relay link A (same as for a coaxial cable)

B 150 | 00

— coaxial submarine cable: B 300 | 00

b) *Groups:*

A 10 | 00

B (1/5 of supergroup)

c) *Carrier telephone circuits:*

A 5 | 00

B (1/60 of supergroup)

5.1.1.2.2 *Annual costs*

a) *amortization costs*

average useful lives:

— element A: 12 years

— element B: coaxial cables: 25 years

element B: radio-relay links: 15 years

b) *maintenance costs*

percentage of investment costs:

— element A: 2%

— element B: coaxial cables: 1%

element B: radio-relay links: 5%

c) *annual charges for buildings* | (for element A only)

supergroup | 0

group | 0

carrier telephone circuit | 1

5.1.1.3 *Costs for the switching part (simplified example)*

5.1.1.3.1 *Investment*

costs per carrier telephone circuit

— automatic outgoing: 22 | 00

— automatic or semi-automatic incoming: 20 | 00

5.1.1.3.2 *Annual costs*

a) *amortization costs*

average useful life: 15 years

b) *maintenance costs*

percentage of investment costs: 5%

c) *annual costs for buildings per circuit*

— automatic outgoing: | 150

— automatic or semi-automatic incoming: | 100

d) *annual operating costs per circuit in use*

— automatic outgoing 3 | 00

5.1.1.3.3 *Statistical information*

Number of chargeable minutes per circuit in use per year:

— semi-automatic and automatic: 65 | 00 minutes

5.1.1.4 *Costs for the ‘‘national extension’’ (simplified example)*

5.1.1.4.1 *Statistical information*

— number of national exchanges used for international calls (weighted average): 3

— number of terminal transmission equipments used (weighted average of A elements): 2

— crowflight length of national circuit used (weighted average): 150 km

5.1.1.4.2 *Financial information*

— cost for use of a national exchange per minute: 0.06

— cost for use of a terminal transmission equipment (element A) per minute: 0.02

— cost for use of 100 km of national circuit per minute: 0.05

— administrative cost per minute: outgoing: 0.10

administrative cost per minute: incoming: 0.05

5.1.2 *Example for calculating costs in reply to the questionnaire*

5.1.2.1 *Average investment costs per 100 km of route of a supergroup (60 channels) actually installed in a coaxial cable*

Basis:

Coaxial cable | containing *4 systems at 12 MHz* | + 1 spare system.

Maximum capacity: | 4 × 2700 circuits = 10 | 00 circuits or *180 supergroups*

Actually installed | (2/3 of capacity) = 7200 circuits or *120 supergroups*

Translation equipments: | 0.5 equipment per 100 km (supermastergroup + supergroup = two A elements + 1 filter)

The amounts include *30% for overheads* .

Calculation: — *cost of the cable* | per 100 km of real length: 16.4 million gold francs
cost of the cable | intermediate repeaters 4.12 million gold francs 20.52 million gold francs

— *cost per supergroup actually installed* — *cable* 20.52 million gold francs: 120 supergroup 171 | 00 gold francs

— *translation equipments:*

supermastergroup

two A elements at 78 | 00 = 156 | 00

1 filter = 33 | 00 189 | 00 × 0.5 = 94 | 00 per supergroup (1/15) 6 | 00 gold francs

supergroup

two A elements at 20 | 00 = 41 | 00 1 filter = 8 | 00 49 | 00 × 0.5 = 24 | 00 gold francs

Total cost for a supergroup 202 | 00 gold francs

5.1.2.2 *Average investment cost for a terminal equipment (element A) of a carrier telephone circuit actually installed*

The amounts include *30% for overheads*

Calculation: — element A for a supergroup: 20 | 00 gold francs

— element A for a group: 1/5 of supergroup = 4160 + group 5940 = 10 | 00 gold francs

Element A for a carrier telephone circuit 1/12 of group = 842 + carrier circuit 3958 = 4 | 00 gold francs.

5.1.2.3 *Annual charges for buildings per terminal equipment (element A) of a carrier telephone circuit actually installed*

Basis:

Annual rental per m^2 = 260 gold francs (analytical cost accounting)

Calculation:

— surface occupied per rack (about 1 m^2) × coefficient ''occupied surface/accessory surface'' (= 4) = 4 m^2 — annual rental per rack = 4 × 260 gold francs = 1 | 40 gold francs
— surface per group: 0.117 m^2 = 30 gold francs

Surface per carrier telephone circuit

(average per rack, new and old equipment, 121 circuits) 0.033 m^2 + 1/12 of group (= 0.010) = 0.043 m^2 × 260 gold francs = 11 gold francs

5.1.3 *Calculation of mean costs*

Example for calculating the transmission costs per carrier telephone circuit

5.1.3.1 *Investments*

	Element A	*Element B*
investment 1980:	5000	3333 (1/60 of 200 | 00)
coefficient of increase for spares:	1.35	1.50
total costs 1980:	6750	5000
cost increase: annual:	2%	4%
coefficient 5 years:	1.104	1.216
investment 1985:	7452	6080

Weighting coefficient of typical network — coax. cables 0.50

— radio-relay 0.40

— submarine cable 0.10

Investment 1985 (typical network):	7452	5000 (approx.)
real length/crowflight distance ratio:	—	1.3

Investment for a supergroup installed in a coaxial land cable.

Overall results 1985:	7452	6500

5.1.3.2 *Annual costs*

	Element A	*Element B*
Capital costs		
investments 1985:	7452	6500
useful life (years)	12	20
amortization coefficient (i = 15%)	0.1845	0.1598
annual amortization	1375	1039
Maintenance costs		
percentage of investment cost 1980	2% (of 5000)	2.5% (of 4000 approx.)
amount per circuit installed 1980:	100	100
per circuit in use 1985:	250 (approx.)	250 (approx.)
Charges for buildings		
per circuit installed in 1980:	11	—
per circuit in use in 1985:	ca. 25	—
Total annual costs per circuit in use 1985		
capital costs	1375	1039
maintenance	250	250
buildings	25	—
Total:	1650	1289

5.1.4 *Cost per minute of an international telephone call (automatic service)*

5.1.4.1 *Transmission part*

Element B

Cost per 100 km of circuit per minute: 1289 gold francs : 65 | 00 minutes = 1.98 gold centimes

Element A

Cost per minute: 1650 gold francs : 65 | 00 minutes = 2.54 gold centimes

5.1.4.2 *Switching part*

Switching equipment

— *outgoing:* Example: per year 7000 gold francs : 65 | 00 minutes = 10.77 gold centimes

— *incoming:* Example: per year 6000 gold francs : 65 | 00 minutes = 9.23 gold centimes

Operation | (outgoing only) Example: per year 4000 gold francs : 65 | 00 minutes = 6.15 gold centimes

5.1.4.3 *National extension*

Assumption: annual rate of change = 0, i.e. cost 1980 = cost 1985. — national exchanges (3 × 0.06 gold francs) 18.0 gold centimes

— terminal transmission equipments (Element A) (2 × 0.02 gold francs) 4.0 gold centimes
— national circuits: (average 150 km) (1.5 × 0.05 gold francs) 7.5 gold centimes
— administrative cost: outgoing: 10.0 gold centimes

administrative cost: incoming: 5.0 gold centimes

Total cost per minute outgoing: 39.5 gold centimes

Total cost per minute incoming: 34.5 gold centimes

5.1.4.4 *Total cost per minute of an international telephone call*

	outgoing	*incoming*
Transmission part (Element B)		
example 500 km (5 × 1.98 gold centimes) =	9.9 gold centimes	9.9 gold centimes
Switching part (1 exchange)		
element A (transmission)	2.54 gold centimes	2.54 gold centimes
switching equipment	10.77 gold centimes	9.23 gold centimes
operation	6.15 gold centimes	—
National extension	39.5 gold centimes	34.5 gold centimes
Total cost per minute:	68.86 gold centimes	56.17 gold centimes

5.2 *Cost price study of telephone-type circuits set up via satellite (INTELSAT)*

5.2.1 *Preliminary remarks*

An earth station is defined as the total equipment installed on a site and consisting of one or several antennas.

For the calculation of mean costs, it is impossible to compare the detailed cost components provided by the Administrations. Two methods can be used:

1) calculate, for each Administration which has supplied data, the annual cost price of a telephone circuit by dividing the overall annual cost of the earth station by the number of telephone circuits set up via the station, and then take the average of the separate cost prices calculated in this way;

2) add up the total annual costs of the telephone service indicated by each Administration and divide the total figure thus obtained by the total number of circuits set up over the various earth stations for which replies have been submitted.

The data concerning the extension circuit between the earth station and the gateway (Element B + 1 Element A at the gateway) are taken from the study for the international telephone service.

5.2.2 *Investments for telephone-type circuits*

Example for an earth station with 2 antennas

	Investments	*Useful*
	1980 | fIlife gold francs	| ears
Construction and installation costs of an earth station:		
— land	4 | 00 | 00	| (em
— building	39 | 00 | 00	| 0
— power supply system	16 | 00 | 00	| 5
— auxiliary equipment	1 | 00 | 00	| 0
— antennas:		

mechanical part 23 | 00 | 00 | 0

electronic part 40 | 00 | 00 | 0

— terminal equipment

(2 A elements at the station) 9 | 00 | 00 | 5

133 | 00 | 00

Overheads of 46% are included in these costs.

5.2.3 *Annual costs (financial charges)*

Costs 1980

gold francs

— land (interest only) | 32 | 00

— building (amortization) 2 | 83 | 00

building (maintenance) | 35 | 00

— power supply system 1 | 80 | 00

— auxiliary equipments

(air conditioning, etc.) | 03 | 00

— antennas:

mechanical part 3 | 10 | 00

electronic part 5 | 88 | 00

— terminal equipment | 30 | 00 *Total annual financial charges:* 14 | 62 | 00

5.2.4 *Operating costs*

Costs 1980

gold francs

— operational staff (including 50% for overheads) 2 | 35 | 00

— power | 45 | 00

— consumable goods | 11 | 00

— maintenance (staff costs are included in operational staff costs; maintenance under this item refers therefore to third party costs including 50% of overhead costs) | 25 | 00

— other costs (motor cars and material) | 7 | 00 *Total operating costs* 4 | 24 | 00

5.2.5 *Total annual costs*

— financial charges 14 | 62 | 00

— operating costs 4 | 24 | 00 *Total annual costs:* 18 | 86 | 00

5.2.6 *Traffic elements*

— average number of telephone-type circuits during 1980: 350 circuits

5.2.7 *Statistical data*

— 1980: number of antennas = 2

| equipped for 407 circuits (in use on the average: 350 circuits)

— 1985: Number of antennas = 2

| equipped for 1200 circuits (in use on the average: 1100 circuits)

— length (km) of the extension circuits to the gateway: 300 km

5.2.8 *Annual costs per telephone-type circuit*

— *1980 (reference year)*

— total annual costs of the earth station: 18 | 86 | 00 gold francs — costs per circuit (1/350) 51 | 75 gold francs

+ extension circuit to gateway (300 km at 1289) 3 | 67 gold francs

+ 1 Element A at gateway 1 | 50 gold francs *Total costs per circuit:* 57 | 92 gold francs

— *1985 (target year)*

— total annual costs of the earth station:

1980: 18 | 86 | 00 gold francs

1985: cost incr ease in 5 years at 5% p.a. = coeff. 1.276 23 | 00 | 00 gold francs

+ additional equipments: 16 | 00 | 00 gold francs *Total* 39 | 00 | 00 gold francs

Number of circuits in use: 1100 Costs per circuit (1/1100) 35 | 54 gold francs
+ extension circuit to gateway (300 km at 1289) 3 | 67 gold francs
+ 1 Element A at gateway 1 | 50 gold francs *Total costs per circuit:* 40 | 71 gold francs

6 Conclusions

The description of the analytical cost study method contained in §§ 1 to 4, together with the examples of cost calculations in § 5, may help regional Tariff Groups to undertake their own studies for the full range of telecommunication services provided. Although the data used in the examples are hypothetical, they reflect an actual situation existing in the study period 1981 to 1984.

Blanc

Supplement No. 3

HANDBOOK ON THE METHODOLOGY FOR DETERMINING

COSTS AND ESTABLISHING NATIONAL TARIFFS

TABLE OF CONTENTS

CHAPTER 1 — INTRODUCTION

1.1 *General*

The purpose of this handbook is to reply to Question 29/III (Determination of costs and establishment of tariffs) which the VIIIth CCITT Plenary Assembly entrusted to Study Group III. For the sake of efficiency, it was decided to confine the initial phase of the study to the telephone and telex services.

1.2 *Purpose of determining tariffs*

1.2.1 *Cost tariffs*

As for any other service or product, the establishment of a tariff, i.e., a sales price, for telecommunication services hinges first and foremost on a knowledge of the costs involved, i.e., the cost price. As is often the case in production processes which involve a large number of products, the allocation of costs to telecommunication service products inevitably raises problems since the different services (local, long-distance and international telephone and telex traffic) at one time or another use the same infrastructures.

1.2.2 *Public tariffs*

Once the cost components are known, tariffs can be established on the basis of a number of factors of an economic, political or even social nature. Any decision concerning tariffs must seek to secure the highest possible optimisation of the infrastructure.

1.3 *Objectives to be achieved*

It is for the management to decide in advance on the objectives to be achieved when establishing tariffs. Except in special circumstances, one of the main objectives must be to ensure the overall financial equilibrium of the undertaking over a sufficiently long period and to generate a reasonable surplus for financing subsequent development.

1.4 *Development of a costing model*

The complexity of the data involved makes it necessary to develop a model that can be automated.

CHAPTER 2 — DETERMINATION OF COSTS — PROPOSED MODEL

2.1 *Introduction*

2.1.1 *The model adopted*

Whatever model for costing services is adopted, it will bring with it the problem of defining cost and profit centres as a difficulty at both theoretical formulation and application levels.

On the other hand, considering the great volume of information that would have to be used to obtain the desired results, it would be wise to adopt a model that could be entirely automated.

This would be a costing system for non-accounting items that will require no more than the basic information available in the companies to be put into operation.

This means that it will be possible to put the model to immediate use in the companies, seeing that no innovations for obtaining information will be required. The information already available as input for the model will just have to be organized in order to obtain the required reports.

2.1.2 *What is being proposed*

The proposal is to achieve a model for studying the cost of the telephone service and the telex service at national level.

On the other hand, knowledge of the costs of each service will help to establish a more consistent tariff policy, as well as to provide companies with alternatives for investments.

The management of each company will, of course, decide what other reports, in addition to those mentioned above, they consider necessary for making the best analysis of the performance of each service.

2.2 *Description of the model*

2.2.1 *The production process*

Knowledge of the production process and the quantity of input used at each stage of this process is vital if one is to determine the cost of a particular product/service.

Let us consider, for example, the case of the provision of local and long-distance automatic subscriber telephony services.

The diagram below (Figure 1) shows the evolution of calls through the installation and equipment involved. We can see that at some points the two services use the same installations and equipment; this occurs with the subscriber terminal equipment, the local network and local switching.

Thus, in the process of a local call, we can identify the ‘‘activities’’ of the subscriber terminal equipment, the local network and the local switching; and in a long-distance call, in addition to these activities, long-distance transmission and switching. Considering the smallest unit of activity by which costs are accumulated as cost centres, it would seem reasonable to structure cost centres at the level of the modules that constitute the telecommunications network. In order to reach the total cost per service, we would then need to establish cost centres for the company’s other activities which are not directly linked to the production processes of the services (indirect expenses) such as: Commercialization of Services, General Administration, Instruction, Training, etc.

Figure 1, p.

2.2.2 *Characterization of the cost centres (Technical aspect)*

Each cost centre has the following characteristics:

a) *Direct costs* — These are the costs of each centre which include:

— manpower

— material/equipment

— logistics (energy, rentals, etc.)

— contracted works

— financial charges and amortization

— others.

b) *Indirect costs* — These are the common service costs which will be allocated on the basis of proportion used.

c) *Acquired costs* — These are the direct and indirect costs that derive from the utilization of service units from any other cost centre.

Therefore, the total costs of a cost centre would be as follows:

Total costs = Direct costs + Indirect costs + Acquired costs.

2.2.3 *Example of a technical aspect (Local switching, telephone)*

Let us go back to the diagram of the production process of local and long-distance subscriber calls and let us take for example the local switching cost centre.

According to what has been established above, this cost centre would be defined as follows:

Figura, p.

Note — Total cost: 3 = 1 + 2: all costs given on the technical aspect are calculated on product lines and/or aggregation levels.

The total cost of local switching consists of its direct costs, the cost of the service units it ‘‘consumes’’ from the local network plus the indirect costs (administration, etc.).

On the other hand, local switching transfers to long-distance switching the cost of the units (minutes/pulses) that are placed at the disposal of the long-distance service; it transfers to the local service the cost of minutes/pulses placed at the disposal of the users of this service.

2.2.4 *Characteristics of the profit centres*

Profit centres correspond to services commercialized by the Administration/RPOA.

Their costs are only produced by an apportionment of technical aspect costs.

In order to make the apportionment process more readable (or to ease the reckoning) it will be allowed to gather technical aspects costs into aggregation level within ‘‘profit centre’’ level, the distinction between direct costs and indirect costs does not work, instead of the notion of ‘‘nature’’ (e.g. manpower, amortization, etc.) has a full meaning.

2.3 *How the model works*

Supposing that a telephone and telex service company provides solely local and long-distance automatic subscriber-to-subscriber service, the model proposed here would work in the manner shown in Figure 2.

In the process of generation of costs, the articulation of the cost centre reflects the correct allocation of costs which does not necessarily represent the physical sequence of ‘‘activity’’ carried out in the production services.

The proposed model presents the following information:

— the total value of the service being provided;

— the value of the traffic unit (minutes/pulses) being provided;

— the total cost in each cost centre;

— the cost of the service unit in each cost centre;

— costs involved in each phase of articulation.

The analysis of the total cost of the local telephone service would convey, for example, the following information:

— the total cost of the local telephone service;

— the minutes/pulses cost of the local telephone service;

— the quantity of minutes/pulses of the local telephone service;

— the share of the following elements in the composition of these costs: manpower, materials, constructions, contracted work, financial charges and amortization, MIS, marketing, administration, etc.;

— the origin of these total/unit costs: local switching telephone service, local network telephone service, local network and subscriber terminal equipment telephone service.

Example: Treatment of a profit centre: ‘‘Long distance traffic telex service’’ gathers charges from:

The profit centre <<Long distance traffic telex service>> gathers charges from:

— the technical aspect (TA) long distance telex switching (i.e. international switching centre);

— a part of TA long distance transmission. The apportionment made for example from telephone circuits used for telex transmission;

— a part of the aggregation level (AL) ‘‘local network telex service’’; the apportionment is made, for example, from the taxed traffic (unit: minutes).

Long-distance transmission (TA) (part) Long-distance traffic Long-distance telex switching (TA) ‘‘Local network’’ telex service (AL) (part) Telex service

Figure 2, p.

CHAPTER 3 — COST AND PROFIT CENTRES

3.1 The different cost and profit centres are defined below in addition to the criteria set up for transferring costs.

3.1.1 *Cost centres*

1. Subscriber terminal equipment telex service.
2. Subscriber terminal equipment telephone service.
3. Local network.
4. Local switching telephone service.
5. Local switching telex service.
6. ‘‘Local network’’ telephone service charges (agregation level).
7. ‘‘Local network’’ telex service charges (aggregation level).
8. Long-distance switching telephone service.
9. Long-distance telex switching.
10. Long-distance transmission.

3.1.2 *Profit centres*

11. Local telephone service.
12. Local telex service.
13. Long-distance telephone service.
14. Long-distance telex service.

3.2 *Cost centres*

3.2.1 *Subscriber terminal equipment — telex service*

Subscriber terminal equipment — telex service consists of:

— teleprinter;

— associated wiring and auxiliary equipment;

— other equipment and belongings.

Service unit: terminal equipment;

Cost allocation criterion: the subscriber terminal equipment transfers all its costs to the ‘‘local network’’ telex service charge.

Figure, p.

3.2.2 *Subscriber terminal equipment — telephone service*

Subscriber terminal equipment — telephone service consists of:

— telephone set;

— associated wiring and auxiliary equipment;

— other equipment and belongings.

Service unit: terminal equipment;

Cost allocation criterion: the subscriber terminal equipment transfers all its costs to the ‘‘local network’’ telephone service charges.

Figure, p.

3.2.3 *Local network*

Local network consists of:

— open wire lines and support pylons;

— aerial cables and support pylons;

— underground cables;

— cabinets, pillars, etc.

— equipment like PCM (pulse code modulation), digital microwave, single line carrier, optical, etc., used in the local network;

— other equipment and belongings.

Service unit: network facilities for interconnection between switching centres and between user terminal equipment and switching centres;

Cost allocation criterion: proportional to the service unit allocated to telephone service or telex service.

Figure, p.

3.2.4 *Local switching — telephone service*

Local switching telephone service consists of:

— manual local switching exchange;

— automatic local switching exchange;

— logistic (energy, rentals, etc.);

— power plant and air conditioning equipment;

— test and control position and equipment.

— other equipment and belongings.

Service unit: chargeable unit of traffic (minutes/pulses);

Cost allocation criterion: the local switch telephone service transfers all its costs to the ‘‘local network’’ telephone service charges (AL).

Figure, p.

3.2.5 *Local switching — telex service*

Local switching telex service consists of:

— automatic local switching exchange;

— logistic (energy, rentals, etc.);

— power plant and air-conditioning equipment;

— test and control positions and equipment.

— other equipment and belongings.

Service unit: chargeable unit of traffic (minutes/pulses);

Cost allocation criterion: the local switch telex service transfers all its costs to the ‘‘local network’’ telex service charges (aggregation level).

Figure, p.

3.2.6 *‘‘Local network’’ telephone service charges (aggregation level — AL)*

— ‘‘local network’’ telephone service charges;

— service unit: chargeable unit of traffic (minutes/pulses);

— cost allocation criterion;

a) for the local telephone service, proportional to the number of minutes/pulses allocated to the ‘‘local service’’ centre,

b) for the long-distance telephone service, proportional to the number of minutes/pulses allocated to the long-distance telephone service.

Figure, p.

3.2.7 *‘‘Local network’’ telex service charges (aggregation level — AL)*

— local network telex service charges;

— service unit: chargeable unit of traffic (minutes/pulses);

— cost allocation criterion;

a) for the local telex service, proportional to the number of minutes/pulses allocated to the ‘‘local service’’,

b) for the long-distance telex service, proportional to the number of minutes/pulses allocated to the long-distance service.

Figure, p.

3.2.8 *Long distance switching — telephone service*

Long-distance switching telephone service consists of:

— manual and semi-automatic trunk exchange;

— trunk automatic exchange;

— logistics (energy, rentals, etc.);

— power plant and air conditioning equipment;

— test and control position and equipment.

— other equipment and belongings.

Service unit: chargeable unit of traffic (minutes/pulses);

Cost allocation criterion: transfers all its costs to the long-distance service itself.

Figure, p.

3.2.9 *Long-distance switching — telex service*

Long-distance switching telex service consists of:

- automatic long distance and international switching;
- logistics (energy, rentals, etc.);
- power plant and air-conditioning equipment;
- test and control positions and equipment.
- other equipment and belongings.

Service unit: chargeable unit of traffic (minutes/pulses);

Cost allocation criterion: transfers all its costs to the long-distance telex service.

Figure, p.

3.2.10 *Long-distance transmission*

Long-distance transmission consists of:

- open wire line system;
- underground cable system;
- radio based system;
- logistic, tower, repeater stations;
- satellite based system;
- optical fibre system;
- test and control positions and equipment;
- other equipment and belongings.

Service unit: voice channel;

Cost allocation criterion: for each service like telephony, telex, etc., proportional to the unit service allocated.

Figure, p.

3.3 *Profit centres*

The following are profit centres that correspond to services provided to users.

3.3.1 *Local telephone service*

Service unit: minutes/pulses.

Figure, p.

3.3.2 *Local telex service*

Service unit: minutes/pulses.

Figure, p.

3.3.3 *Long-distance telephone service*

Service unit: minutes/pulses.

Figure, p.

3.3.4 *Long-distance telex service*

Service unit: minutes/pulses.

Figure, p.

Blanc

3.4 *Allocation of indirect costs*

Indirect costs comprise the costs allocated to centres which do not correspond to network elements and therefore cannot be distributed clearly among the profit centres.

Indirect costs consist of:

— managerial information system;

— marketing;

— administration;

— others.

Cost allocation criterion:

For each cost centre: for the sake of simplicity, the following arbitrary rule is applied:

— indirect cost of MIS $\times \dfrac{irect\ costs\ of\ each\ cost\ centre}{otal\ direct\ costs}$

Figure, p.

CHAPTER 4 — THE INPUT DATA FOR THE MODEL

4.1 *Accounting data*

As stated above, the input data for the model consists of information already available in each company which requires organization.

4.2 *Physical data*

The measurements of traffic now being carried out in the ‘‘ticketed’’ manual and automatic long-distance service are habitual.

In the local service there is no difficulty in determining the traffic being carried out. Should a particular company have any difficulty in determining traffic in localities where service is not measured, the eventual discounting of this traffic (which it is always possible to measure) will not affect the results, considering its small significance.

4.3 *Reports*

The model makes it possible to analyze the annual costs at the level of each service, which as compared with the revenue makes it possible to determine the margin (rate per unit).

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or marketing, administration, etc.

CHAPTER 5 — ESTABLISHMENT OF TARIFFS (PUBLIC TARIFFS)

5.1 *National telephone service*

5.1.1 *Basic objective of the national telephone tariff*

5.1.1.1 In principle, the prime objective in setting charges for the national telephone system is to recover the cost of providing the service, including running costs, depreciation and a suitable return on the capital investment. The return on capital is usually that agreed with or allowed by a Regulatory Body, normally the Government. This basic principle can equitably be applied to individual components of the national telephone tariff, although in practice economic and political structures generally preclude such an absolute approach and cross-subsidy between individual components of the tariff almost invariably applies.

5.1.1.2 Fixing rates based on a pre-determined return on capital is common practice with public services — water, gas, electricity, etc., and so, unlike many other commodities, there is rarely an opportunity to benefit from a monopoly situation by raising prices above a relatively modest level of return. In some instances, it may also be necessary — due to political and

social pressures and price elasticity — to fix the domestic tariff on the basis of low or even nil or negative return, with cross-subsidy from the generally more economic international services or other areas of Government revenues, e.g. oil. The national telephone tariff should incorporate all standard facilities and services which can be defined as those required on a regular basis or in sufficient demand to warrant uniform charging on a common service basis. The range of services included may therefore vary between different countries' systems but would always incorporate call charges and rentals and installation fees for exchange lines provided by the standard means of construction. Usually commonly supplied terminal apparatus such as extension telephones, PABXs, planphone arrangements and single payment services such as removals, takeover of existing services and re-connections will also be covered by the standard tariff. One-off charge assessments should apply for specialized subscriber requirements such as large PABXs (normally applying specially — assessed rental or sale formulas) or for subscriber lines provided by non-standard means or in remote areas with low demand (applying a special construction charge procedure which incorporates a specially assessed rental formula).

5.1.2 *Factors to be considered when establishing tariffs*

5.1.2.1 *General background*

i) A variety of circumstances exist under which telecommunication systems are provided in developing countries. Countries differ from one another not only in their stage of development, but in their geography and terrain, their population size and mix, their economic and political structures and their actual and potential wealth.

ii) In any single country, there may be a variety of needs which the Telecommunications Administration has to serve. Differences may arise between geographic regions, between urban and rural, public and private demands, business and residential groups.

iii) In general, these are termed environmental factors under which an Administration has to operate. Other factors, generally termed marketing factors, will determine how much demand arises, how much service will be given and can be used to overcome or accentuate the environmental factors.

iv) In this section, four factors are considered as follows:

— standard of living;

— urban and rural service considerations;

— telephone penetration level;

— elasticity of demand.

Note — Some of the work in this section is an extract from GAS 5 reports and further information in these areas can be obtained by reference to these ITU GAS 5 reports.

5.1.2.2 *Standard of living*

i) The level and distribution of national income in a country or a market segment has a very significant impact on the demand for telecommunications services. A mathematical model has been developed which determines, amongst other parameters, the correlation of average income per household with the demand for private telephone installations. One of the objectives was to find the level of income at which half of all households desire a telephone. For the year 1965 and at a rate level prevailing in the Federal Republic of Germany it was found that at an average household income per month of approximately DM 2000 (or US $ 550), half of all households had a telephone, or had ordered one.

ii) The distribution of income, as well as the average level of income, may be among the determinants of the demand for a given commodity. A country with a few rich people and many poor is likely to have quite a different consumption pattern from that of a country with the same average level of income which is distributed fairly evenly. Similarly, looking at income distribution over time, a significant shift of the sort which could be caused by a radical reconstruction of tax structure might result in a substantial change in consumption patterns: middle-class purchasing habits could replace those of the rich and the poor. Within any given country, however, changes in income distribution are normally fairly gradual and will not affect consumption of most consumer products greatly except over the rather long term.

iii) There are other possible shifts in income which are not necessarily discovered by examining average income levels and which may be of importance in determining consumer purchases. For example, some forecasters emphasize the idea of the threshold income level — that there is some level of income at which the household moves over the threshold of willingness and ability to buy some particular product or service. If the threshold income level can be identified and the number of households moving over it in any given year can be predicted, this will obviously be of help in determining

the potential market for the commodity in question. A market segmentation of the residential sector by income classes can be valuable. The aim is to determine the market penetration in different segments and the probability to use the service.

iv) As income grows, one can expect pronounced shifts in the relative demand for different categories of goods and services. Particular types of shifts have been observed by comparing the budgets of individual working-class families. A rising family income tended to be accompanied by increased spending in all categories while the percentage spent on food tended to decline, the percentage spent on housing and household operatings tended to remain constant, and the percentage spent on clothing, transportation, recreation, health and education tended to increase.

5.1.2.3 *Urban and rural service considerations*

i) In urban areas, there is generally a concentration of economic activity (including government service) which gives rise to a telecommunication demand. In addition, the average income is normally higher than in other parts of the country, which means that the demand for all types of goods and services is generally higher. Thus, a telecommunication demand in such areas often exceeds supply. At the same time, the costs of providing telecommunication services in these urban areas are low compared to the costs

of providing services in isolated and/or underprivileged areas. Consequently, it is usually possible for telecommunication companies to achieve a good rate of return on the services offered in urban areas.

ii) In rural areas, on the other hand, average income is relatively low. At the same time the costs of providing telecommunication services are relatively high due to the distances that have to be covered, low population densities, and/or low levels of equipment utilization. Thus, for the greater part, subscribers are unable to pay the full cost of the service. Consequently, it is generally difficult for telecommunication companies to achieve an adequate rate of return on the services offered in these special areas.

iii) Telecommunication development in the developing countries indicates that the limited resources normally available for investments in telecommunications have been primarily allocated to urban, interurban and international services where declining unit costs and the higher financial returns can be obtained. To the extent that these investments are restricted to the modern sector of the country's economy, their benefits do not extend

directly to rural areas where many of the country's poor live and where even the basic telecommunication needs are not being met. This may, to a considerable extent, be due to the fact that investments in these areas are financially unprofitable.

iv) One of the greatest problems facing telephony development in rural areas is the financial unattractiveness of such projects. In this regard, it is generally recognized that service provision to remote and/or underprivileged areas should not have to be entirely self-financing. Some form of internal cross-subsidy scheme is the solution most commonly recommended to deal with this problem. Cross-subsidy schemes have the advantage of being relatively easy to administer and not highly visible. Use of this technique, however, is not without its drawbacks. In particular, it results in the telecommunication authority being forced to take on a policy responsibility for which it was not intended and may not be equipped. Such a responsibility should normally lie with the national government. Such a line of reasoning would lead a country to favour some form of direct, government-sponsored, tax-based, subsidy scheme. Ultimately, each country must decide this issue for itself, given its circumstances.

v) The issue of what form a subsidy should take does not answer the question of how much the subsidy should be. For developing countries which typically face overall capital shortages, this is a difficult question to answer. Ultimately, the answer lies in being able to demonstrate that telecommunications deserve a higher priority when scarce investment funds are being allocated.

5.1.2.4 *Telephone penetration levels*

i) The relationship between households/dwellings and the provision of telephones is usually expressed in terms of penetration where 100% implies that each household has a telephone. This penetration level is usually expressed as main stations per 100 population (also termed telephone density).

ii) Telephone penetration levels may be viewed/used in three ways:

a) as a measure of achievement following implementation of a telephone system and or telephone tariffs;

b) as a method of predicting future demand for services (usage) and arranging tariffs to encourage/discourage specified areas/times of usage;

c) as a means of demonstrating the need for telecommunications investment.

iii) Actual penetration of service into households reflects a perceived need (value) for telecommunications, taking environmental and geographical consideration into account.

iv) The cost of initial telephone acquisition and subsequent maintenance and usage is an important factor in the rate of telephone penetration. Households that are currently without service are likely to be those who are either not in a position to afford it or those who are yet to be provided with a service by their Administration. A further category may be those households who will be induced to utilize the service once it is made available in their area. The momentum of telecommunications development will therefore be dependent on established (often commercial) users. In order to promote and sustain economic growth in a country as a whole, tariff structures for telephone services should have a broad economic base that recognizes the different needs of the various sections of the community.

5.1.2.5 *Elasticity of demand*

i) It is a widely known and accepted fact of economic theory that normally the higher the price of a particular product or service the less it will be demanded. This statement is modified by the concept of demand elasticity; a product is said to be price-inelastic when the relative change in demand is correspondingly smaller than the relative change in price. At the extreme, a product is highly price-elastic if revenue decreases with increasing prices; though the unit price increases, the number of units demanded falls sufficiently to yield less total revenue. It is unlikely that this would be a desirable change, though for some enterprises it might be, yielding the same profit with less effort and resources through a decrease in expenses. Usually, with price-elastic products, costs cannot be reduced in proportion and price increases lead to smaller profits, or larger losses per unit. This feature applies particularly to telephone services because of the large fixed costs existing in networks.

ii) *Price-elasticity of demand*

Elasticity of demand for new installations may be estimated taking into account the subjective price perception of potential customers. Price elasticity expresses the sensitivity of customers to the cost of the service. The elasticity parameter is calculated as the ration of percentage change in demand (quantity sold per period) caused by a percentage change in price.

In symbols,

$$E_{q\backslash dp} = \frac{(Q_1 - Q_0)/Q_0}{(P_1 - P_0)/P_0} = \frac{\text{relative change in quantity}}{\text{relative change in price}}$$

where

$E_{q\backslash dp}$ is the elasticity of quantity demanded with respect to a change in price

Q_1 is the quantity demanded per period after price change

Q_0 is the quantity demanded per period before price change

P_1 is the new price

P_0 is the old price

Elasticity of revenues ($E_{R\backslash dP}$) may be derived from the above formula as follows:

$$E_{R\backslash dP} = 1 + E_{q\backslash dp}$$

iii) Besides the application of price elasticity to new installations, an elasticity factor may be determined for the effect of a change in monthly fixed charges on subscribers' decisions to retain the service (telephone, telex, private line, etc.).

Similarly, elasticity of demand studies may be used to evaluate the effect of higher or lower usage charges on traffic volumes (e.g. local calls, long-distance calls, telex, facsimile, etc.).

The factors can be calculated by analyzing the effect of historic changes in tariffs for which related unit quantities can be identified.

In an inflationary environment it should be kept in mind that unchanged tariffs represent a relative decline in real price compared to a rising overall price index from year to year. Under a condition of price elasticity this will result in a demand stimulation.

The degree of elasticity depends on several factors. Intuitively, demand elasticity will be low for telephone business subscribers, and higher for private long-distance calls. The degree of availability of comparable substitute services (e.g. mail, telegram) also influences price elasticity. Finally, the degree of price elasticity depends on levels of income (business cost consciousness, or private disposable or discretionary income).

Elasticity is often lower with greater market penetration, and it may vary with the size of the price change. Elasticity may also be different for price increases and decreases.

5.1.3 *Design of a national telephone tariff*

5.1.3.1 *General background*

Recognizing that there may be difficulties in trying to cost relate the different tariff items, it is useful to have certain guidelines on the costs relevant to individual tariff items. They may, for example, help in countering Government or customer complaints regarding the pricing of individual items of service. It should be noted that spare capacity should always feature as part of the ''averaged'' costs of any service.

In general there are three basic methods of tariffing national telephone systems; that whereby all calls are charged, that where no calls are charged, and that where only some classes of calls are charged. All methods have common features and components listed below that should be identified and costed individually. These costings can then be incorporated into the tariffing/charge setting procedure in a manner suitable to the tariff system under study.

5.1.3.2 *System where all domestic calls are chargeable*

i) *Exchange line rental*

The charge for this item should, on a cost related basis, be designed to service the average cost of all apparatus that is *exclusive* to each subscriber, i.e.: cost of the telephone instrument, installed cost of the line form exchange to subscriber's distribution point and of exclusive equipment in the public exchange such as the subscriber's meter together with maintenance of all these items.

ii) *Exchange line installation fee*

This item should, on a cost related basis, cover average capital cost of the drop wire from the distribution point to the subscriber's premises, plus all wiring within the premises and the labour and transport cost involved in making the connection, including connection of the telephone instrument.

iii) *Domestic call charges*

The charges for domestic calls should, on a cost related basis, service the cost of public exchange (less any exclusive equipment therein) plus inter-exchange links.

It may be possible to segregate local and trunk call costs (normally by breakdown of exchange and trunk costs on a traffic weighting basis). In practice however, this may be unnecessary because the general tariff strategy will be for a certain style of tariff, (e.g.: untimed local calls plus a range of different metering intervals on the different classes of trunk call), thereby precluding precise cost relationship for each different type of call.

iv) *Terminal apparatus — (rentals and installation fees)*

Tariffs for standard range PBXs, extension telephones and other terminal apparatus are normally easier to cost-relate than the preceding items because identification of average cost is more straightforward/easier.

v) *Deviation from cost related approach*

The main restrictions on applying a cost related approach for each separate tariff item are political, social, marketing and strategic. The cost factors usually indicate that the exchange line rental applied to ‘‘residential’’ customers should be higher than that applied to ‘‘business’’ customers. This is because the average exchange to subscriber line length is greater to residential areas than to business areas. Also, there may be a short term benefit in maintaining low residential rentals if this means that spare capacity is reduced but longer term planning should be based on more cost-related rentals for all classes of subscribers.

However, the rentals actually applied may well have to represent the opposite of this fact if the service provision policy is to provide residential subscribers with an affordable service. Likewise, the inability to market the residential service at a cost-related rental would support a ‘‘below cost’’ approach.

In practice, the domestic tariff affords considerable opportunity for a desirable degree of ‘‘cross subsidy’’. Terminal apparatus like PBXs, plan arrangements and answer-phones and essentially business-oriented services and can usually sustain premium charges. Call charges could be at a premium level due to the preponderance of business-originated traffic. Exchange line installation fees represent the main example of ‘‘strategy-based’’ charging; the charge could be at or above the cost where demand exceeds capacity. This approach has the additional advantage of not affecting existing customers.

The principal dangers inherent in having a heavy business to residential subsidization are residential dilution of the system, unrequired new residential demand (particularly in remote rural areas) and restriction in business demand (e.g.: for replacement of aging facilities).

5.1.3.3 *Flat-rate system*

i) Under this system the rental level(s) allows for specified classes of call to be made regardless of volume, without payment of any traffic-related charges. In geographically large systems, this ‘‘free’’ usage may be restricted to local area calls but for a small system the rental may incorporate system-wide usage.

ii) A strictly cost-related approach therefore requires incorporation of average subscriber usage in the rental and, quite contrary to the above arguments, a consequent excess in the business rental because of the higher usage usually made by business subscribers.

The approach to pricing of exchange line installation fees and terminal apparatus charges should generally be the same as for a ‘‘call charging’’ system.

5.1.4 *Main characteristics of different charging systems*

5.1.4.1 *Flat rate*

No call charges for calls within a specified geographical area; this may cover the *whole* of the domestic system.

Characteristics

i) Easy and simple to apply; the subscriber knows exactly what their bill will be and billing complaints are therefore avoided. Revenue and cash flow estimating is simplified.

ii) Inescapable ‘‘high’’ rentals which effectively penalize low usage subscribers and therefore could discourage subscriber demand. The business/residential rental differential takes no account of the wide variation of usage within each classification. Usage tends to be high because no call charges are payable often resulting in high exchange and trunk route costs.

iii) There is no need to supply subscriber’s meters or call timing equipment (unless International Subscriber Dialling on a bulk billing basis is introduced).

iv) Where tariff changes are required, there is little option but to amend the flat rental(s) due to the lack of other major revenue sources, so there is minimal flexibility.

5.1.4.2 *Partial flat rate (specified number of calls or call units at nil charge)*

Usage may be stimulated but it is usual that many subscribers will restrict their usage to the amount allowed for free or only make essential calls.

5.1.4.3 *Message rate (metered untimed call)*

Calls to or within a specified geographical area are charged at a fixed amount regardless of duration.

Characteristics

i) Complaints regarding call bills are less likely than with a measured call system and revenue forecasting is less complicated but in that respect both systems suffer compared with flat rate.

ii) Subscribers can make long duration calls reasonably cheaply. This increases or expedites the requirement for additional equipment, including expensive trunk circuitry resulting in additional costs.

iii) Because calls are charged at a common rate *per call* there may be a cost saving on equipment, there being no need for periodic pulse metering.

5.1.4.4 *Measured rate*

Calls are chargeable on a measured basis, i.e.: based on distance, duration and possibly time of day.

Characteristics

i) The billing is relatively more complicated; there are more meter reading complaints than on flat or message rate, whilst the revenue forecasting is complicated.

ii) The subscriber is able to control to a considerable degree the size of their bill for telephone service through limiting the number and/or duration of their calls. This makes the measured rate system capable of justification in principle to subscribers and controls the level of expenditure on exchanges and trunk equipment and circuitry.

iii) The timing of all calls means that the basic charges (exchange line rental and the unit call fee) can be maintained at a lower level than with message rate or flat rate thus encouraging more subscriber demand. Message rate and flat rate encourage long duration calls, yielding no additional revenue and creating a requirement for additional switching equipment but measured rate yields call revenue in proportion to system usage. This means that any additional expenditure required on switching equipment will probably be offset by an increase in call revenue.

iv) Additional capital cost is initially required to provide subscribers' meters and pulse generating equipment. A measured rate system is particularly compatible with the introduction of International Subscriber Dialling.

v) This system gives the greatest degree of selectivity when considering tariff amendments.

Note — The different characteristics of each charging approach can in fact often be construed, as far as the Administration is concerned, as either advantageous or disadvantageous. For example, under § 5.1.4.4 (Measured rate) the encouraging of demand from applicants with low potential usage is generally undesirable as a long-term proposition since it creates pressure for investment on uneconomic expansion but in circumstances where considerable spare capacity exists, even low rental/low usage subscribers may be economically worth encouraging as a short term policy. Similarly under the flat rate method the high fixed charge(s) may limit demand — this may be beneficial to the Administration depending on similar considerations.

Without such an approach, the result may well be tariffs which achieve the short-term revenue requirements for the overall business but which may effect heavy business to residential subsidy, stimulating excessive residential demand, diluting the system and requiring an inordinate level of new investment.

5.1.5 *Aspects of call metering*

5.1.5.1 *Periodic pulse metering (PPM)*

This is the most common method of metering subscribers calls, whereby the equipment registers an initial meter pulse (representing one unit call fee) as soon as the destination telephone is answered and then registers one pulse at every fixed interval thereafter. The initial chargeable pulse represents payment for ‘‘setting-up’’ cost and subsequent pulses represent payment for circuit and exchange occupancy.

5.1.5.2 *Repeat multi-metering*

This method is the same as with PPM except that multiple pulsing applies on answer and at every fixed interval thereafter, e.g. 2 units on answer and then 2 more units at, for example, every 3 minutes thereafter.

5.1.5.3 *Local/trunk call metering*

Most measured rate telephone systems apply PPM on variable pulse intervals which are dependent on distance or zone. Local area calls (defined as own-exchange calls, calls within a specified multi-exchange area or calls within a specified geographical area) might be charged at call unit fee for unlimited time (i.e.: on answer only) with only trunk (non-local) calls charged on PPM, often at varying pulse intervals depending on distance or time of day. The increasing tendency is to move towards periodic pulsing of all calls whether with local calls less frequently pulsed than trunk calls or in geographically small systems, with uniform pulsing for all domestic calls.

5.1.6 *Time-of-day charging (off-peak tariffs)*

5.1.6.1 Longer duration pulsing intervals may be desirable on calls made during evening and weekend periods to increase demand in the periods when switch/trunk capacity is under employed and to relieve traffic loading during the busy business period. However, if there is no or little congestion in the busy parts of the day and insignificant ‘‘new demand’’ is expected there is a risk that overall call revenue will actually reduce, with no offsetting benefit from decongestion.

5.1.6.2 When considering the introduction of off-peak rates care must be taken in evaluating what is trying to be achieved, i.e.:

— is the aim to try to transfer a part of the peak hour traffic during normal working days to another time of the day to achieve a more even and efficient utilization of the network; i.e. cost saving approach; or,

— is the aim to encourage subscribers to make additional calls and thus create additional revenue.

5.1.6.3 If traffic is dominated by commercial and administrative type traffic, this traffic is unlikely to be transferred to non-office hours or be very responsive to reduced charges. In such cases, reduced non-office hours traffic would not relieve congestion during the peak periods but only mean that calls which would have been passed will be passed at lower charges and thus reduce income.

5.1.6.4 Another problem could be that the peak hour for traffic will be changed by the introduction of reduced rates and the peak hour thus transferred to the reduced rate period. This is uneconomic as the system will normally be dimensioned on the basis of traffic on which a reduced earning is received. Care must be taken in identifying the hours during which reduced off-peak rates apply and to retain the flexibility to adjust these hours in the light of experience.

Ideally, off-peak rates should not be offered on operator-handled calls (because operator costs invariably increase outside normal working hours) or to a destination where the time difference is too great.

These points are also valid in studying the question of the introduction (implementation) of different collection charges for different days of the week.

5.1.7 *Subscriber classification (business/residential mix)*

5.1.7.1 With respect to availability and usage of the telephone system, the business and residential users can generally be regarded as distinct sectors. National tariff structures generally reflect this categorization and apply a higher tariff for business users than for residential users. Whilst this approach is often not consistent with the costs arising (reflecting a degree of cross-subsidy between the market sectors), this tariff differential is often supported by the greater usage made of the system, and the ability to pay, of the business sector.

5.1.7.2 This interaction between business and residential tariff levels offers an opportunity to Administrations to influence demand in accordance with their service provision policy (e.g. to provide subscribers with an affordable residential service) or perhaps to restrict demand in light of capacity constraints.

5.1.7.3 In this context it should be noted that factors affecting the demand for telephone service differ for each sector of the market (e.g. the business sector will be more influenced by the economic/business activity level, the availability of substitute services, etc.) and the effect of a price change can be difficult to estimate accurately. Accordingly, it is prudent to obtain some measure of the effect of any price change or customers usage/demand and this may require the analysis of average customer calling patterns between the market sectors before and after a price change.

5.1.7.4 *Residential customer bills*

Residential customer bills are relatively straightforward in that they usually cover only the exchange line rental and call charges. Records of customer calling patterns can be used to identify the effect of charges in call prices, to be added to any rental adjustments. However, some customers will make fewer calls and their bills will comprise a higher proportion of rental than for the average customer. This will not be of any significance if the proportional increases are the same for rentals and call charges. However, with the trend of costs tending to require greater rental increases, the proportional increase in bills is greatest for those customers making least calls. These may be customers who can least afford increases. Figures derived from average bills should therefore be quoted in terms of the averge effect.

5.1.7.5 *Business customer bills*

An average of all business customer bills has limited value except as an indicator of the mean of a wide range of variables, and for comparison on the same basis with the average residential bill. As business customers vary in their usage of the service it is advisable to build up case histories of various categories of business customer so that the effect on each, and on demand, can be identified in more general terms.

5.2 *National telex service*

5.2.1 *Tariff structure*

In general, there should be three main types of charges for the telex service:

i) An initial installation fee, for having a connection to the network which is paid prior to the initial connection being made.

ii) A subscription charge which may be paid periodically, i.e. monthly, quarterly, etc., in advance to cover the telex equipment and connection to the telex exchange (private wire). In some countries the provision of telex equipment has been deregulated and private companies or subscribers may provide their own equipment. In such cases a lower connection to the service charge may be applied.

iii) Traffic charges, that is the charge for the utilization of the network.

5.2.1.1 *Initial fees and subscription charges*

i) The initial fees and subscription charges for a telex subscription should at least cover the average costs, which are independent of the traffic exchanged. These costs are:

a) amortization and interest on the capital which is invested by the Administration in the individual equipment of each subscriber (e.g.: teleprinter, subscriber's line, line relays, meter, relevant part of exchange building, etc.);

b) current maintenance of the individual equipment of each subscriber and other operational costs (e.g.: the entry of the subscriber's name, address and telex number in the telex directory, the costs of the necessary subscription registers, the costs of production and handling of the bills, etc.).

ii) The purpose of the initial fee plus the subscription charges is to cover these basic costs which occur even if the subscriber does not use his equipment for outgoing communications.

iii) There is an interdependence between the initial fee and the subscription charge, the higher the initial fee is set, the lower the subscription charge can be and the obverse is also true. The lowest initial fee should correspond to the costs of the labour used, materials consumed, and the Administration involved for the installation of the subscription. The initial fee is an important marketing tool which can be used as a demand regulator for the service. The reasons for fixing the initial fee at a higher level may be that a prohibitive effect is desired, i.e.: the Administration wants to reduce the demand, because of shortage of investment or other resources, or it may be that large receipts are needed in a short time in order to finance current investments or to fulfil contracted loan repayments.

iv) The ideal situation is when an Administration has the possibility to determine the initial fee at an optimum level, which results in the meeting of desired revenue and cash flow targets whilst not deterring the public from making applications for new subscriptions.

5.2.1.2 *Traffic charges*

i) The traffic charge is a fee for each communication which should cover any remaining costs of capital plus the operation of the network concerned especially the switching equipment.

ii) For local communications this fee usually varies according to the duration, that is, it is fixed per unit of duration with one minute or six second units being the most commonly used.

iii) For long distance communications, the communication fee may vary both according to the duration and to the geographical distance between the subscribers involved. This basis is also common practice for international service.

5.2.2 *Charging systems*

5.2.2.1 For manual and semi-automatic networks, the registering and subsequent debiting of call charges is initiated by the operator who established the call. When the subscriber books the call and after the call is finished, the operator records on a ‘‘ticket’’ all the relevant details which are:

— the calling subscriber’s name and category;

— the called subscriber’s name and category;

— the time and date;

— the tariff to be applied;

— the call duration.

These tickets are then processed to produce customers bills.

5.2.2.2 When telex service is provided on an automatic network two different methods can be used for automatically debiting call charges against the originating subscribers; these are:

— periodic pulse metering;

— automatic ticketing.

The two methods can be used together in the same telex network.

5.2.2.3 *Periodic pulse metering (PPM)*

Periodic pulse metering is a system whereby charging pulses are generated and counted during a call by a meter which is connected to the individual line circuit equipment of each subscriber. The subscriber meter is stepped by the pulses and the pulse frequency is determined by the tariff. It is common that the pulse interval is inversely related to the distance between the two subscribers.

5.2.2.4 *Automatic ticketing*

In this method, all necessary information for charging a call such as the calling subscribers number and category, the called subscribers number and category, the time and date, the tariff to be applied and the duration of the call, are automatically stored on a ticket, perforated tape or magnetic tape. For billing purposes these tickets or tapes are subsequently processed in a processing centre.

5.2.3 *Charging unit*

5.2.3.1 It has become common practice for different minimum charging units to be applied depending on the type of service offered.

5.2.3.2 For fully automatic service:

i) charging is by the minute and any fractions of a minute shall be charged as for one minute. This is known as one plus one; or

ii) charging is by shorter periods (commonly six seconds) either derived by periodic pulse metering or an automatic accounting system.

5.2.3.3 For semi-automatic and manual service:

i) any telex call of three minutes duration or less is normally charged as for three minutes;

ii) when the duration exceeds three minutes, a charge shall be made for each minute in excess of the first three minutes. Any fraction of a minute shall be charged as for one minute. This is known as three plus one.

5.2.4 *Examples of national charging structures*

5.2.4.1 The national telex network configuration will depend on the size of the country, the number of current and potential telex subscribers, their geographic distribution, the economic situation of the country, the stage of development of the telecommunications Administration, etc. This configuration will shape the charging structure and levels, especially for the traffic charge.

5.2.4.2 The following different configurations are considered:

i) The country is served with one telex exchange which works as combined national/international exchange.

The telex exchange is usually installed in the capital of the country where there is a concentration of business. Subscribers outside the capital are connected through long distance lines.

In some towns outside the capital where there is an identified concentration of business, line concentrators may be installed. These line concentrators may be connected to the telex exchange using VFT or TDM channels.

ii) In a large country with a higher number of subscribers and several towns where business is concentrated, the country is usually served with several telex exchanges connected together in a system hierarchy (which may be more or less analogous to the hierarchy in a telephone network) with the main exchange often working as a combined national and international exchange.

5.2.5 *Application of tariffs for different network configurations*

Considering the different network configurations the following may be concluded:

5.2.5.1 *A country with one telex exchange*

i) Remote subscribers are connected by long-distance lines.

ii) Remote subscribers are connected to line concentrators.

Whichever of these apply, both the initial fee and the subscription charge may be increased in proportion to the cost of the long-distance line — pertaining to the subscriber — and the line concentrator. However, it may be desirable to have a standard ‘‘universal’’ subscription charge with subscribers a long-distance from the exchange in effect being subsidized by those only a short distance from the exchange.

To simplify the subscription charge it can be divided into two parts; one relating to the apparatus (teleprinter) and the other to the line (and accessories).

The traffic charge should, however, ideally be the same for local and remote subscribers, thus it does not vary by distance as the transmission and switching costs will be the same for all calls.

5.2.5.2 *A country with several telex exchanges*

In a country with several telex exchanges forming a hierarchy in the national telex network, the tariff ideally would be as follows:

For local subscribers, that is subscribers connected to the same telex exchange, either in the capital of the country or in any other town, the charges paid by the subscribers will be an installation fee, subscription fee and the traffic charge. Ideally, all local calls on all exchanges would be at the same rate, but for non-local, i.e. ‘‘trunk’’ or ‘‘national’’ calls there should be different traffic charges that are distance related. The scheme of distance steps in telex should be less complex than that usually found in telephony, as the biggest part of the cost is related to switching equipment and not to trunk lines as is the case in telephony. Two or three steps of distance can be used.

The long distance charges should be calculated to cover the costs of transit exchanges, trunk lines, transmission equipment, maintenance and operation costs, administrative costs, etc.

5.2.6 *Special facilities*

Many modern telex exchanges have special facilities such as abbreviated dialling, message broadcasting, store and forward, etc. Subscribers wishing to be connected to such facilities may have to pay a certain charge, for each facility to be paid periodically with the subscription charges. It may be difficult to fix the level of such charges, but it should at least cover any extra costs resulting from such facilities but to evaluate these charges more satisfactorily, a thorough marketing study of the demand for such facilities and real value of such service is necessary. In certain cases they may be considered enhancements to the basic service which increase usage and provided free of charge.

5.2.6.1 *Store and forward*

Subscribers are able to store messages within the exchange for subsequent transmission. Generally, no additional charge is made for this facility.

5.2.6.2 *Multi-address call*

The same message can be sent simultaneously to a number of different destinations. Each message should be charged for a separate message.

5.2.6.3 *Abbreviated dialling*

An initial list of numbers is normally provided free of charge. Any subsequent changes to the list will be subject to a charge to cover the cost of a new programme.

5.2.6.4 *Automatic call transfer*

Incoming calls for one number may be transferred to another local number during the absence of the subscriber from the first number. No additional charge is normally made for this facility.

5.2.6.5 *Automatic advice of duration*

The advice of duration of a telex call will be automatically printed out on completion of all calls. No charge is made for this facility.

5.2.6.6 *Subdivided accounts*

Available to subscribers who require their telex account to be subdivided into sections. No additional charge is normally made for this facility.

5.2.6.7 *Conference call*

Permits ‘‘conversations’’ to be held between the caller and a number of other numbers, which may include an overseas subscriber. Each connection is charged for as a separate message.

5.2.7 *Miscellaneous services/charges*

5.2.7.1 *Teleprinter transfer charge*

A charge should be paid by any subscriber who wants to transfer their teleprinter from its installed place to another. The charge should cover all the costs incorporated in such a transfer. Average transfer charges can be set for:

— transfer within the same building;

— transfer outside the building;

— transfer outside the town.

A transfer charge is paid once against the execution of such transfer.

5.2.7.2 *Deposit*

Some Administrations ask for a deposit which is paid at the beginning of a subscription with the initial fees. This deposit can be against any damage that may happen due to misuse of the teleprinter, or if there is doubt about the financial status of the customer. The deposit can include a certain amount equivalent to the average consumption of a subscriber for the billing period. The deposit is reimbursed to the subscriber at the time his contract is concluded.

5.2.7.3 *Recovery of equipment*

A charge shall be paid by any subscriber who wishes to cancel his contract for telex service to cover the physical (i.e. labour) and administrative work involved.

5.2.7.4 *Retainer fee*

A retainer fee per month can be applied in lieu of the monthly equipment and connection fee to those customers who opt to retain or fail to request removal of the private wire installation and do not have telex equipment installed on their premises.

CHAPTER 6 — EXTENTION OF THE MODELS

This chapter is for further study.

6.1 *General*

The model described in Chapter 3 has been developed for the purpose of calculating telephone and telex service costs.

The model can be extended, using the same methodology, on the basis of the following two principles:

— extension to other services by altering the level of analysis;

— allowance for the operator's consumption of telecommunication services in profit centre calculations.

6.2 *Extension to other services*

The model may be extended to other services by studying the cost centres specific to each such service in addition to those already described above. The purpose of the study will be to identify, within each cost centre, both the share and the method of allocating each centre's costs to the service in question.

6.3 *Allowance for the consumption of telecommunication services*

Allowing for the telecommunication services consumed by the operator consists of:

i) identifying the consumption and expressing it in the same units as those used for outside customers;

ii) dividing the costs assigned to the profit centres defined above into administration-related costs (Ca) and outside customer-related costs (Ce), for example pro rata to the different levels of consumption;

iii) correcting the costs assigned to each profit centre by the following formula:

$$C(i) = CR(i) \times \left[1 + (*s\, Ca(j)\ \}\ \text{over}\ \{\ (*s Ce(j)) \right]$$

where i is profit centre, i, and j is the full complement of profit centres studied.

The final cost obtained, $C(i)$, is then compared with the products covered.

CHAPTER 7 — CONCLUSIONS

7.1 The authors have endeavoured to offer the developing countries a theoretical model for determining tariffs, albeit one which each country will still have the arduous task of adjusting to its own specific situation. There are two essential conditions to be met before this can be done.

7.1.1 The first is to obtain reliable and sufficiently detailed information on the past and present situation of the undertaking. Data derived from a well-organized management cost accounting system are of the utmost importance, as of course is general information relating to the number of subscribers and to traffic.

7.1.2 The second is to acquire some insight into future developments. Ideally, tariffs are set for several years and it is therefore useful to have even a rough idea of how the situation will develop over that period, in order to make the arrangements for simulating the application of planned tariff measures.

7.2 The collection of information on the past and future situation of the undertaking is not usually part of the tariff expert's specific duties. If no adequate system exists for collecting such information, the first task must be to create or develop one. This is a prerequisite for the establishment of balanced tariffs which will place or maintain the undertaking on a sound economic footing.

Blanc