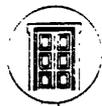
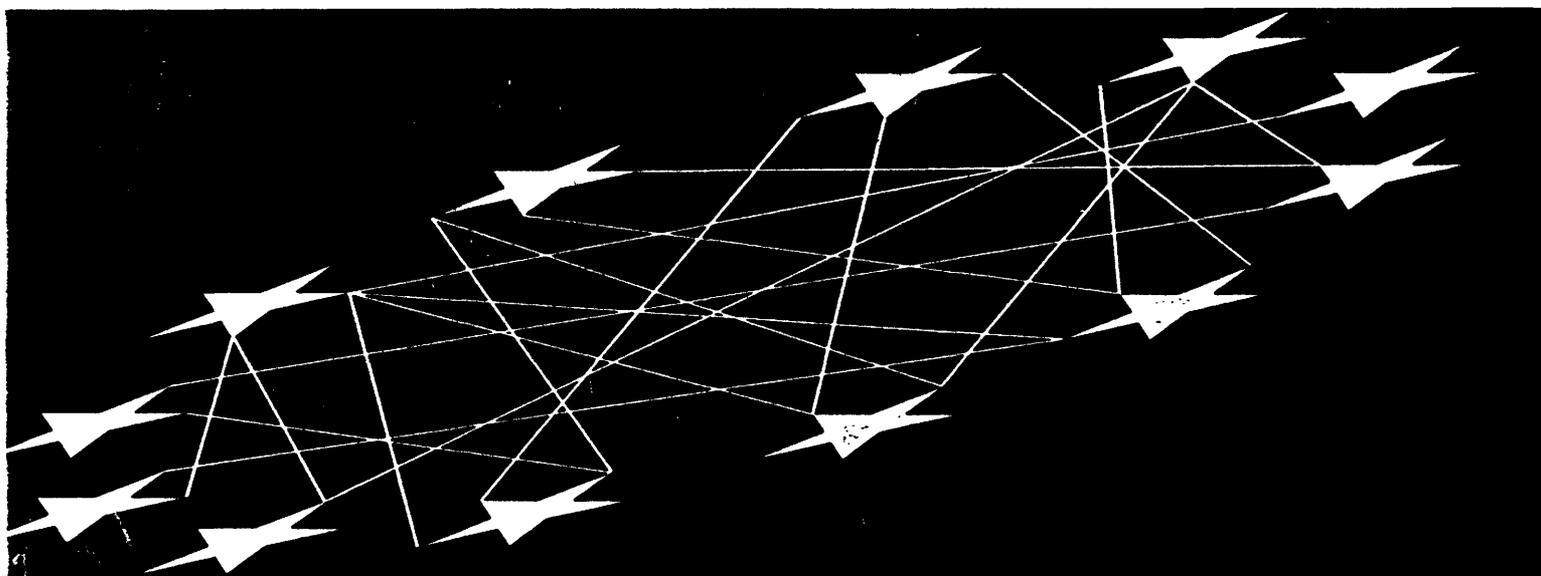


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**Study prepared for the
Commission of the
European Communities,
DG XIII**



A study on cost allocation and the general accounting principles to be used in the establishment of interconnect charges in the context of telephone liberalisation in the European Community

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1. PREFACE

Scope of Study

In response to the specific terms of reference provided by the Commission the final report presented is the compilation of a 6 month study undertaken by Arthur Andersen, with the assistance of Antelope Consulting and Ovum Limited between March and October 1994 for the Commission of the European Communities DG XIII.A. The study covers only the twelve existing Member States¹.

The scope of the study comprised the following aspects:

- Identification of specific issues relevant to questions of cost allocation and the choice of cost accounting methods in Telecommunications Operators (TOs)
- Details of existing cost allocation and cost accounting methods of the Community operators
- An assessment of the way in which interconnect charges should be formulated and established
- An assessment of the way in which universal service costs and any other social costs should be taken into account when establishing interconnect charges
- An assessment of the way in which efficiency should be promoted in the determination of interconnect charges
- Elaboration of cost allocation and cost accounting methods, compatible with existing national practices, which would be necessary for implementing an efficient scheme for establishing interconnect charges. This was limited to the overriding principles and did not require identification of detailed cost allocation rules or cost accounting principles.

¹ Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK.

The study was carried out through interviews with interested parties and original research of interconnect regimes in place worldwide, and takes account of the considerable advances made by the Commission in earlier studies.

The data in this report is correct as at the time of the questionnaire responses and interviews. We appreciate that changes in opinions and aspects of the data may have arisen during the time since conducting the questionnaires and interviews. In particular we would like to note that SIP, our respondent from Italy, has recently undergone merger with Italcable, Iritel, Telespazio and Sirm to form a new operator - Telecom Italia.

Acknowledgements

The study team developed detailed questionnaires to gather information and these were circulated to the incumbent Telecommunications Operator (TO) (former monopolist PTO) and the National Regulatory Authority (NRA) in each Member State together with a number of actual and potential competitors and interconnecting operators. We would like to thank all the personnel at these organisations who gave of their time to complete the questionnaires and attend the follow up interviews. A list of the organisations surveyed by questionnaire and/or interviewed in connection with this study is set out below.

COUNTRY	OPERATOR/REGULATOR NAME	INTERVIEWED	QUESTIONNAIRE COMPLETED
Belgium	Belgacom	√	√
	Belgian Institute for Post and Telecommunications	√	√
Denmark	Tele Danmark A/S	N/A	√
	Telestyrelsen	N/A	√
France	France Telecom	√	√
	Direction Générale des Postes et Télécommunications	√	√
Germany	Deutsche Bundespost Telekom	√	⊙
	Federal Ministry of Post and Telecommunications	√	√
	Mannesmann Mobilfunk	N/A	√
Greece	Ministry of Transport and Communications	x	x
	Hellenic Telecommunication Organisation (OTE)	x	x

Ireland	Telecom Eireann	√	√
	Department of Transport, Energy and Communications	√	√
Italy	SIP (now part of Telecom Italia)	√	√
	Ministry of Post and Telecommunications	x	x
Luxembourg	Enterprise des Postes et Télécommunications	√	√
	Ministry of Communications	√	√
Netherlands	PTT Telecom BV	√	√
	HDTP	√	√
Portugal	Portugal Telecom	N/A	√
	Ministry of Transport and Communication	x	x
Spain	Telefónica de España, SA	√	√
	Directorate Generale de Telecomunicaciones (DGTel)	√	√
United Kingdom	British Telecom	√	√
	Mercury Communications Limited	√	√
	Vodafone	√	√
	Cellnet	√	√
	Mercury one-2-one	√	N/A
	Colt	√	N/A
	Energis	√	N/A
	Cable Television Association	√	N/A
United States of America	AT & T	√	N/A

x These organisations were invited to participate in the study but unfortunately had to decline due to other constraints on their time

① The Questionnaire was completed by Arthur Andersen from information gained in the interview.

Further Information

The study was conducted by a European wide team of professionals under the direction of John Ormerod. Any queries on the contents of this report should be directed in the first instance to John Ormerod, Nick Owen or Morten Singleton on 44-71-438-3622, 44-71-438-3058 or 44-71-438-3000 respectively.

2. EXECUTIVE SUMMARY

2.1 Introduction

The provision of telecommunications services has historically been considered a natural monopoly. As a result of technological advances most telecommunications experts now are of the opinion that monopoly conditions are theoretically only likely to arise in specific segments of the local loop, if at all. In parallel with these technological advances, regulatory developments and changing political factors have motivated the consideration of introducing competition into telecommunications in many countries. Following the Review of the Telecommunication Services Sector the European Community has set the liberalisation of all voice telephony services as a major long-term goal.

Competition in network industries can either take the form of service based competition over a monopolist's network or there can be infrastructure and service based competition where competing networks add a further dimension to the competitive environment. In either case liberalisation will require the interconnection of competing networks and service providers to ensure "any-to-any" service is provided in an economically efficient manner. Such interconnection necessitates the establishment of principles for determining, on an ongoing basis, the charges that must be levied by one network operator to another network operator or service provider for the interconnect services demanded, i.e. the interconnect charge.

In newly liberalised environments, there are no market prices for interconnect services. Furthermore, where networks are owned by organisations that are competing against firms needing to interconnect with the same network, there is a risk that anti-competitive behaviour will result. It is essential to establish the framework for interconnect charges otherwise there is a risk that many of the potential benefits to the Community of competition will be delayed or lost.

The Commission's response to this has been that the basis for establishing interconnect charges should be an assessment of the costs incurred by the operator providing interconnection facilities, i.e. that interconnect charges should be "cost orientated". This requires the establishment of principles for determining the costs of efficiently providing interconnect services, including the costs of providing universal service where such an obligation exists.

The purpose of this study is to recommend cost accounting practices and cost allocation methods compatible with existing national practices to support such an efficient scheme of interconnect charges. This study therefore looks at the cost accounting issues of relevance to Telecommunications Operators (TOs) and the existing cost accounting practices of Member State operators. It then provides recommendations on how interconnect charges should be established and formulated, how universal service obligations and efficiency should be promoted through the interconnect regime and finally considers the cost accounting practices and cost allocation methodologies that should be adopted to support such charges.

2.2 Cost Accounting in Telecommunications Operators

The Need for Cost Accounting Systems

Organisations adopt cost accounting systems that provide cost information that users require. The relative values placed upon different types of information by different users will be reflected in the cost accounting systems that organisations adopt. These influences are not static but are dynamic, changing to meet the new requirements of information users as the organisation, its competitors and the commercial and regulatory environments evolve.

There are a number of different interest groups, or stakeholders, in any organisation. Broadly they can be divided into two groups - external and internal. The demand for cost information from management, the principal internal stakeholder, arises for a number of reasons including the desire to make the total business more manageable by breaking it down, to introduce incentives for efficient production, and to provide relevant cost information for pricing decisions etc. Each purpose may require different cost information and each may be slightly different to the cost information required for external financial reporting.

Where competitive commercial pressures do not necessitate management to seek this internal cost information, costing systems often develop to support external financial reporting requirements. US-UK comparative research, undertaken by Arthur Andersen, of the changes that take place when network utility industries are opened to competition concluded that the challenges created by emerging competition necessitate significant cultural and management changes, not least of which are those concerned with service cost and profitability measurement and management.

Cost Accounting as a Regulatory Concern

The role that cost information plays in the regulatory environment may influence the cost accounting systems of TOs as a result of the demands placed upon such systems by regulatory reporting requirements. Costs have traditionally, and will continue to be, an important feature in "utility" regulation.

The approach taken to consumer protection by the NRA, be it "rate of return" or "price-cap" regulation, will influence the demands placed upon the TO's cost accounting systems. Whilst the latter has better incentive effects on the total cost base of a monopolist provider it does not ensure the production of robust service cost information, a feature more commonly associated with rate of return regulation prescriptions.

The requirements of a TO's cost accounting system will therefore be influenced by the changing regulatory environment. One should not presume that with the introduction of competition the responsibility and workload of the regulator will automatically reduce. Indeed, during the transition from monopoly to competitive markets the regulator's requirement for cost information may become more onerous, until the competition becomes established and market forces provide the necessary checks.

The more active roll envisaged for the NRAs, particularly in refereeing the unbundling of tariffs, developing the cost methodology, and overseeing its implementation will require additional resources and funding if it is to achieve these policy aims.

Cost Standards and Costing Terminology

Different cost standards have different uses. Any analysis of cost information should be carefully reviewed to ensure it meets the user's requirements. No single cost standard can provide all the information an organisation needs.

It can be argued that efficient resource allocation and consequent economic efficiency results if prices are set equal to marginal cost (MC). However, MC is impractical to measure due to the difficulty of analysing unitary changes in output. This problem can be overcome if long run incremental costs (LRICs) are used. LRICs take a longer term view of the changes in cost that arise and therefore allow both volume sensitive and non volume sensitive fixed costs to be incorporated into a cost standard that remains marginal in concept, and therefore also promotes efficient resource allocation and economic efficiency.

However, both the MC and LRIC standards have a serious shortcoming. Neither takes account of residual joint and common costs nor of the historical financial position of the organisation. Therefore if prices are set equal to the LRIC an organisation is unlikely to be financially viable in the long term. Instead prices must be set at a premium, or margin, above the LRIC, such that across all services the margin allows a recovery of the residual joint and common costs, and provides a return that covers the legitimate past expenditure of the organisation, and allows it to remain financially viable.

Whilst there are some theoretical economic principles for developing prices based upon concepts of incremental cost, such as the Ramsey Pricing Rule and the Efficient Component Pricing Rule, both have practical shortcomings that render them less useful.

Fully Distributed Cost (FDC) is an historical cost concept that distributes all of an organisation's costs to products and services. If used in pricing decisions this will ensure that the firm remains financially viable, but many economists have argued that the use of arbitrary cost allocations within the FDC system results in sub-optimal decisions and therefore inefficient outcomes. The degree of arbitrariness in cost attribution and allocation can be significantly reduced with the use of cost causal attribution and allocation methodologies, such as Activity-Based Costing, and therefore the criticisms of FDC for use in pricing decisions can to some extent be mitigated.

Embedded Direct Cost (EDC) is an historical cost contribution approach that attributes the actual direct historical network expenditure to individual services. In this way prices can be set such that the margin above EDC is sufficient to recover all historical residual joint and common costs and to ensure that the organisation remains financially viable in the longer term. EDC contribution analyses are appealing to regulators and TO management because they "tie into the books" and explain recent, albeit past performance. They allow management to obtain a detailed

understanding of the relative contributions of individual services and highlight revenue and cost imbalances. They also provide a rigorous basis for setting prices which ensures that revenues will fully recover legitimate expenditure made in previous years.

A final drawback of both FDC and EDC, even when enhanced by the use of Activity-Based Costing, is that they are based upon the existing physical network engineering capacity and existing business processes and work practices. They take no account of technology changes, potential efficiencies in business processes and work practices, and include large elements of cost which are "sunk" or unavoidable in cost determination.

Some words about Cost Allocation

In considering any cost standards for use in pricing decisions it is important that operators and regulators alike ensure that they both understand and satisfy themselves that appropriate decisions have been taken in the cost attribution and allocation process.

There is considerable flexibility in developing cost attribution and allocation principles. Having decided upon the principles there is considerable further flexibility in the detailed basis of application. The telecommunications industry is characterised by a very high proportion of the cost base having no direct relationship to the service offerings. Consequently, complex decisions are required on extensive and subjective cost attribution and allocations.

Ideally a rigorous and detailed cost methodology should be published in sufficient detail for an independent observer to understand all the judgements that have been made.

2.3 Existing Cost Accounting Practices and Cost Allocation Methods of Community Operators

Background

The national geographical and demographic factors as well as the ownership structure, competitiveness of the marketplace, and the external and regulatory reporting framework of the individual Member States have all influenced the level of costs and the development of costing practices in each Member State's incumbent TO.

Given the genesis of most of Europe's TOs in state-owned monopolies and the relatively recent formulation of independent companies in many Member States, their existing cost accounting systems reflect the historical demands that were placed upon them. These are unlike the demands made upon the cost accounting systems of competitive commercial organisations. Accordingly, their cost accounting systems are often not as well developed.

Financial Reporting Requirements

Historically, many of Europe's TOs were managed to a state imposed budget and they were required to account on a cash basis for transactions. The costs of

individual products and services was not a significant issue for either managers or policy makers. As long as total revenues were in excess of total costs by an amount sufficient to fund investment, and to provide a contribution to state treasuries no-one focused on the relative profitability of different services.

More recently, many of Europe's TOs have been established as independent companies, but more often than not, majority ownership has at least initially remained with the state. Whilst this has necessitated the adoption of accruals accounting, the rigour and detail with which it is applied is greatly influenced by the ownership structure, regulatory demands and the degree of liberalisation and consumer pressure.

In most Member States the cost accounting systems of the incumbent TOs are significantly less well developed than one would find in competitive commercial organisations. Most incumbent TO's accounting systems have developed to a large extent to support external financial reporting requirements. While most TOs perform some form of internal management cost reporting this is often predominantly sourced from the external financial reporting system and is unlikely to be of sufficient rigour and detail to provide 'accurate' service cost information.

The rigour and detail employed by TOs across Europe to meet their external reporting requirements is also variable. Most of Europe's TOs have to produce annual financial statements that adhere to the requirements of Generally Accepted Accounting Principles (GAAP) and other relevant legislation. This has been broadly harmonised by the implementation of the EC 4th and 7th Directives which have been adopted throughout the community. However, the costing and other systems developed to support these requirements vary considerably. For example, there are a number of incumbent TOs that have not, until comparatively recently, or do not currently, maintain a full detailed fixed asset register.

The role of the NRA varies across the community. Some NRAs have only recently been established, but all are now separated from the operator. Generally, outside the UK the regulatory environment is in the early stages of development. The level of understanding amongst Member State NRAs of the cost accounting issues associated with interconnection is varied, with many NRAs requiring significant improvement to be effective in their roles. It is apparent that many NRAs are approaching interconnect without an adequate understanding of the costing issues. This may temper effective regulatory oversight in developing cost orientated interconnect charges.

Regulatory reporting requirements vary considerably across the community with consequent variation in the demands placed upon TO's cost accounting systems. Where binding requirements exist in the law or the licence the TO's cost accounting system has to be capable of compliance. However, some NRAs use ad-hoc reporting requests for information which restricts, rather than facilitates the development of the TO's cost accounting capabilities.

In some Member States the regulatory role appears to be blurred with that of an investment monitoring role. There is clearly significant potential for conflicts where such a situation exists. Such inherent conflicts of interest need to be resolved if the

industry is to gain confidence in the ability of the NRA to provide impartial regulation.

Internal management information has not yet reached the levels of complexity, detail and flexibility more common in competitive commercial organisations. Internal reporting increasingly focuses on the customer and efficiency which will in turn encourage the development of more sophisticated cost accounting systems.

Few incumbent TOs produce highly segmented reporting. Generally, the TO's segmental reporting capability is not as detailed as will be required for setting accurate cost orientated interconnect charges.

In competitive operators more rigorous and detailed segmental information is maintained. Incumbents generally, however, have indicated a keen interest in obtaining additional and more rigorous information where this is not currently available.

Both operators and NRAs anticipate dramatic changes in reporting requirements which will in turn require significant development of the TO's cost accounting systems. The competitive forces which would encourage such developments may be enhanced by NRA involvement to increase the pace of change.

Cost Standards

The cost accounting systems of the incumbent operators all currently utilise the FDC cost standard. Some incumbents professed themselves unaware of incremental costs and their suitability for pricing decisions but those who are familiar with this cost standard appreciated how useful it might be. In contrast, operators in competitive markets demonstrated a greater awareness of the alternative cost standards to FDC and utilised those standards more extensively. FDC is also not held in such high regard by them as it is by incumbent operators in less competitive markets.

NRAs generally indicated less awareness of the issues in the choice of cost standards than the TOs. However, to some extent this may be explained by a reluctance to comment where cost standards are currently under consideration. Generally, however, NRAs are proponents of the FDC or equivalent standards due to the ability to verify the costs by independent audit.

Existing Member State interconnect agreements reflect the fact that all incumbent operators utilise FDC based cost accounting systems. Only in competitive markets are alternatives advocated, such as Mercury Communication Limited's preference for incremental cost based interconnect charges in the UK.

Few TOs indicated any willingness to revise the cost standard used in their cost accounting system. NRAs were silent on this issue.

Cost Accounting Systems

Most TOs agree that direct costs make up a minimal proportion of total costs. Much of the service cost calculation is therefore dependent upon the attribution and allocation of shared costs. There are large differences in the level of detail and nature of cost data captured, collected and analysed into cost pools between TOs. (For

example fixed assets are categorised differently and depreciated at different rates). Generally it was evident that more detailed and rigorous processes were conducted by operators in competitive markets.

Similarly there were large differences between approaches to the capitalisation or expensing of cost items in each Member State. This might seem surprising given the expected harmonisation intended by the implementation of the EC 4th and 7th Directives in all Member States but it reflects the range of alternatives permitted under Member States' accounting standards.

The cost attribution and allocation methods used by Community TOs also varied in the levels of allocation and the methods used. The principles of Activity-Based Costing are becoming increasingly well known although its practical application is currently fairly limited and restricted to a relatively high level.

Most TOs view their cost accounting systems as continually evolving to meet the needs of internal and external information users.

Cost and Tariff Imbalances

Large imbalances exist between service costs and tariffs in all Member States (except Denmark), both geographically and by service. TOs and NRAs do not generally expect geographical de-averaging to take place in the future. Geographical de-averaging of tariffs is a politically sensitive issue and should therefore be tackled appropriately.

Service cost and tariff rebalancing would eliminate the local access loss. Many TOs and NRAs are considering service rebalancing (at least partially) which will reduce the magnitude of the local access loss.

Interconnect

Outside the UK, existing network operator interconnection is generally only extended to a related party mobile operator, or a second mobile operator. Most interconnect charging is currently tariff orientated as opposed to cost orientated. However, there are encouraging signs of TO's intentions to collect and measure the costs associated with interconnect in the future. This does not yet extend to an understanding of, or intention to cost, unbundled services. TOs outside of the UK have not addressed in detail the issue of what unbundled services should be available in interconnect.

Universal Service Obligation (USO)

Most TOs and NRAs are unable to provide a sufficiently detailed definition of the USO to allow it to be costed, and do not, as a general rule, calculate the cost in any detailed way.

Deliberately or otherwise, most incumbents confuse the definition of the USO with that of the Access Deficit and as such are overestimating the magnitude of the cost of the USO.

2.4 Formulation and Establishment of Interconnect Charges

Factors Influencing Interconnect Charge Formulation

The diversity of interconnect regimes around the world demonstrate that a number of factors can influence the formulation and establishment of interconnect charges. For example:

- The structural separations introduced into the telecommunications sector at the time of liberalisation;
- The government's objectives for future industry structures;
- The timetable over which the goals of liberalisation need to be achieved;
- The degree of tariff imbalances in existing retail tariffs;
- A consideration of the political repercussions of certain courses of action.

The formulation and determination of interconnect charges will be one of the most significant determinants of how efficiently the industry uses its scarce network resources. It will also influence how closely retail prices reflect the true underlying economic costs of service provision, and thus how rapidly incumbent operators improve their efficiency and the market responds to changing consumer needs through service innovation. The need for the NRA in each Member State to become involved in the establishment and regulation of interconnection and particularly the agreement of cost orientated interconnect charges required to allow the use of monopoly assets is therefore inevitable.

Costs and Tariffs

Most European incumbent TOs are at present still operating as at least dominant players in most of their businesses, and most have a monopoly over the provision of voice telephony services. As a result, their tariff structure has arisen to a great extent as a result of their genesis in the public sector and this has led to a number of inherent cross subsidies.

These cross subsidies arise as a result of obligations and/or tariff constraints imposed by the regulatory authorities. These have an economic consequence on the incumbent and many argue that these obligations and/or their funding should be shared amongst competing operators, perhaps through the interconnect regime. There are two significant cross subsidies that need to be considered particularly, Universal Service Obligations (USOs) and the Local Access Loss.

The USO arises where operators are required to provide socially desirable but uneconomic services (e.g. pay phones) or to serve groups of uneconomic customers (e.g. the deaf, the socially disadvantaged, remote rural subscribers). There is clearly a cost in the provision of these services and as markets are liberalised regulators need to decide whether the obligations and/or their funding should be shared.

Also as a result of their genesis in the public sector in most Member States TOs have tariff imbalances for particular services. The most important, and that articulated by

most TOs is that they make a loss on the provision of local access due to pricing below cost, and that this is funded through above cost call tariffs. Whilst the origin of this local access loss may have been as a result of early USO policy, most customers giving rise to a local access loss are not USO customers. When viewed together with the revenues generated from incoming and outgoing calls many of these subscribers are economically profitable. Therefore such tariff imbalance costs as the local access loss should be considered separately from the USO.

Unless tariffs are rebalanced to closely reflect underlying cost, such imbalances could give rise to real costs to certain operators. For example, if the incumbent TO provides residential access but a new entrant carries that subscriber's long distance call traffic the incumbent will lose the opportunity to fund its local access loss through higher long distance call charges. This is the logic behind requiring new entrants to make a contribution to the local access loss, such as the Access Deficit Contribution (ADC) regime in the UK.

Our empirical research demonstrates that there is a great deal of misunderstanding throughout Europe with many people using the terminology "Access Deficit" synonymously with the cost of USOs. What should be appreciated is the two are fundamentally different in their cause and underlying economics and significantly different in quantum, and therefore need to be considered separately.

Formulation of Interconnect Charges

In formulating cost orientated interconnect charges a number of elements to the interconnect charge can be identified. There are two principal elements that relate to costs that arise as a result of one party buying interconnect services from another. These are the Connection Charge and the Conveyance Charge.

If a policy decision is taken to share the provision of and/or the funding of costs arising in relation to obligations imposed by the regulator (as identified above) via the interconnect regime, a further two charge elements can be identified. The first of these will reflect tariff imbalances - i.e. the Local Access Loss Charge, and the second will reflect the cost of USOs - the Universal Service Obligation Charge. The need for the local access loss charge will obviously be removed if NRAs remove the constraint on incumbent TOs rebalancing their tariffs.

Unbundling

In setting cost orientated interconnect charges it is also necessary to address the question of what it is that interconnecting operators should charge for, and what it is they demand. To date interconnect regimes have been set up for the provision of bundled interconnect services. More recently in the UK and the US, there has been a drive to unbundle interconnect services. This necessitates the separation of the service into the use of different network elements to ensure that interconnecting operators only pay for those network elements they use. Indeed, due to the different underlying economics of individual network elements it is not possible to achieve cost orientated charges unless charges are levied for unbundled elements.

Recent experience in the UK has shown that identification of the unbundled elements is not a simple task. However, one thing is clear, the identification of the

unbundled elements should not be left to the incumbent TO or the NRA alone. Participation by existing and potential competitors is necessary to understand what it is they wish to buy. In the UK Oftel's original consultation on interconnection started in June 1993. By March 1994, following a number of industry workshops, Oftel were only able to publish a preliminary list of services unbundled into individual network components. Finalisation of this list is yet to be achieved.

Establishment of Interconnect Charges

There is widespread consensus that operators should be allowed freely to negotiate the detail of interconnect terms and conditions. However, there is clearly asymmetrical power in such negotiations in favour of the incumbent TO. Therefore regulatory intervention in setting the framework for interconnection would appear to be essential. The NRA has a vital role to play to ensure that interconnect agreements promote fair competition. This can only be achieved if new entrants can rely for their bargaining power on a regulatory regime which sets the framework and objectives that interconnect agreements are considered in, and provides a process for dealing with disagreements. It is also the responsibility of the NRA to ensure that interconnect agreements promote economic efficiency and are therefore in the national interest.

To achieve these goals, the NRA must establish an interconnect framework that allows transparent interconnect charges which are both efficient and sustainable. The interconnect regime must ensure that there is no undue discrimination and that sufficient information is available to ensure competitive new entry and market efficiency result. Accounting separation is widely accepted as a method of supporting this objective, although the practicalities of its implementation would require industry consultation.

Whilst we acknowledge the principle of subsidiarity it will be an opportunity lost if these principles are not agreed in sufficient detail at a community level. The Community as a whole may suffer if their establishment is left to individual Member State NRAs and the inevitable delays that would result.

2.5 The Universal Service Obligation and Interconnect Charges

We understand the Commission's underlying aim is to ensure that the economic benefits of competition within the European telecommunications sector are achieved without foregoing the social benefits which have historically been available through state run monopolies, and their implicit cross subsidisation of such social policies.

The empirical research in this study shed very little new light on this subject and accordingly this report sets out preliminary ideas, mainly derived from the existing expertise of the study team members, reviewed jointly in the light of the other findings of this study.

Compatibility of Competition and Universal Service

There are many who have argued that the introduction of competition endangers universal service policy goals because it will lead to the end of cross subsidies inherent within existing tariff structures, to the detriment of many ordinary customers. Whilst there is some strength in this argument, the contrary position is that as long as regulatory oversight is exercised to ensure price rebalancing takes place at a reasonable rate, and that vulnerable subscriber groups who could suffer from rebalancing are safeguarded, subscribers will benefit from liberalisation. In fact there are some strong and compelling arguments why, properly regulated, competition can in fact benefit universal service, and indeed may form part of a future definition of universal service.

What is the Universal Service Obligation

Whilst the concept of universal service is clearly understood throughout Europe there are number of definitions available, none of which are sufficiently articulated to allow accurate costing. In a report to DG IV, Cave, Milne and Scanlan define the USO as "services that are supplied to customers or groups of customers at a loss, even when the firm supplying them is operating efficiently and its past investment has been based on sound business decisions". Obviously this should not include those customers that in hindsight are loss making but only because the TO has failed to exploit their potential. Further, they have identified four different policy perspectives that may relate to universal service.

It is apparent that, depending upon the stage of telecommunications development in a particular Member State, different policy perspectives may predominate, thus affecting the definition, interpretation and cost of the USO in each circumstance. For example in stages of early development, universal service goals will primarily be related to the achievement of universal geographic coverage. In high income countries, where household penetration is likely to exceed 90%, universal service goals are largely likely to be accomplished for basic service and the principal policy objective then becomes providing targeted subsidies to prevent subscribers leaving the network as a result of tariff rebalancing, and to encourage marginal non subscriber groups to subscribe.

In most Member States it is possible to generalise that the primary goal of the universal service policy is now social, and we should therefore regard universal service as a social requirement of the telecommunications industry. Similarly allowing freedom to rebalance the different revenue components to better reflect the underlying costs is overall in the national interest of each Member State and should therefore be encouraged, subject to suitable consumer safeguards.

It should be noted that incumbent TOs in certain Member States have onerous public service obligations e.g. France, Belgium. These are not the same as universal service obligations but are similar, in that they impose upon the incumbent a cost e.g. the cost of provision of a telephone service free of charge to the government. In the short term these costs can be dealt with in the same way as USO costs, but the long term objective should be to remove from the industry the burden of funding such obligations.

Responsibility for Universal Service

Whilst universal service policy objectives are clearly the domain of the NRA in each Member State it has traditionally been the "responsibility" of the incumbent to meet and fund such costs. As markets liberalise it is likely that this could lead to some sub-optimal incentive effects whereby the incumbent operator incurs, or claims to have incurred, more than economically efficient costs in meeting its obligations. This is likely to present problems as operators and regulators try to agree if and how the cost of such obligations should be funded in a liberalised environment.

In this report we have assumed that by the time European Member States liberalise their voice telephony services, networks will have achieved wide geographic coverage and that universal service policy objectives will largely be restricted to targeting subsidies to disadvantaged groups and to prevent people leaving the network following rebalancing. If liberalisation occurs before a Member State has reached this stage, the cost of the USO is likely to be greater to ensure widespread geographical network coverage. Given the current liberalisation timetable we do not anticipate that this will happen, but if it does the obligation for wide geographical coverage can be accommodated in the same way as other targeted subsidies, by a franchise approach. Indeed liberalisation in this way may speed up universal service provision. We also assume that by the time voice telephony is liberalised service cost and tariff imbalances in Member State tariffs will have been eradicated through progressive tariff rebalancing. If they have not, local access losses will still be recorded by incumbent operators and the associated cost will need to be funded. The point to note is that this is not included within the cost of USO.

Establishing and maintaining the social requirements of universal service policy will become an iterative process involving the following steps. Firstly the NRA through wide consultation and debate should determine what "non commercial" (USO) services society requires of the telecommunication industry. Each TO should then be invited to offer such services on a voluntary basis. Remaining unfulfilled requirements should where appropriate be made the subject of competitive bids, such that TOs could bid to fulfil all, or part of, a requirement and contracts would be awarded on the basis of a fuller evaluation of these bids. The services thought unsuitable for competitive bidding, or for which no bids are received, would then be imposed as an obligation on whichever TO, or TOs, appears to be best placed to fulfil them efficiently. This means it will not always be the incumbent TO, although in the early stages of liberalisation this is more than likely. Where such unilateral imposition imposes an inequitable cost burden upon TOs they could then appeal to the NRA to share the funding of the obligation. Our empirical research shed very little new light on the actual cost of meeting USOs in each Member State. In part this was because the "cost" may be variously interpreted as either total cost or net cost taking into account call revenues, or lifetime cost as opposed to specific period cost, and in all cases, can be calculated either on an avoidable, fully distributed or incremental cost basis.

Cost of Universal Service

Logically the most satisfactory definition of the cost is one that takes account of the net current annual cost for all lines which prior to connection, the TO would choose, or have chosen, not to connect. There is a normal commercial decision to cultivate

currently unprofitable or marginally profitable customers for their future prospects (e.g. student bank accounts) and whilst future prospects are of course never certain it is usual to accept some risk. Therefore not all unprofitable customers would fall to be defined as USO customers. Since only a minority of customers are likely to impose a net USO cost (after taking account of call revenues), it is reasonable to estimate the cost of service provision to these "uneconomic" customers on an avoidable cost basis, i.e. to calculate what cost would be saved if these customers were taken off the network or not connected.

The net cost of USO as defined above is likely to vary significantly depending upon the level of network development. In high income European countries with well developed networks the avoidable cost of removing a subscriber from the network is likely to be very small, whereas at the very early stages of development when network roll out is a high priority the avoidable cost of adding subscribers to new areas are much more significant. A recent report by Analysys for the Bangemann Group has estimated the cost of USO before and after proposed tariff rebalancing and concluded that excluding Greece and Portugal, where networks are less well developed, the USO costs range from 0.5% to 5% of revenue prior to rebalancing and 0.25% - 3.7% after rebalancing. Having examined the available data on the cost of USO in advanced economies we observe that any method based upon TOs cost and revenue records can produce a number of different answers. If, however, avoidable costs are used and incoming call revenues are taken into account, such costs shrink dramatically.

Funding of Universal Service

Where an operator believes the unilateral imposition of universal service obligations upon it is unfair because the avoidable cost is incongruous with its status and competition policy objectives it could appeal to the NRA for shared funding. After the NRA has vetted the avoidable cost calculated by the TO, they may agree to some form of shared funding of the cost.

Whilst it may be convenient to use interconnect agreements as the vehicle for such income transfers to help fund social obligations the relevant cost will not generally vary in proportion to any dimension of interconnect, be it either capacity or call minutes, so it is not clear that they should be added to the existing elements of interconnect charges. Generally they may be better relegated to a separate item in the interconnect agreement in their own right, and recovered as a USO levy on the industry in a competitively neutral manner, perhaps based on revenue. These proposals are consistent with current work being done in the USA on a so called "Net Trans systems for Universal Service Support".

2.6 Promotion of Efficiency Through Interconnect Charges

There is widespread belief that the provision of voice services by the incumbent operators of Europe is currently inefficient. The primary driving force for liberalisation is the desire to increase the static technical and allocative efficiency of the industry together with its dynamic efficiency. This will improve the efficiency of use of network resources, the use of resources by the economy as a whole and the efficiency with which the industry responds to market needs respectively.

Efficiency of Incumbent TO

Interconnect charges themselves are probably not best used as a direct means for influencing the operational efficiency of incumbent TOs, due to the immaterial effect that interconnection is likely to have on the incumbent TOs cost structure in the short-term following liberalisation. The only way to achieve lasting efficiency improvements is to open the telecommunications sector to the forces of competition, and in this way interconnect charges can be used indirectly to promote efficiency if they are set at a level that enables competitive entry, and reduces the perceived barriers to entry.

Competition can establish new levels of operational best practice, putting pressure on costs, driving modernisation programmes and thereby increasing both the static, technical and dynamic efficiency of the market. The price rebalancing resulting from competition will improve allocative efficiency and the pressure on profitability will increase dynamic efficiency further.

Efficient Market Entry

NRAs must, however, balance the desire to facilitate competitive entry by setting low interconnect charges with the risk of inefficient market entry based upon short-term arbitrage opportunities that do not offer economically sustainable businesses. If this occurs, there will be a loss of static technical efficiency which, if prolonged and taken to an extreme, could outweigh the benefits achieved from liberalisation. This is certainly a danger when the interconnect charges are set equal to any marginal or incremental concept of cost. As previously discussed, to encourage only efficient market entry interconnect charges should account for more than the incremental cost of interconnect calls. They should also contribute a proportion to all residual joint and common costs, even where these cost are sunk, and they should be calculated over a reasonably large increment and long time frame.

NRAs could well argue that the dangers of inefficient market entry are small when compared with the benefits of enhancing the efficiency of the incumbent TO through competition. The optimal output is likely to be achieved only if NRAs balance the desire to promote competition and the risk of potentially inefficient market entry.

Inefficient market entry could also result from cross subsidies within existing telephone tariffs. In virtually every Member State there is a cross subsidy where call revenues fund local access losses. The most efficient means of dealing with this situation is for tariffs to be rebalanced to remove the local access loss. This will enable prices to reflect the real cost of provision and thus encourage use of the telephone network only where it is cost effective to do so. The only economic argument against this cost orientated tariff, is that high access prices might discourage new network subscriptions and thus reduce the number of people any individual telephone user is able to contact. The balance between these two arguments depends upon the level of penetration of the national telephone network, but in most Member States penetration is already high and it would seem likely that the local access loss is not serving any economically useful social purpose. It would be much more preferable to allow tariff rebalancing, with safeguards to ensure that there is no market "shock" and that vulnerable subscriber groups are protected. If, however, tariff rebalancing to eliminate the local access loss is not possible it will be

necessary to build a contribution to the local access loss into the interconnect regime or find an alternative method for shared funding.

Charging Method

If interconnect charges are based upon retail tariffs of the incumbent, the new entrant is severely restricted in its ability to offer any innovative tariffing schemes, and "me too" pricing and service offerings will result. This will create dynamic inefficiencies in the market.

If prices are to be based on cost the "pure" charging method would be to relate the interconnect price to the network capacity used for the majority of conveyance charge elements, since this reflects the real cost causation. However, the use of capacity charging tends to work against the new entrants and many may prefer an interconnect price based on calling levels. This is not the case where the new entrant becomes more established and can better forecast its capacity requirements.

Perhaps the best arrangement is to give the new entrant the choice of either the capacity or per call minute cost related interconnect charge.

Further, interconnect charges should be based upon unbundled network elements, as the differing underlying economics of different network elements will not allow cost orientation in a bundled environment. Whilst the cost associated with defining and identifying the appropriate unbundled network elements may be high in the long term it is likely that the cost will be more than justified by the benefits accruing to the industry.

Ensuring Efficiency Over Time

Whatever the cost basis for interconnect charges they should be formulated in such a way that allows the balance between encouraging competitive market entry and the requirement only to encourage sustainable market entry to change through time. This will allow the charges to mirror the changing competitive positions within the liberalised market place. The use of marginal or incremental cost based interconnect charges tends to foster efficiency in the incumbent, but may result in inefficient market entry. It may provide a good starting point for interconnect prices but if this approach is to be adopted it is important that an increasing premium is added to the incremental cost each year to ensure that the new entrants are adding to the overall efficiency of the market. Whilst the use of fully causally distributed cost will help to guard against inefficient market entry, it may well prevent competitive market entry and will tend to reduce the competitive pressure on the incumbent and thus may not encourage improvements in its efficiency. In this case it is important that there is downward pressure on FDC based interconnect price and thereby on the incumbent's cost base. It seems likely that some form of price-cap should be used, particularly where it is also being applied to retail tariffs.

Structural Asymmetries

Undoubtedly there will also be a whole range of other structural asymmetries existing in the market at the time of liberalisation (e.g. unequal access). Whilst the interconnect charge may be used to compensate new entrants for the structural

disadvantages any such method can only produce sub-optimal economic outcomes. The only way to remove this problem is to remove the structural asymmetries. In the intervening period prior to their removal a number of countries have found abatements to interconnect charges a useful method to encourage incumbent operators to remove structural asymmetries or to help new entrants offset their consequent costs.

2.7 Cost Accounting Practices to Support an Efficient Scheme of Interconnect Charges

There is clearly no *right way* to formulate and establish interconnect charges. Different interconnect regimes reflect different industry structures and the political and social objectives of these jurisdictions. Similarly they develop as the market develops and will never achieve the economically optimal solution but instead should be constructed to facilitate competitive market entry and thus obtain the benefits of liberalisation in a way that meets national political and social objectives, whilst striking a balance between the interest of incumbents and new entrants, for the benefit of consumers. Therefore whilst it is possible to evaluate the alternative approaches theoretically, the one adopted in practice is likely to be a theoretically sub-optimal but workable compromise. At a European level we can suggest principles that should be followed in establishing cost orientated interconnect charges that benefit from the experiences of other countries, and that these principles should be broad enough to have application across Member States.

Appropriate Costs for Setting Interconnect Charges

The only definition of cost that is relevant for pricing decisions is one that is based upon long run cost. This will allow the organisation to remain financially viable. However, there is an asymmetric distribution of information between the incumbent TO and competing operators and the NRA alike. Therefore to have confidence in the cost of providing interconnect the NRA must either calculate the cost himself using an historical cost or engineering cost study approach or alternatively set down the principles that should be followed by the incumbent TO in calculating these costs. The latter appears attractive but it should be recognised that too much discretion can be left with the incumbent if only broad principles are promoted by the NRA. Further, the NRA cannot avoid a detailed understanding of the incumbent's cost base if it is to ensure that regulatory investigations and questions of price-cost relationships are clearly understood.

Historical Vs Forward Looking Cost

Economic theory would suggest that the relevant long run costs are forward looking, and that prices should then be set to provide a premium or margin over the forward looking long run costs such that across all services this margin allows the company to and remain financially viable. In competitive commercial organisations prices are not set based on cost alone but are based on market forces. However, in practice approximations of varying accuracy to the forward looking costs are often made employing historical cost information. Whilst not always the case, this is because the cost of obtaining reliable forward looking cost information often outweighs the resulting benefits. Furthermore management are often keen to ensure that reported profits cover all historical costs. Our empirical research suggests that in the more competitive Member States TOs are beginning to develop a much better

understanding of their cost bases for management decisions. This is an expensive process which requires competition to provide the driving force.

Competitive markets stimulate the development of new management tools for success in the competitive arena. As competition becomes more intense the cost of not understanding forward looking costs will outweigh the cost saved by using "rough historical approximations". It is only the forces of competition that will drive TO management to develop the myriad of management tools they need to survive, such as a more sophisticated understanding of their customers and the segment and service line contributions achieved. It is the commercial need to have this information that will drive organisations to understand and manage their costs in a way that gets closer to economically efficient ideals. It is our belief that regulatory demands will never be able to deliver these responses in the way that a competitive market place can.

Furthermore, there are a number of practical problems with the implementation of forward looking costs. Most of the European TOs do not have a cost system that will produce the information in a robust manner. Whilst we predict that competition will force them to ascertain this information in the long run, information obtained by regulatory demand is unlikely to be satisfactory. The only remaining solution would be for the NRA to commission independent cost studies of the forward looking costs using engineering cost studies. However due to the asymmetry of information between the incumbent and others this would likely result in a sub-optimal outcome, and even if these costs were developed they would undoubtedly meet with criticisms from unconvinced competitors. Due to the lack of transparency between underlying cost and charges the regime would be difficult to defend. Finally, they are subjective in nature and therefore incapable of independent verification or audit.

Thus, whilst we believe that the correct cost basis for pricing decisions is one based upon forward looking costs it is unlikely that most of Europe's TOs could be required to produce this information given the characteristics of their existing costing systems. In the interest of expediency interconnect charges in a practical setting will need to be based on historical rather than forward looking cost, at least in the short run. Whilst not theoretically pure this will for the time being allow interconnect terms to be set in advance in a transparent manner which will be an "enabler" for market entry and therefore competition. Following liberalisation, as the interconnect market becomes competitive interconnect charges will be driven to reflect the forward looking cost by the competitive process.

Incremental Vs Fully Distributed Costs

The next question is to decide whether Incremental Cost (IC) or FDC should be used. Whilst not an economically pure substitute for forward looking LRIC, an EDC approach can be used as a rough approximation of incremental costs. This does not overcome criticisms relating to changing technologies and inefficient operations, but the application of rigorous cost causal principles, including the use of Activity-Based Costing techniques for cost attribution and allocation, can be adopted to get a workable substitute for the LRIC. Prices set equal to the EDC will not make a contribution to residual joint and common cost or allow the organisation to remain financially viable in the long term, therefore a margin should be added so as to allow recovery of these costs. This margin should not be so high as to ensure the

incumbent TO recovers all of its cost and therefore has no incentive to become more efficient.

The margin should be established through negotiation between the interconnecting parties. Where this does not give rise to agreement the NRA should determine the appropriate margin.

In the early stages of liberalisation the contribution to total revenue from interconnect services is likely to be small for the incumbent TO, but the cost to the new entrants is likely to be the single most important determinant of their viability. A workable compromise that encourages competitive market entry and also puts incentives on the incumbent to reduce cost through increased efficiency may be to set interconnect charges based at a margin above the EDC but below FDC. Thus there is a theoretical basis for setting interconnect charges based on this surrogate for incremental cost when first introducing competition and then migrating towards charges based on fully allocated costs as competition develops. Ultimately, in a competitive market the difference between the FDC and the LRIC plus "premium" will be small. If one accepts the EDC as a rough approximation to the IC it will allow interconnect charges to be based upon costs from the audited accounting system and will provide transparency in the relationship between cost and charges. Whilst not the most theoretically sound basis in the short term this will facilitate efficiency in the long term by permitting market entry and therefore put pressure on costs such that in the long term charges reflect the true underlying cost of service provision.

Formulation of Interconnect Charges

Having considered the cost standard to be utilised it is worthwhile refocussing attention on the formulation of interconnect charges.

A. Charges for Interconnection Services

A1. The Connection Charge. Of the interconnect charge elements this is likely to be the most easily identified and agreed by interconnecting parties, and consists of primarily capital costs that can be easily identified in a causal manner as a consequence of interconnection. Charges for connection should reflect the directly attributable costs of connecting the two systems. Charges should be one-off reflecting the non traffic sensitive nature of these costs, although a mixture of upfront payments and periodic fixed rentals may be agreed.

A2. Conveyance Charges. These charges should be for unbundled network elements. Conveyance costs cover:

- the use of the physical connection between the two networks to permit the transfer of calls from one network to another;
- the usage cost incurred when one operator utilises another operator's network to handle a call e.g. the provision of sufficient capacity for switching, transmission, and other network components;
- the variable supplementary and ancillary costs, such as call setup, monitoring and recording network activity, billing etc; and

- the overhead cost associated with the provision of interconnect services.

The costs and therefore the charges will have a number of sub components reflecting a combination of fixed Non Traffic Sensitive (NTS) costs, and variable Traffic Sensitive (TS) costs and also distance and non distance sensitive costs. The cost should be separately calculated for each unbundled network element and divided into those that are NTS and those that are TS, and those that are distance related and those that are not.

B. Charges for shared funding of obligations and tariff restrictions imposed by the Regulator

B1. Local Access Loss Charge. For an economically efficient outcome and a less problematic regime the local access loss is best dealt with by removing any restrictions upon operators from rebalancing their tariffs, provided universal service obligations are met by targeted subsidies.

It is understandable that with the potential threat that infrastructure competition in the local loop may have, many incumbent TOs do not find it attractive to lobby to lift the restrictions on rebalancing. If the restrictions were lifted they may well not raise prices as a result of this threat of competition, and this would result in their local access business still being loss making. One conclusion is to suggest that the book cost of the incumbent TO's investments in their local loops must be stated above their economic value, and that therefore they should be written down to allow a reasonable return to be made on providing access.

If neither rebalancing nor asset writedowns has been effected prior to liberalisation and losses are still incurred as a result of regulatory restrictions on price rebalancing then some form of shared funding of the local access loss will be required.

The problem then becomes one of ensuring correct quantification of the size of the local access loss. For new entrants to have confidence in the regime this will require an exposure of the incumbent's cost base and an accurate calculation and quantification of the local access loss.

The local access loss will not vary in proportion with any dimension of interconnect other than the use of the local access network. The cost should not be recovered within the interconnect charge but relegated to a separate item in the interconnect agreement to be recovered over the use of the local access network in a competitively neutral manner.

B2. Universal Service Obligation Charge. The most satisfactory result may well be achieved if USOs are allocated to those organisations best placed to achieve them once voluntary or competitive application for provision of such services has been taken into account. Only if a TO can then demonstrate that the avoidable cost is inequitable given its size should the NRA consider shared funding of this avoidable cost by way of a levy on other operators.

However, the cost associated with USOs will not generally vary in proportion to any dimension of interconnect, be it either capacity or call minutes. As with the local access loss charge they may be better allocated to a separate item in the interconnect

agreement in their own right and therefore become more akin to a USO levy on the industry and recovered in a competitively neutral manner rather than incorporated within the interconnect charge.

The Isolation of Inefficiency

Even where the arbitrariness of cost attributions and allocations is reduced with rigorous employment of cost causal attribution and allocation methodologies such as Activity-Based Costing, there is still an unresolved problem with the use of any historical cost approach. That is, they attribute cost based upon the actual historical network engineering capacity together with actual business processes of the organisation, and therefore the resulting costs reflect historical traffic patterns and performance of the organisations. If the TO is, or has been, inefficient there is a danger that this will be encouraged to continue. Therefore it is imperative that the NRA together with TOs ensure that a strict application of Activity-Based Costing is used in cost attribution and allocation, this will assist in the identification of inefficiencies. Benchmarking between European TOs will assist in identifying areas of cost worthy of more rigorous investigation. This will generally lead to a reduction in the cost of individual network elements.

Each NRA should agree with incumbent operators a process for elimination of the inefficiencies. Only where it is felt appropriate should these costs be shared. Sensible network planning which has resulted in efficient surplus capacity to ensure the resilience of the network should not be confused with inefficiency.

Consistency and Comparability

Due to differences in accounting policies and their detailed application by Community operators different operators could derive different costs given the same underlying cost base. It is important that during the period of managed competition there is an effort by the Community to ensure consistency and comparability of cost methodologies to ensure that different accounting treatments do not allow sub-optimal economic outcomes to arise. This should not be restricted to the cost accounting policies adopted but also to the cost attribution and allocation principles used in operator's costing systems.

There is considerable flexibility in developing these cost attribution and allocation principles and having decided upon the principles there is considerable further flexibility in their detailed application. It should be the responsibility of the NRA together with the industry to agree the cost accounting methodologies and identify the underlying cost drivers within the network operations and also the techniques to be used in the Activity-Based Costing system. This is a fairly detailed area and requires considerable work, however, if this investment is not made up front the even larger potential benefits of competition will be lost.

2.8 Conclusions and Recommendations

In view of the challenging and complex issues involved in liberalisation across a diverse Community, the purpose of this study was to highlight the key issues and provide some broad guidelines and principles to form the basis for future

development and progress. The views expressed in this report are clearly our own, and are based upon the interviews that we have performed with operators and regulators throughout Europe and the secondary research of the considerable literature which has been published on this subject.

There is currently a unique opportunity for the European Commission to ensure a harmonised approach to the cost accounting methods used in the establishment of costs on which to base interconnect charges. This will ensure that consistent and efficient charges are developed across the Community. With the onset of competition in voice telephony in most European countries timetabled for 1998, this process will be increasingly difficult to implement if delayed.

Any guidance that the Commission develops on this subject should take into consideration the business requirements of the Telecommunications Operators (TOs) themselves, and as such should be practical, implementable and congruent with the business practices of these operators. The Commission's goal should be to develop a general framework for interconnect; establishing the broad principles which will form the basis for future development and progress, and hence enable a harmonised approach to interconnect.

Existing Cost Accounting Practices and Cost Allocation Methods of Community Operators

The cost accounting practices and cost allocation methods of Community operators generally meet the information needs of current users. However, the competitive market place will require the development of more rigorous approaches to cost accounting in many Member State TOs. Early development should be encouraged. In addition, the importance of a comprehensive and harmonised cost accounting approach to interconnect in the EU has been recognised.

To date, with few exceptions National Regulatory Authorities (NRAs) have generally not been required to have a detailed understanding of the cost accounting issues associated with interconnect. However, with the onset of a liberalised market NRAs will need to develop a more detailed understanding of costing issues to be able to provide effective regulatory oversight in developing cost orientated interconnect charges, and cost orientated tariffs.

Formulation of Interconnect Charges

The diversity of interconnect regimes around the world indicates that a number of factors influence the formulation and establishment of interconnect regimes. As such the Commission should suggest broad principles for interconnect to be agreed at an EU level. The responsibility for implementation should rest with the Member States.

The principles which we recommend the Commission endorse are as follows:-

- Interconnect Charges should be based on the underlying costs of an efficient operation, and in all cases contain two elements attributable to the interconnect services provided. These are:
 - The Connection Charge.
 - The Conveyance Charge.
- Separate charges within each element should be developed to reflect the traffic sensitive and non traffic sensitive costs and the distance and non distance related costs.
- Further Charge elements resulting from obligations and/or tariff constraints imposed by regulatory authorities do not relate directly to interconnect. As such they should be recovered separately from the costs of interconnect services, or, at a minimum as a separate part of the interconnect agreement. This incorporates the following elements:
 - The Tariff Imbalance or Local Access Loss Charge.
 - The Universal Service Obligation Charge.

Consideration of these elements are given in separate sections below.

- Interconnect Charges should be set to facilitate competition. In order to achieve this objective, NRAs in each Member State should ensure that the interconnect process is transparent giving rise to charges which are efficient and sustainable. Accounting separation under the review of the NRA is one way transparency may be achieved. In addition, NRAs should ensure that agreements are not unduly discriminatory and that confidence in the agreements is promoted through the availability of sufficient information.
- Interconnect charges should be based upon the cost of unbundled network elements. NRAs should liaise with TOs and potential operators to develop a list of the unbundled network elements which interconnecting operators wish to purchase. A co-ordinated European approach would be an efficient means by which this process could be achieved and would ensure cross-border consistency.

The Local Access Loss

The local access loss arises out of service cost and tariff imbalances. We believe that the local access loss should be eradicated, where justifiable, by ensuring that any constraints on the rebalancing of tariffs are removed.

We recommend that the Commission should:

- Encourage Member States to remove all barriers to tariff rebalancing. The speed of rebalancing and safeguards for vulnerable consumer groups should be determined by the NRA to take account of the national situation.
- Until such time as the service tariffs are rebalanced, consideration may be given by the NRA to sharing these "losses" amongst competing TOs. Such costs of the local access loss should be recovered over the use of the local access network in a competitively neutral manner.
- Recovery of the local access loss should only be partial, to encourage efficiency in the incumbent operator. Local access loss charge waivers may be considered by NRAs to encourage competitive market entry until full rebalancing has occurred, but such initial waivers, if of only limited duration, make transition arrangements more difficult and will stifle the development of competition in the local access market.

The Universal Service Obligation

The definition of the universal service obligation evolves with the development of a country's telecommunications infrastructure. Such evolution will continue in the competitive market. We believe that competition will not endanger the provision of universal service, but that, with regulatory oversight to ensure price rebalancing is carried out at a reasonable rate and vulnerable subscriber groups receive targeted support, competition will improve the provision of universal service by:-

- improving efficiency and reducing prices
- fostering innovation
- generating market growth
- creating increased revenue with which to fund genuine universal service obligation costs
- encouraging operators to compete for the provision of social services.

We recommend that:

- The NRAs in each Member State should be responsible for defining and identifying universal service obligation services and costing the universal service obligation.
- The following principles for sharing the provision and/or funding of universal service obligations should be used by the Member States:
 - the cost of universal service obligations should be calculated on an avoidable cost basis and incorporate the net current annual cost for all lines which, prior to connection, the TO would choose, or have chosen, not to connect.
 - the provision of universal service and/or the funding of the cost of universal service obligations should be encouraged to conform to the following framework:
 - i. TOs should be encouraged to provide "USO" services on a voluntary basis.
 - ii. Unfulfilled obligations should be offered for competitive tender by TOs.
 - iii. Residual obligations should be imposed by the NRAs upon those TOs best placed to meet them.
 - iv. Where an operator believes the unilateral imposition of universal service obligations upon it is unfair because the avoidable cost is incompatible with its status and competition policy objectives it could appeal to the NRA for shared funding.
 - v. After the NRA has vetted the avoidable cost calculated by the TOs they may agree to shared funding of the cost.
 - vi. Shared funding of universal service obligation costs should be by way of a levy on the industry in a competitively neutral manner and not included as part of the interconnect charge.

Promoting Efficiency

The most effective mechanism for improving efficiency is through liberalisation which will:

- encourage use of best practices and apply downward pressure to costs

- bring about rebalancing and hence improve allocative efficiency

For interconnect no one charging method will provide the ideal solution for promoting efficiency. Low charges may encourage efficiency of the incumbent but may also lead to inefficient market entry.

The promotion of efficiency, incorporating the principles agreed at a Community level, should be conducted by the NRAs who are best able to tailor the interconnect charge regime to the national situation.

In this respect we recommend the following principles:

- interconnect charges should be set so as to facilitate competition which will then encourage efficiency.
- Where Incremental Cost concepts are used in interconnect pricing, charges should be set above the incremental cost to ensure a contribution to the residual joint and common costs of the interconnected operator.
- Where Fully Distributed Costing is used to set interconnect charges, downward pressure should be exerted on the interconnect charge to encourage TO efficiency. For example, through the application of a price-cap.
- Interconnect charges should be based upon the cost of unbundled network elements.
- The structural advantages enjoyed by the incumbent should be offset by abatement of interconnect charges. Abatements may then be reduced through time to reflect the increasing symmetry between the new entrant and the incumbent.
- The industry needs to investigate the practicality of implementing charges based on capacity.
- New entrants should then be offered the choice of either a capacity or a per-call minute cost related interconnect charge.

Cost Accounting Practices

There is currently a diversity of cost accounting practices across the Community which need to be harmonised for equity in interconnect.

Investment in more detailed and more rigorous cost allocation and attribution methodologies will arise through competition in time.

The Commission should take this opportunity to harmonise accounting policies and practices as far as is practicable. A framework for such harmonisation should incorporate the factors listed below. This is not intended to be a complete or

definitive list, and indeed excludes elements previously directed for Community action elsewhere in our conclusions.

We recommend that:

- European TOs should be encouraged to adopt a uniform approach to cost attribution and allocation methods, and accounting principles to ensure cross-border consistency in cost measurement.
- Cost allocation and attribution methods employed by TOs should be based on cost causal principles. Such principles may require joint and common costs to be attributed and allocated in a more cost causal manner than currently employed. Such increases in the levels of attribution and allocation should be encouraged so long as the benefits of greater cost causality are not outweighed by excessive expense.
- Activity-Based Costing principles should be encouraged for use by TOs as a method for understanding the underlying costs and cost drivers where Fully Distributed Cost or Embedded Direct Cost standards are used. The industry should agree the cost drivers and cost allocation and attribution methodologies to be applied.
- TOs should be encouraged to develop long run incremental cost information for pricing decisions.
- Until such time as long run incremental costs are practicable, interconnect charges should be based on Embedded Direct Cost plus a margin to contribute to the joint and common costs of the interconnected operator.
- The size of the margin above the Embedded Direct Cost should be determined by negotiation between the parties to interconnect. Only when there is a dispute should the Member State NRA become involved.
- A process for eliminating inefficiencies should be agreed between the NRAs and incumbent operators. The costs of inefficiencies in incumbent operators should be calculated where a Fully Distributed Cost or Embedded Direct Cost approach is used for interconnect charges. Such calculations should either be scrutinised by the NRAs or carried out by them. The cost of such inefficiencies should not be passed on to interconnecting operators in the interconnect charge and should only be shared where this is felt appropriate by the NRA.

3. INTRODUCTION

This section describes the background to this study in order to set it in context with other EC studies and relevant Directives. It discusses the case for interconnection and specifically the need for regulatory involvement and cost orientated interconnect charges. It then identifies the key issues to be addressed in achieving this objective, relating them to the scope of the study and describes how the remainder of the report is structured to address that scope and draw conclusions.

3.1 Context of Study

The conclusions and recommendations of the Review of the Telecommunications Services Sector², were endorsed in a resolution adopted by the Council of Ministers on 16 July 1993.

This set as a major long term goal in the Community the liberalisation of all voice telephony services "whilst maintaining universal service". The resolution has set 1 January 1998 as the overall date for the full liberalisation of voice telephony services, with additional transition periods of up to 5 years for Member States with less developed networks (i.e. Spain, Ireland, Greece and Portugal) and a possible period of up to two years for very small networks (i.e. Luxembourg). It supports the Commission's intention to prepare, before 1 January 1996, the necessary amendments to the Community regulatory framework.

In the follow up to that review the Commission of the European Communities (CEC) commissioned this study on "cost allocation and the general accounting principles to be used in the establishment of interconnect charges in the context of telephone liberalisation in the European Community".

² Commission of the European Communities. Communication to the Council and European Parliament on the consultation of the Review of the Situation in the Telecommunications Services sector. 28 April 1993, COM (93) 159 final. ISBN 92-77-55601-3.

3.2 Interrelationship of this study with other Concurrent Studies

During the study timetable there was a concurrent study undertaken by Wissenschaftliches Institut für Kommunikationsdienste GmbH ("WIK") and the European-American Centre for Policy Analysis (EAC) on Network Interconnection in the Domain of ONP - "The WIK Study".

The WIK Study on interconnection is a "comprehensive study of the issues involved in the interconnection of different telecommunications networks aiming to develop a general regulatory framework for a competitive market". The Arthur Andersen study "examines the practical questions associated with the establishment of appropriate cost allocation and accounting systems and assesses the way in which interconnect charges should be established in preparation for full service liberalisation". Our study also assesses the way in which universal service costs should be taken into account when establishing interconnect charges and the ways in which efficiency should be promoted.

Our study therefore concentrates on existing cost allocation systems and on the practical steps which should be taken to ensure TOs are able to adopt cost allocation and accounting methods which will support the requirements of a liberalised service domain.

3.3 Existing EC Directives

There are a number of existing EC Directives that specifically discuss cost accounting systems and the characteristics they should take. Given the significant cost and lead times required to implement different or "upgraded" cost accounting systems it is worthwhile summarising the main characteristics recommended in those Directives.

EC Directives that are of relevance are as follows:

- 90/387/EEC - ONP framework Directive
- 90/388/EEC - The services Directive
- 92/44/EEC - leased lines Directive

- Draft Directive on voice telephony

Each of the above Directives call for objective, transparent, published, non discriminatory, cost orientated tariffs for unbundled services.

The ONP framework Directive also suggests that unbundled cost orientated tariffs should provide for a fair sharing of the global cost of resources and enable operators to make a reasonable level of return.

Article 10 of the leased line Directive sets out the legal requirements to be applied to tariffing principles and the cost accounting systems to support them. Article 10.1 states that tariffs should be cost orientated and independent of their application. Article 10.2 states that the suitable cost accounting system should include elements that highlight both direct and common costs and also provides general allocation principles. Recital 19 to the leased line Directive also states that "[TOs] shall use an appropriate transparent cost accounting system, which can be verified by accounting experts ensuring the production of recorded figures; whereas such requirements can be fulfilled for example by implementation of the principle of fully distributed costing."

3.4 The Case for Interconnection

Historically the provision of telecommunications services has been considered a natural monopoly. There are many different definitions of a natural monopoly but the most common are based upon the sub-additivity of the cost function resulting from economies of scale and scope. In theory this means that a single provider should deliver conditions of economic efficiency provided there is no abuse of monopoly power. As a result of technological advances most telecommunications experts recognise that monopoly conditions are theoretically only likely to arise now in specific segments of the local loop (WIK)³. In parallel with these technological advances, regulatory developments and changing political factors have motivated

³ Wissenschaftliches Institut für Kommunikationsdienste GmbH (WIK). (Neu, Werner and Karl-Heinz Newmann). Interconnection Agreements in Telecommunications. Study prepared for The Commission of the European Communities DG XIII. Bad Honnef, January 1993.

consideration of the introduction of competition into network industries⁴, such as telecommunications, previously thought of as natural monopolies.

Liberalisation of the telecommunications sector is widely believed to be the most appropriate way to obtain "the best possible deal for the end user in terms of quality, choice and value for money"⁵. Experience elsewhere in the world indicates that competition increases levels of efficiency, the amount of service innovation and customer choice, and has also resulted in reduced prices. In the US consumers have benefited from substantial reductions in long distance tariffs and innovative services without the deterioration of universal service achievement in states that have adopted positive policies to that end.⁶ Competition will bring large consumer benefits, not only directly but also indirectly as a result of the fact that an efficient telecommunications sector is now recognised as an enabler of industrial growth and therefore the economy as a whole⁷.

Broadly, competition in network industries can either take the form of service based competition over a monopolist's network or there can be infrastructure and service based competition where competing networks add a further dimension to the competitive environment. In either case efficient competition will only be achieved if firms are allowed to interconnect with networks operated by rival firms, either to allow the provision of competitive services or to enable one firm to gain access to the other firm's customers, (e.g. to allow a mobile operator's customers to call the PSTN's customers). The terms and conditions on which operators can interconnect with each other are therefore of vital importance to the development of a competitive telecommunications market. In particular such interconnection necessitates the establishment of principles for determining, on an ongoing basis, the charges that

⁴ Network industries are characterised by the use of a common infrastructure to provide a range of products and services e.g. gas, electricity, rail, water and telecommunications.

⁵ Oftel. Consultative Document issued by the Director General of Telecommunication. Interconnection and Accounting Separation. The Office of Telecommunication, June 1993.

⁶ FCC. "Trends in Telephone Service" FCC Industry Analysis Division, March 1993.

⁷ Explanations presenting causal arguments which link an expansion in GDP to telecommunications development are many, and can be found in the literature on economic growth and the diffusion of technology.

must be levied by one network operator to another network operator or service provider for the interconnect services demanded, i.e. the interconnect charge.

3.5 The Case for Regulatory Involvement

In a telecommunications market where all levels of the market are competitive, the interconnect services would be competitively priced, and there would be no need to establish the principles for determining such charges. It is not necessarily the presence of competition that will provide market prices but the threat of competition, existing or possible⁸. However, few sectors of the European telecommunications market are currently freely competitive for voice telephony services.

Whenever a network is owned by an organisation that is competing against firms needing to interconnect with the same network there is a risk that anti-competitive behaviour will result. The dominant network owner is motivated to overcharge for interconnection as the competitor's only alternative is to build its own network. This benefits the dominant operator in two ways, higher revenues from interconnect services and greater barriers to potentially competitive market entrants. The situation is aggravated by the vertical historical structure of the telecommunications industry, where activities that can be thought of as natural monopolies, and potentially competitive activities for which access to the network is essential, are combined⁹. In the telecommunications industry provision of certain segments of the local wireline network can be thought of as a monopolistic service whereas many long distance services are now regarded as competitive.

⁸ The Federal Ministry of Posts and Telecommunications. Basic Considerations on a Cost Benchmark for the Eligibility for Approval of Monopoly Tariffs. Information series on regulation issues 10. Bonn, May 1993.

⁹ AT&T in their response to the Oftel Consultative Document on Interconnection and Accounting Separation stated that "a central barrier to vigorous, multicarrier competition in the UK is BT's ability and incentive to frustrate the competitive process through its dominant control over essential interconnection facilities needed by others to reach end users, and its simultaneous participation in all levels of the retail market. Through this structural advantage, BT is able essentially to control the viability of its rivals. In addition, BT may utilise its control over interconnection to gain other advantages stemming from the lack of equal access (from both customer and technical perspectives), superior information relating to customers and network charges and the like".

Where there is vertical separation the provider of "upstream" monopoly services provides them as an input to providers of retail services on an arms length basis and does not participate in the "retail" or "downstream" market. However, for a number of reasons many governments liberalising their telecommunications industries do not find it attractive to introduce vertical separation of the former monopolist when liberalising. In this situation, where there is vertical integration and liberalisation, the former monopolist is often dominant in the downstream market as well as the upstream market and the success of competition is dependent upon the regulation of interconnect terms.

Consequently, whichever industry structure is adopted regulation of interconnect terms will be necessary. WIK identify two opposing views regarding the way interconnection should come about. The first relies upon regulatory intervention to make interconnection mandatory to ensure the success of competition and resulting economic efficiency. Others oppose this view on the basis that mandatory interconnection may prevent the entrepreneurial new entrants from seeking improved methods of providing end to end service. This view is sustainable only if certain conditions pertain to the interconnect terms. The compromise is to ensure interconnection is always available, but to allow new entrants to freely negotiate with incumbents over interconnection terms and allow them to exercise their entrepreneurial abilities to find alternative ways of delivering services to their customers if this is attractive. The regulatory problem then becomes one of ensuring that interconnect terms achieved through negotiation encourage economically efficient outcomes and that the dominant operator does not take advantage of his greater power. Accordingly, charges cannot be left to market forces and regulatory intervention is required until market participants can be assured contested market prices.

3.6 Cost Orientated Interconnect Charges

The Commission's response to this has been that the basis for establishing interconnect charges should be an assessment of the costs incurred by the operator providing interconnect facilities, i.e. that interconnect charges should be "cost

orientated"¹⁰. This in turn implies the need to establish the principles for determining the costs of interconnect services, including the costs of providing uneconomic universal service where such an obligation exists. This principle therefore raises the question of how such costs are measured, and more particularly how they are broken down and allocated to different services, or customers.

The Commission therefore set as the objective of this study the examination of the practical questions associated with the establishment of appropriate cost allocation and accounting systems, and the establishment of the principles for determining interconnect charges.

3.7 Achieving Cost Orientated Interconnect Charges and Relevance to Scope and Structure of Report

The achievement of cost orientated charges gives rise to a number of key issues which must be addressed before a framework for achieving the objective can be implemented.

There is the question of how cost is measured in telecommunications organisations. There are a number of different cost standards available to any organisation attempting to understand its costs and they each have different uses. Furthermore, the characteristics of provision of telecommunications services are that a range of services are provided over a common network and this gives rise to complex questions of cost allocation when calculating the cost of service.

This issue is recognised in the scope of this study which requires "the identification of specific issues relevant to questions of cost allocation and the choice of cost accounting methods in TOs". We address this in Section 4 of this report describing the various cost standards and their strengths and weaknesses. We also discuss the historical forces that have influenced the choice of cost accounting methods in TOs.

¹⁰ Council of the European Communities. Council Directive of 28 June 1990 on the establishment of the internal market for telecommunications services through the implementation of open network provision. 90/387/EEC. Official Journal of the European Communities No. L192 p1-9.

Section 4 therefore identifies the issues relevant to cost accounting in TOs and develops some theoretical understanding of the relative merits of particular standards. The Commission require that the recommendations of this study are consistent with existing national practices, and therefore before developing any detailed recommendations on the most appropriate cost accounting practices for determining interconnect charges, an appreciation of the current practices of TOs is gained. Accordingly, the scope of this study also requires "Details of existing cost allocation and cost accounting methods of the Community operators." Section 5 details the results of our empirical research in this area and provides a reference point for developing cost orientated interconnect charges which are practical and capable of implementation by TOs without excessive cost and disruption, and that are therefore compatible with existing national practices.

The next issue to address is the process of using cost information to establish cost orientated interconnect charges. This is consistent with the scope requirement for "an assessment of the way in which interconnect charges should be formulated and established". Section 6 addresses this by revisiting the objectives of interconnect and identifying the role of interconnect charges in shaping competition in telecommunications. Section 6 then discusses the formulation of interconnect charges and identifies the role of the regulator in the process of setting interconnect charges.

The final components of the study's scope are "an assessment of the way in which universal service costs and other social costs should be taken into account when establishing interconnect charges" and "an assessment of the way in which efficiency should be promoted in the determination of interconnect charges" respectively. Sections 7 and 8 discuss these two issues in turn identifying the inter-relationship between interconnect and the policy objectives of universal service and efficiency.

Section 9 of the study builds on the findings of the previous sections by pulling the various issues and findings together to set out a practical framework for the establishment of cost orientated interconnect charges. It also provides some suggestions on what the next steps should be in terms of research and development of more detailed recommendations.

4. COST ACCOUNTING IN TELECOMMUNICATIONS OPERATORS

4.1 Introduction

Across the Community there are diverse levels of regulatory understanding of the cost accounting issues of relevance to interconnection between TOs. This section reviews a number of the basic issues pertaining to cost accounting in TOs. It examines the need for cost accounting information and systems by business organisations and the influences on the design and sophistication of such systems. It then examines the changing requirements for cost accounting systems in TOs and the impact of regulation and liberalisation on the requirements of such costing systems. The section then reviews the nature of costs arising in TOs and provides an analysis of the different cost standards used to analyse costs, and an overview of their appropriateness for different uses. Finally consideration is given to the particular problem of cost allocation for TOs.

4.2 The Need for Cost Accounting Systems

Before making any observations on cost accounting practices and cost allocation methods employed by organisations, or recommending appropriate practices to be adopted, it is worthwhile to first review the reasons why all business organisations need cost accounting systems.

The need for such systems is driven by a desire for cost information. There are a number of different interest groups, or stakeholders, in an organisation, all of which have a desire for cost information. Many will require different information for different purposes. As the environment changes the constituent stakeholders in an organisation may change, as will the importance placed upon the different information requirements of each.

Cost accounting systems therefore need to produce cost information that meets the requirements of those demanding the information. Accordingly, they evolve to meet the information requirements of the stakeholders - information only being produced when the benefits of production outweigh the associated costs.

Stakeholders within any organisation can broadly be divided into two groups - external and internal. External stakeholders will include shareholders, the government, the revenue authorities, suppliers and customers, the NRA, etc. and this necessitates external financial reporting of cost information. Internal stakeholders comprise management, employees, etc. These groups will require internal financial and non financial reporting of cost information.

Cost accounting systems are required by management for a number of purposes; pricing, performance management, etc. (see below). However, traditionally they have generally developed within the framework of the external financial reporting system. This is the system for reporting organisational results to the owners to allow them to assess management's performance, to the revenue authorities for the purposes of levying taxes and perhaps the government to ensure particular policy objectives are being met. These are 'external' impositions and of more interest to commercial organisations has been the use of cost information to assist in management.

Cave and Mills have suggested that the demand for management cost information for commercial organisations may spring from at least four sources¹¹. Firstly the desire to breakdown the firm into more manageable units, secondly to sustain a system of incentives to encourage efficient production, thirdly to co-ordinate the activities of separate units and fourthly to provide information relevant to pricing.

They point out that the cost information required for external financial reporting and internal management reporting is likely to differ, and even the four requirements of management set out above may require different costing procedures. Where competitive commercial pressures do not necessitate management to seek this cost information costing systems often develop to support external financial reporting requirements only.

It is intuitive that the cost accounting systems adopted in monopoly state controlled TOs whose principal objectives are the provision of a universal service at specified engineering and quality standards are likely to be relatively unsophisticated, and

¹¹ Cave, Martin and Roger Mills. Cost Allocation in Regulated Industries. Centre for the study of Regulated Industries (CRI) Regulatory Brief 3. Public Finance Foundation 1992. ISBN 085299 5520.

may be based on concepts of cash accounting not accruals accounting. Once these organisations are replaced by public companies with monopoly power the requirement for cost information is likely to escalate if only to the point where the regulator can ensure that the return on total costs is equitable. As they become competitive organisations the management cost information requirements are likely to grow dramatically as managers try to identify the profitability of different services and customer groups to maximise profits and ensure an efficient allocation of the organisation's resources¹².

Arthur Andersen have conducted comparative US-UK research of the changes that take place when utility network industries are opened to competition¹³. This research concluded that worldwide the environment for utilities, including telecommunications, is being transformed by the competitive pressures that inevitably arise following privatisation and deregulation. Protected markets, predictable financial performance, unchallenged operating policies and job security can no longer be relied upon. One by one, each industry has had to face the new challenges created by emerging competition. This has necessitated cultural and management changes within the industries not least of which are those concerned with cost management and service cost and profitability measurement.

In summary, costing systems have developed, and will continue to develop, to meet the information demands placed upon them. In the context of European TOs a number of factors will have influenced the sophistication of existing cost accounting systems, and will continue to affect their future development, not least of which are the ownership structure (government department, government controlled independent company, public company), the competitiveness of the market place, the external reporting requirements and the regulatory requirements. As detailed in section 5 these variables are quite different across the European Community and

¹² As network industries are privatised and liberalised there is a need for these organisations to adopt new management strategies and this requires them to develop new management techniques often based on new or improved information systems - including changed costing systems. In the context of the majority of European TOs these organisations are yet to fully adapt and they do not therefore possess the sophisticated cost accounting systems that competitive industries possess. These will be a pre-requisite to their future competitive success.

¹³ Arthur Andersen. Predictable patterns - Navigating the continuum from protected monopoly to market competition. March 1994.

influence on the sophistication of existing and future cost accounting systems should not be underestimated.

4.3 Cost Accounting as a Regulatory Concern

The role that cost information plays in the regulatory environment will influence the cost accounting systems and their development. Costs have traditionally been, and will probably continue to be, an important feature in utility regulation, especially in the development and approval of tariffs.¹⁴

As the extent of liberalisation increases so too does the demand for cost information by the regulator. This is set out in more detail below, and serves as a good example of how the information requirements of a stakeholder are not static, but instead are dynamic, changing with the environment the TO operates within. Regulation has long sought to substitute competitive market conditions and "hold the fort" until competition arrives. It has attempted to achieve this by using costs as a benchmark against which prices can be measured.

Regulation has three primary objectives in price setting:

- consumer protection - prevention of customer exploitation in the regulated service areas, primarily through tariff controls.
- competition policy - prevention of anti-competitive pricing strategies in competitive business areas, and the promotion of customer choice through competition.
- social obligations - the administration of special service prescriptions for TOs which fulfil public policy objectives.

¹⁴ Wissenschaftliches Institut für Kommunikationsdienste GmbH (WIK) (Weinkopf, Marcus). Regulatory Requirements on Cost Accounting Systems within the Framework of ONP. A study carried out for CEC-DG XIII. Final Report. Bad Honnef, February 1992.

The way that costing systems have evolved to help national regulators meet these objectives is often a by-product of the method of regulation chosen.

Consumer Protection

In competitive markets purchasers make decisions based on prices offered by different suppliers of goods relative to the utility they experience from making the purchase. It is very rare for the purchaser to be interested in the cost of production of a particular good. In a monopoly market place where no alternative competitive prices exist the purchaser is far more concerned about the costs of production of the underlying good or service so as to make a judgement about the "fairness" of the price charged - "is it reasonable?". The prevention of customer exploitation by undue high prices has been the overriding reason for the regulation of public utilities.

The grant of a monopoly right to a supplier in a certain market reduces the elasticity of demand faced compared to that which would be faced under competitive market conditions. In an attempt to prevent upward pricing flexibility regulators use cost information to assess the reasonableness of tariffs for services subject to quality benchmarks. There are two common approaches to this problem. Firstly endogenous cost-based approaches; where the regulator determines appropriate tariff levels based upon an analysis of the costs actually incurred in the production of regulated services (i.e. "rate of return regulation"). Secondly exogenous index based approaches; where acceptable tariff levels are, after an initial assessment of future productivity development of the regulated firm for an agreed number of periods, determined by the development of exogenous indices, like for example the Retail Price Index (e.g. "price-cap regulation"). The type of regulation chosen affects the regulatory demands made upon cost accounting system.

In the US the Federal Communication Commission (FCC) originally adopted an endogenous cost-based rate of return regulation. As a consequence the regulator had to formulate, supervise, and enforce detailed rules for the development of the reasonable cost base that should be used in rate of return calculations. As a result US TOs have experienced extremely prescriptive rules and regulations regarding the Universal System of Accounts (USOA) and detailed cost accounting principles. The level of prescription was undoubtedly related to the fact that US TOs were not state owned but publicly held private sector companies, and the threat of abuse of monopoly power to the detriment of the general public was therefore more acute

than would be expected for state owned companies. More recently the US regulatory environment has started to use exogenous index-based approaches.

Exogenous index-based regulatory approaches, e.g. the price-caps applied in the UK and the Netherlands, which are more popular in Europe, also aim to prevent the national operator from exploiting its monopoly power at the expense of consumers. By contrast, however, they deploy a ceiling of reasonable pricing which is, in itself, completely independent of the actual costs incurred by the firm. Whilst this form of regulation has the advantage of creating positive incentive affects on the TO to reduce its cost base through efficiency it also means that there has been no requirement imposed by the regulator on the operator for particular cost accounting methods and cost allocation methodologies.

Although the above two approaches to monopoly regulation have different incentive effects, both are in essence designed to ensure that consumers only pay a price that allows the monopolist to recover all of its costs plus an "equitable" rate of return on its capital employed across all services.

Competition Policy

As competition develops regulatory concern changes. No longer is the regulator simply concerned with issues of monopoly tariffs, but as parts of the old integrated monopolies are opened to competition there is an asymmetric distribution of market power between new entrants and the incumbents. Regulatory concern needs to change to ensure that prices charged by regulated firms in the competitive elements of their business do not undercut the real costs of the respective service.

Whilst this is true in the case of formerly vertically integrated monopolist TOs whose apparatus supply business has been liberalised, it will also be true where various "retail" businesses are liberalised, and where emerging new competitors rely on a product/service purchased from the incumbent as a major input for their service offerings, local loop terminations for example.

The regulatory requirement for cost information to ensure fair competition is therefore somewhat more detailed. It will require improved cost reporting by the incumbents if the regulator is to try and ensure "a level playing field" with the objective that both the "retail" and "wholesale" prices charged by the incumbent send

appropriate market signals encouraging efficient resource allocation, market entry and market exit.

Social Obligations

The third regulatory concern set out above was connected with social obligations. When these obligations are placed upon TOs such that they are required to perform certain functions that they would not perform for strictly economic or commercial reasons there is clearly a cost to the organisation.

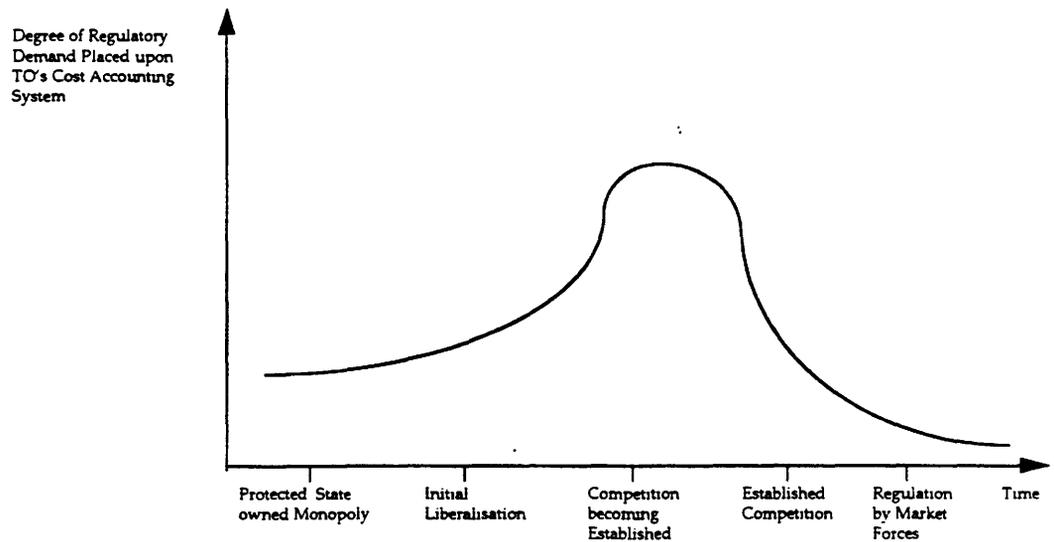
As competition develops regulators need to determine the magnitude of such costs and decide whether it is appropriate to share the obligations and/or the funding of their costs, and if so, how. The regulatory response will make differing demands upon the cost accounting systems of the regulated company. There are two approaches, one implicit, the other explicit.

An implicit regulatory approach to obligation-related costs, and one that is typical in most European countries, is to grant the operator an exclusive right to operate in certain markets. This provides barriers to competitive entry, and there is no incentive for operators to identify the cost of social obligations as they are understood to be part of the monopoly service. Accordingly they are recovered by the services where public concern about the undesired distributional effects is weakest (e.g. international and long distance calls, and more recently mobile telephony). This approach may have undesirable incentive effects that lead the regulated firm to over invest in areas where it can claim to be acting in the public interest, and causes problems as markets are liberalised. As WIK state this implicit approach is only sustainable in the long term in a monopoly environment¹⁵.

An explicit regulatory approach requires the definition of the obligation and agreement as to the cost associated with this obligation. It also requires the incumbent to measure the cost so that as competition develops the cost can be equitably shared by all operators and thus does not create inefficient incentives.

¹⁵ Wissenschaftliches Institut für Kommunikationsdienste GmbH (WIK). (Neu, Werner and Karl-Heinz Newmann). *Interconnection Agreements in Telecommunications*. Study prepared for The Commission of the European Communities DG XIII. Bad Honnef, January 1993.

In summary, the demand for cost information, and therefore the requirements of a TO's cost accounting system, will be influenced by the regulatory approaches taken. One should not presume that with the introduction of competition the responsibility of the regulator will automatically be reduced. Indeed during the transition from protected monopoly to freely competitive markets the regulators requirement for cost information may become more onerous in the interim period until the competition becomes established and market forces provide the necessary checks.



The more active role envisaged for NRAs, particularly in refereeing the unbundling of tariffs, developing the cost methodology, and overseeing its implementation will require additional resources and funding if it is to achieve these policy aims.

4.4 Cost Standards and Costing Terminology

Sections 4.2 and 4.3 set out why organisations collect cost information, and the impact of regulation on the type of information required. However use of the term cost is often misunderstood. If interconnect charges are to be cost orientated it is important to understand what is meant by *cost*. There are many different definitions of cost. Cost is a multi-dimensional concept and the term must be used with care.

Before proceeding in Section 5 to look at the existing cost accounting practices of Member State operators it is perhaps pertinent to clarify and define the different cost categories that exist and the alternative cost standards that are available.

*Cost categories*¹⁶

Cost categories are specific classes of costs differentiated according to their relationship with changes in output. In producing a product or service organisations incur *fixed costs* (which are independent of the level of output) and *variable costs* (the size of which is dependent upon output levels). The extent of fixed costs in most organisations will depend upon the time horizon viewed - in the long run all costs are variable. For a given level of output it is possible therefore to calculate total costs and unit average costs and their constituent fixed and variable elements.

When an organisation provides more than one service some of its costs are *service direct costs* of a particular service, in that there is an unambiguous relationship between the cost and the service. Other costs may be either joint or common. The definitions for joint and common costs are more liberal in telecommunications than the true economic definitions. Joint costs arise where the incurrence of cost on a productive input is shared between a family of services (e.g. the cost of investment in a switching system). Common costs arise, where the cost of a productive input is shared across all services of the firm (e.g. executive salaries, fixed licence costs). Certain joint and common costs may be directly or indirectly attributable to a service on a cost causative basis. This leaves residual joint and residual common costs, the magnitude of which depends upon the rigour and detail of the direct and indirect attributions.

The strictly economic definition of a joint cost is one where the cost of a productive input by necessity produces more than one good or service in strict proportions (e.g. wool and mutton); and common costs are the costs of inputs producing several different outputs but with the potential for varying the proportions of the service output.

In this report we have used the more liberal telecommunication definition for joint and common costs as opposed to the strict economic definitions described above.

¹⁶ Cave, Martin and Roger Mills, *Cost Allocation in Regulated Industries*. Centre for the study of Regulated Industries (CRI) Regulatory Brief 3. Public Finance Foundation 1992. ISBN 085299 5520.

A *directly attributable* cost is one with an unambiguous relationship with the existence of a product or service but which is not recorded against the specific product or service in the organisation's accounts e.g. product specific software costs can be directly attributed to call products based on usage.

An *indirectly attributable* cost is not capable of direct identification against a specific product or service but allocation is possible on a measured non arbitrary basis e.g. power plant depreciation cost attributed to the relevant network equipment using the power plant and then to product based on product usage of the network equipment.

The more rigorous the direct and indirect cost attributions made the greater the reduction of costs considered joint and common with less sophisticated attribution techniques.

Joint and common costs arise where organisations have economies of scale and scope. Economies of scale are present where unit costs decrease across higher output levels and economies of scope exist where multiple outputs are produced more cheaply in combination than separately.

Where a firm stops production of a particular product or service (e.g. withdraws from the provision of local loop terminations) it will save the *avoidable costs*, and except in the case of a very long term time horizon the avoidable cost is unlikely to be equal to the *incremental cost* (defined below).

Contrastingly, where a firm commences production of a particular product or service there is usually a cost of contribution foregone from alternative applications of the resources. This is called the Opportunity Cost.

Finally, the cost of an asset should be considered *sunk* when these costs, once committed, cannot be avoided even if the volume of output served by the asset is reduced to zero.

Cost categories are made up of individual and specific cost items defined by the organisation, e.g. administrative expenses, marketing expenses, maintenance expenses.

Cost standards

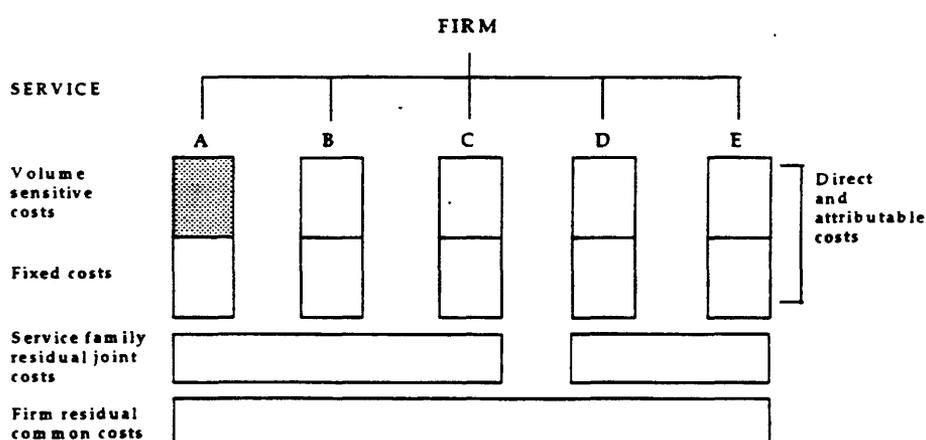
Cost standards are the economic and accounting methods used for establishing or estimating the cost of particular products or other cost objects and are comprised of different combinations of cost categories. They are differentiated by the extent and type of the organisation's total costs that are included. Organisations may choose to use more than one cost standard, and employ different cost standards for different purposes. The use of a particular cost standard for pricing and decision making can be justified if its application will result in improved economic efficiency and allocation of resources, with the resulting advantages passed on to consumers.

This section presents an explanation of the various cost standards which are commonly employed in the analysis of cost and includes marginal cost, incremental cost, fully distributed cost, embedded direct cost and stand alone cost. To simplify the analysis we will use as an example a five service firm, for which each service has elements of direct and attributable costs (both fixed and variable) and residual joint and common cost categories that are either common to a number of services, or to the firm as a whole. We will define the cost standard as it relates to service A in each example.

4.4.1 Marginal Cost (MC)

The marginal cost standard measures the forward looking cost of producing one more unit of output or the cost saved by producing one less unit of output holding constant the production levels of all other products and services of the firm. i.e. the change in the firms total cost as a result of a unitary change in output.

Cost Categories Included



The MC includes only those cost items in the direct variable cost category of the relevant service. Thus marginal costing excludes all cost categories which do not vary with output, or do not demonstrate any causal relationship with the unitary change in output.

Rationale

Under certain assumptions it can be shown that economic welfare is maximised when the prices for goods and services are set at the MC of the resources used to produce those goods, and consequently an economically efficient outcome results.

Practical Considerations

Measurement is difficult in practice because costing unitary changes in output is rarely possible, primarily because division of labour and capital is never perfect. Furthermore the MC standard includes no fixed or joint and common costs, and therefore prices set based on MC will not allow recovery of these or other sunk costs. These have historical financial implications (i.e. the company will not make a profit) and are relevant to the financial viability of the firm.

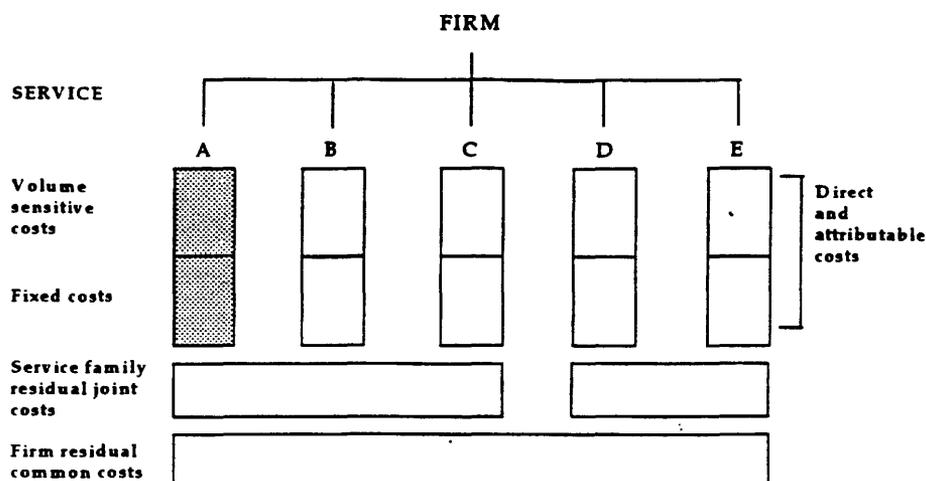
The MC is however useful as it provides the theoretical price floor, the minimum cost that must be recovered by the firm in the short run.

4.4.2 Incremental Cost (IC)

The incremental cost standard measures the change in the total costs of the firm that arises from an increase or decrease in output by a substantial and discrete increment.

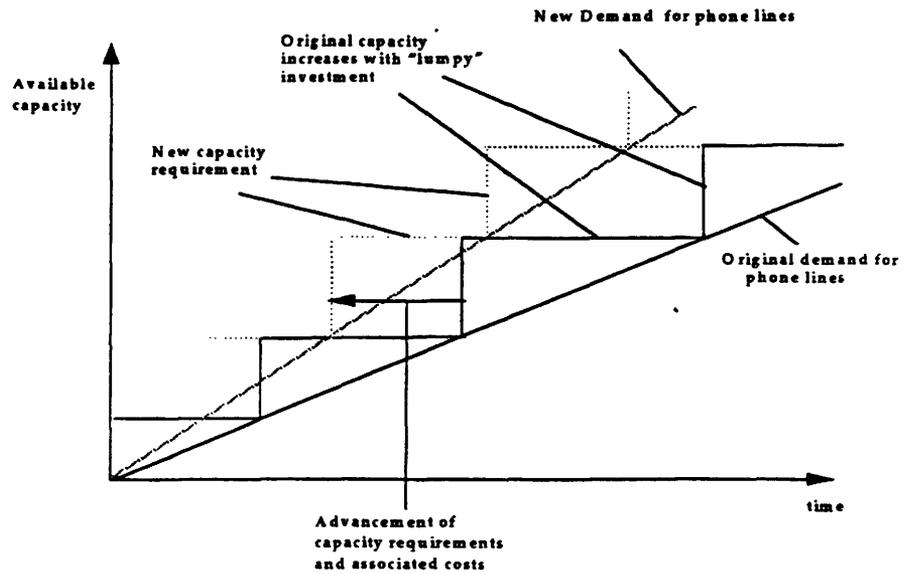
In the particular case where the increment under consideration is a single unit, IC and MC will be the same. The principal difference between MC and Total Incremental Cost (TIC) is that the MC includes only those costs that change with a unitary change in output whereas the TIC includes the costs to provide either an entire service or a substantial and discrete increase in output of an existing service and includes some capital and volume insensitive costs. Most economists consider that the IC standard should adopt forward looking (rather than historical) costs.

Cost Categories Included



Incremental costing incorporates all variable costs and those fixed, non volume sensitive, costs which relate to the incremental change in output. In the short-run this is constrained by the existing plant capacity. In the long-run capital costs are treated as variable and incorporated into the IC using capacity costing principles. The Long Run Incremental Cost (LRIC) therefore includes both the capital costs associated with a substantial change in output and the volume sensitive costs of providing a service. For an individual unit the LRIC is divided by the number of units in the increment to get the Long Run Average Incremental Cost (LRAIC).

Volume sensitive costs are included by using cost causation rules to determine direct causal relationships between costs incurred and the activities giving rise to these costs. Capital costs are included using a capacity costing approach which calculates the cost of the next increment of investment capacity required by the firm to meet a permanent substantial increase in demand. The capacity costing approach recognises that most capital investment undertaken is not perfectly divisible, but is acquired in large lump sums. Changes in demand advance or postpone these investments and the change in Net Present Value (NPV) of the investment that results gives rise to the capital cost of the decision. The capital costing approach is therefore a discounted cash flow concept. Hence the cost of plant is calculated by spreading capital costs across the available capacity and not across the units of capacity actually used. This is illustrated graphically below:



In this way it is possible to establish a direct relationship between both volume sensitive and capital costs and changes in demand.

Rationale

Incremental costing establishes a link between a change in cost and the cause of that change and therefore is a "marginal" concept. The only difference between LRAIC and MC relates to the units over which it is measured. Conceptually therefore, there is little difference. Use of IC will therefore lead to economic efficiency in the same manner as MC.

Practical Consideration

IC resolves some of the practical problems of measurement associated with MC. This is because the standard allows measurement in terms of discrete increments which can be as large or as small as the firm is capable of measuring.

Because of its conceptual similarity to MC, IC is therefore useful practically for setting the price floor (SRIC in the short run with constant capacity, LRIC in the long run with variable capacity), and in the identification of cross subsidisation and predatory pricing in transfers from monopoly to competitive environments.

LRIC is therefore an appropriate substitute for MC in the long run - especially where capital can only be acquired in large indivisible increments, as is the case in TOs. However, as with MC, LRIC, like all IC concepts, ignores the recovery of residual

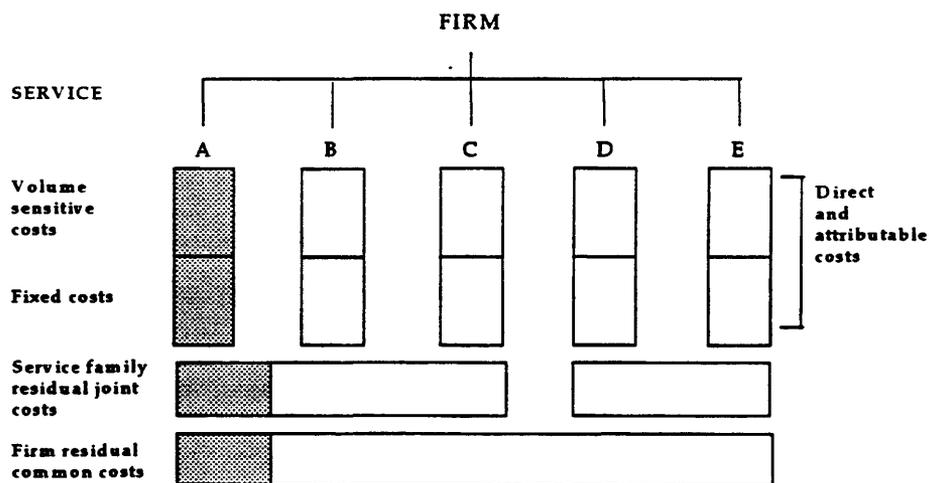
joint and common costs. These must be incorporated into any modelling to ensure long term financial viability of the firm. LRIC provides the "price floor" and hence prices should be set not equal to the LRIC but based upon it.

4.4.3 Fully Distributed Cost (FDC)

This cost standard allocates all of an organisation's costs to services. Fully distributed costs generally include the costs directly and indirectly attributable to the service, plus a share of those costs with no causal relationships, i.e. joint and residual common costs. The rules for determining the shares of the indirect costs and overheads are usually causally related but no entirely non-arbitrary set of rules exist. FDC is sometimes called "Fully Allocated Cost" (FAC).

This is the most common cost standard adopted by firms for their own internal purposes and by US regulatory bodies. It is usually based upon an organisation's historical costs.

Cost Categories Included



FDC includes both the volume sensitive and fixed direct costs of the service together with a proportion of the residual service family joint costs and firm common costs.

Historical FDC is based on the existing physical network engineering capacity together with the business processes within the company. Information is derived from the company's books and records, and as such, reflects the actual fixed assets used to provide the service, and the existing levels of capacity and network utilisation inherent in them.

As a result of their nature there is no single way of allocating the residual joint and common costs to individual products. These costs are allocated to services based on one of several allocation bases. A crude, but illogical, basis would simply be to divide the common costs over all services equally. The most common methods adopted in practice are:

- The Relative Output Method (ROM) where costs are allocated to services in proportion to their share of total output.
- The Gross Revenue Method (GRM) where costs are allocated to services in proportion to their share of firm revenue.
- The Net Revenue Method (NRM) where costs are allocated to each service in proportion to its contribution to net revenue.
- The Attributable Cost Method (ACM) where costs are allocated to each service in proportion to the direct and indirectly attributable cost of the service.

The ROM is only possible when all outputs can be expressed in terms of a common physical unit, and GRM and NRM are based on revenue - hence to use the costs of service to set prices would be a circular argument.

Obviously there is also no single way of performing the direct and indirect cost attributions and different approaches may give rise to differing answers. Any FDC standard relies upon the subjective judgements of those implementing the FDC standard, and it is because of this arbitrariness that economists criticise FDC as a basis for pricing decisions.

"The only costs that have objective reality are ones that describe a causal relationship between the act of purchase and their incurrence. Cost allocations that are not grounded in causality have no basis in objective

reality; they have no meaning independent of the prices they are supposed to justify, except in a rare ritualistic, incantational sense."¹⁷

Cave and Mills suggest that economists have long argued that the adoption of a FDC standard does not achieve efficient resource allocation because it is based on average rather than incremental costs. As Baumol has stated¹⁸

"There is obviously not the slightest reason to expect that the prices emerging from a full-costing process will bear the slightest resemblance to those known to be necessary for efficiency in resource utilisation."

Emmerson has demonstrated the potentially unwelcome economic outcomes of using a FDC standard as the basis for pricing and decision taking relating to the offering or withdrawal of services from a market in the "Death Spiral" example¹⁹. See Appendix 3.

Rationale

In light of the criticisms levelled at the FDC standard from the perspective of pricing, resource allocation and subsequent economic efficiency it is perhaps useful to look at why it is the most common cost standard adopted by organisations, operating in both competitive and monopolist situations.

The likely reason for its ubiquitous use is probably to be found in history, and through an understanding of the relative values placed upon cost information for different purposes by organisational stakeholders. It has been a principal objective of all firms to collect sufficient cost information to monitor and report historical financial performance. This has often been uppermost in management's minds since this is driven by external requirements. External financial reporting and the

¹⁷ Kahn, A E and W B Shew. Current Issues in Telecommunications Regulation: Pricing. Yale Journal on Regulation, (1987) Vol. 4 No.2, pp 191-256.

¹⁸ Baumol, William J. Minimum and Maximum Pricing Principles for Residual Regulation, in A. Danielsen and D. Kamerschen (eds), Current Issues in Public Utility Economics. Lexington Books, 1983.

¹⁹ Emmerson. Incremental cost concepts. Emmerson Enterprises Inc, USA June 1992.

establishment of balance sheet valuations therefore lead to the development of the FDC standard. From management's own point of view the use of this standard was often also incorporated into pricing decisions because if a firm could not recover in its prices its total historical costs this would adversely affect reported profitability and therefore perhaps their tenure! It is also the only cost standard that can be used for service costing that is capable of objective assessment and therefore independent verification.

Given the adoption of the FDC standard management may then be guilty of trying to use the data produced without the appropriate analysis of changing circumstances and corresponding modifications to the cost information for other purposes, such as pricing, see the "Death Spiral" referred to above.

From a regulatory standpoint a major advantage of adopting the FDC standard is that it corresponds with firms' internal procedures and thus simplifies the data collection tasks. This allows the service costs to be "tied into the books" and audited where relevant. However, if it does not promote economically efficient pricing its benefits for regulatory purposes are diminished.

Obviously since FDC standards will continue, by necessity, to be employed by firms for external reporting purposes the criticism of the standard is limited to its use for pricing decisions and regulatory purposes. To some extent these criticism can be overcome if greater attempts are made to ensure cost causative attribution (either directly or indirectly) to services and to reduce the arbitrariness of any "general" allocations of residual joint and common costs. As stated previously, there is no single method of cost attribution and allocation and the more cost causative they are the less valid the criticisms.

The FCC believes that with a well designed cost allocation system over 80% of costs can be attributed to services on a cost-causative basis. As Cave & Mills have pointed out the use of Activity-Based Costing may overcome many of the criticisms relating to the arbitrariness of FDC²⁰.

²⁰ Cave, Martin and Roger Mills, *Cost Allocation in Regulated Industries*. Centre for the study of Regulated Industries (CRI), Regulatory Brief 3. Public Finance Foundation 1992, ISBN 085299 5520.

Alfred Kahn, the American regulatory expert said

"The fact that most services are typically provided in combinations, using the same facilities, does not mean that definable shares of the common costs cannot in principle be causally attributed to each. When the same equipment may be used to make products A and B, and when producing A uses capacity that could otherwise be used to supply B, then we may speak of their costs as common instead of joint: and in this event, the marginal cost of A *may* include an identifiable part of these common costs. This situation is widespread in the public utilities, and in industry generally. The same railway plant can be used for passenger or freight service, and for any number of kinds of freight, over any number of routes. The same coaxial cable may transmit telephone messages, business data or TV programs. The same warehouse may be used to store a variety of products. If any of these products or services uses freight cars, circuits, or warehouse space that would in fact otherwise be used for one of the others, or if it requires the construction of greater capacity than would otherwise be necessary, then it *does* bear a causal responsibility for a share of common capacity costs. The cost allocation formulae actually employed may achieve only a rough, rule-of-thumb approximation to the actual costs for which each product or service is responsible, but those costs have objective reality."

Practical Application

Even where the FDC standard has been accepted on the basis that all material cost attributions have been made on a cost causative basis, the outcome will greatly depend upon detailed decisions made in identifying cost drivers and the activities using these costs, i.e. in the implementation of the attribution and allocation procedures. This at a minimum raises the opportunity for discretion to be exercised and is therefore capable of manipulation. For example, can the new entrant be sure that an incumbent TO will have been completely independent in its cost attribution process so as not to favour itself in any way?

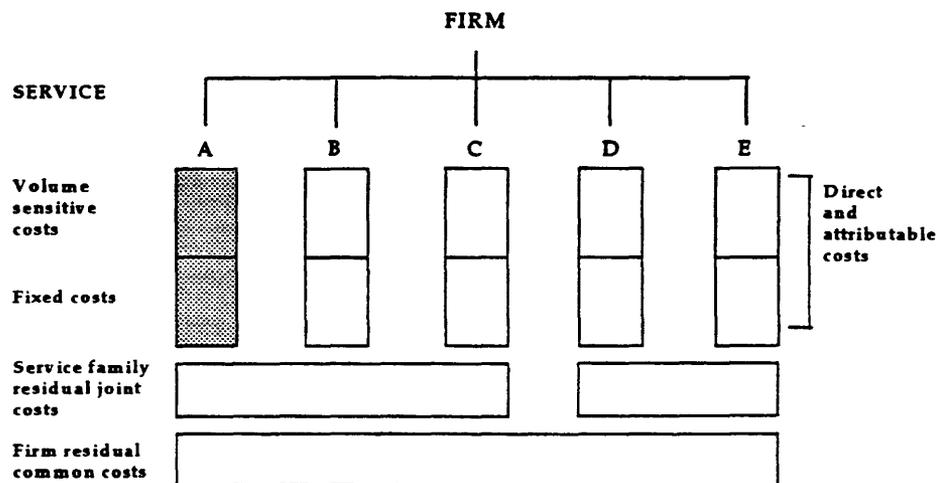
Consequently if regulators wish to rely on an FDC standard they must satisfy themselves that appropriate decisions of this kind have been taken.

A final drawback of even this enhanced FDC approach is that it is based upon existing physical network engineering capacity and existing business processes and work practices and it takes no account of technology changes, potential inefficiencies in business processes and work practices, and includes large elements of costs which are "sunk" or unavoidable in cost determination.

4.4.4 Embedded Direct Cost (EDC)

The Embedded Direct Cost standard allocates all of an organisation's historical direct and indirectly attributable volume sensitive costs and fixed costs to services.

Cost Categories Included



In this respect it is akin to FDC but does not seek to allocate residual joint and common costs to products and services.

Rationale

Embedded Direct Cost Analysis is an historical cost contribution approach to attribute the actual historical network expenditure to individual services. It analyses the physical network engineering capacity, together with the business processes within the company. The analysis reflects historical traffic patterns and performance of the organisation and allows the services provided to be costed. Information is derived from the company's books and records, and as such, reflects the actual fixed assets used to provide the service, and the existing levels of capacity and network utilisation inherent in them. As with FDC certain costs have to be directly or indirectly attributed to services. There are many different attribution methods and

those used should be cost causal in approach. Activity-Based Costing is one such method of attribution which has received widespread support in providing a better understanding of the cost base of the organisation and the cause and effect relationship between activities performed, their associated costs, and the resulting output of those activities.

Practical Considerations

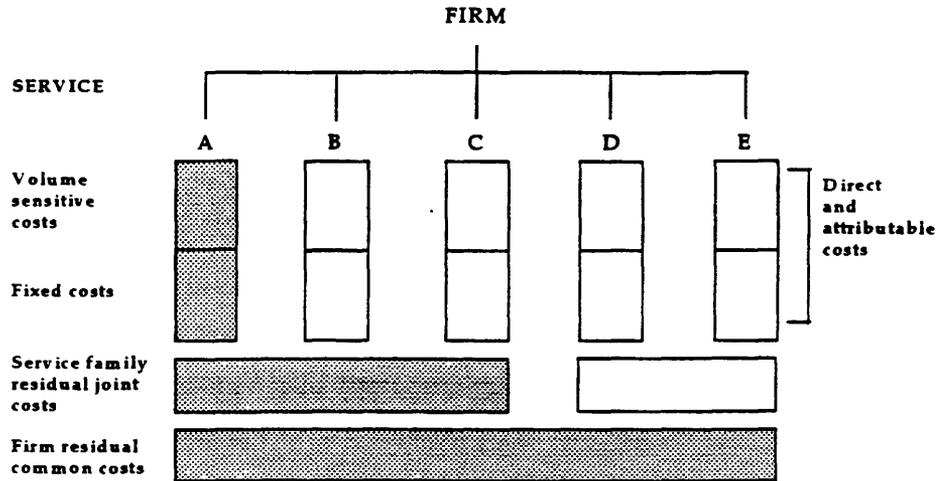
EDC contribution analyses are appealing to regulators and TO management because they "tie into the books" and explain recent, albeit past, performance. Furthermore, such analyses provide management with a detailed knowledge of the costs incurred in running the existing network, and a detailed understanding of the relative contributions of individual services to the pool of joint and residual common costs highlighting revenue and cost imbalances. They also provide a rigorous basis for setting prices which ensures that current revenues represent a full recovery of legitimate expenditure made in previous years. Their shortcomings are that they take no account of technology changes, possible efficiency improvements in business processes or work practices and include large elements of cost which are "sunk" or unavoidable in cost determination.

As Michaelson points out "EDC studies represent a halfway station between traditional [FDC] studies which are widely acknowledged to be inappropriate for pricing [decisions] and incremental cost analysis".

4.4.5 Stand Alone Cost (SAC)

A cost standard which measures the cost of providing a service in isolation from the rest of the business.

Cost Categories Included



The SAC includes all directly attributable costs and all shared cost categories associated with the production or provision of service and therefore includes volume sensitive, fixed, common and sunk costs associated with the product. Under SAC all shared cost categories which under FDC are allocated between two or more products are totally accounted for by one product.

Rationale

The SAC standard does not produce economic efficiency if used for pricing and resource allocation decisions as it is not based on the marginal method of cost allocation. However, the standard is applicable to the pricing decision by setting a price ceiling - the cost of a hypothetical firm established to sell a single product or service only.

Practical Consideration

The most common method of estimating SAC is by setting up a model of a hypothetical firm. The operational and capital requirements of producing the product or service are determined. Equipment requirements identified through this process are then multiplied by equipment cost to determine the partial cost of service. Overheads, administration expenses and other cost item associated with setting up a hypothetical firm are then added to produce total SAC.

The SAC can therefore be seen to be calculable - but elements of complexity and subjectively detract from its effectiveness.

4.4.6 *Costs for Pricing Decisions*

Having reviewed the various cost standards that can be adopted by an organisation it is possible to observe that there is no single cost standard that is appropriate for all uses.

Section 4.4.1 suggested that economic efficiency is achieved if prices are set equal to MC, but that MC is a difficult practical measure due to the difficulty of analysing unitary changes in output. Section 4.4.2 suggested that this practical measurement problem can be overcome if ICs are used and that the "marginal" nature of IC allows efficiency to be promoted. However, the shortcoming of both cost concepts is that they do not allow long term financial viability because no account is taken of residual joint and common costs.

Whilst IC provides the pricing floor and SAC provides the price ceiling the price that theoretically encourages economic efficiency and permits the firm's long term financial viability will be somewhere in the middle and is likely to have as its basis the LRIC²¹.

The extent to which this is approximated using the FDC standard will depend upon a number of factors including the technology the firm employs, the efficiency of its current organisation, and in no small measure the cost causative nature of the cost attribution and allocation process employed by those producing the information. Notwithstanding its potential failures as a pricing tool, however, the FDC standard will continue to be employed for external financial reporting and limited performance measurement.

When used for pricing decisions, IC establishes the price floor for a service but not the actual tariff. To the extent that market conditions permit, competitive services should be priced to yield the highest level of contribution to residual joint and common costs and the firm's profitability as long as the tariff exceeds the IC. Every enterprise has fixed common costs that cannot be classified as incremental to any particular service. Exclusive focus upon IC is not meant to deny the existence of fixed costs. Collectively margins between prices and ICs must equal or exceed total

²¹ Section 4.4.2 suggests that prices should be based upon LRIC not set equal to LRIC.

fixed or residual joint and common costs, or the enterprise cannot be self supporting in the long run. To assign, or allocate shares of residual joint or common costs to individual services provided is however flawed. It carries with it the self contradicting implication that an increase in the amount of service provided requires an increase in these fixed costs.

When pricing based upon IC it is necessary to add a premium (or margin) to ensure the organisation recovers the residual joint and common costs. There are some economic theories to determine how this premium is recovered from a particular service, two of which are set out below. These theories differ depending upon whether it is a final/"retail" services or intermediate/"wholesale" service such as interconnection. However, there are practical objections to each which limits their use.

One economic theory suggests that the price of final or retail services should follow the Ramsey pricing principle where the percentage difference between the price of any good and the incremental cost of the good i.e. the premium/margin, is inversely proportional to the elasticity of demand of the good. This minimises economic welfare damage resulting from deviations of price from IC, and therefore maintains economic efficiency. It appears to be an equitable principle to allocate common costs to services in proportion to the excess benefit which consumers derive from them over what they have to pay. In effect, the common costs are loaded particularly onto services for which demand is unresponsive to price e.g. retail access charges.

Another economic theory suggests that the pricing of intermediate or "wholesale" services should be based on the Efficient Component Pricing Rule (ECPR) of Baumol and Willig²². This rule states that the price charged should be equal to the incremental cost of providing the component as well as the opportunity cost to the first firm of selling the component to the second firm. The opportunity cost is the foregone revenue the first firm loses from not being able to use that component itself. However, this rule only holds true in practice if it is possible to quantify the opportunity cost, and only if it is certain that such costs only arise as a result of efficient service provision by the incumbent TO. Given the widely held view that

²² Baumol, William J. Deregulation and Residual Regulation of Local Telephone Service. AEI Studies in Telecommunications Deregulation. March 1993.

many TOs are inefficient in their operation it seems likely that this is the greatest criticism of the ECPR²³.

In an ideal world we can see that organisations would rely on a number of cost standards, incremental and stand alone cost standards for pricing, embedded direct costs for performance appraisal and fully distributed costing for financial reporting.

Of necessity however, most organisations will not formally adopt all of these but are likely to use a FDC system predominantly, with additional pricing and decision support systems surrounding it to the extent that they are required as a result of commercial necessity.

WIK²⁴ have suggested that all prices should be based upon long run incremental cost and that the "illusiv" margin to be added to this should be such as to ensure full recovery of all past historical cost. As a pricing principle this will ensure that incumbent TOs remain financially viable, however, new entrants will argue that it still sustains prices at a level that allows incumbents to recover costs incurred historically that have either arisen as a result of inefficient investment decisions, or that allow for sub-optimal network architectures, business processes, or staff utilisation. The assumption that all past investment decisions reflected in incumbent operators' historical costs were undertaken in an efficient manner can be questioned on the basis that one of the prime motivations for liberalising the telecommunications sector is that incumbent operators are believed to be inefficient.

4.5 Some Words About "Cost Allocation"

Due to the high proportion of joint and common costs that arise in TOs that are not solely incurred for a particular product or service the issue of cost attribution and allocation with all cost standards is fundamental.

²³ Alban, Robert. "Interconnection Pricing". Telecommunication Policy 1994 18(5) 414-420 concludes that the Efficient Component Pricing Rule does not provide an efficient basis for interconnect pricing.

²⁴ Wissenschaftliches Institut für Kommunikationsdienste GmbH (WIK), and European American Centre for Policy Analysis (EAC). Study on Network Interconnection in the Domain of ONP for the European Commission. Draft Final Report. WIK/EAC, September 1994.

Many commentators think of cost allocation as it relates to the "arbitrary" allocation of residual joint and common costs. However, it is worth noting that although the majority of costs in a TO are joint and common costs, many of these can be causally attributed to different services either directly or indirectly. Given the extent of these costs and the subjectivity that can be exercised in their "causal attribution" it is crucial to understand the range of different attribution or allocation methods that could be employed giving rise to different but equally justifiable service costs. This subject will be examined more closely in section 9.

KEY POINTS: SECTION 4

- Cost accounting systems have developed to meet user needs. Historically these demands have come from external stakeholders, but with competition, management and internal stakeholders will have more extensive cost information requirements.
- Regulation of prices has three primary objectives:
 - Consumer protection through endogenous or exogenous based price control.
 - Development of competition.
 - Social obligations which may be fulfilled either implicitly or explicitly.
- Decisions made regarding regulatory policy can influence the development of cost accounting systems.
- 'Cost' is a multi-dimensional concept. Different measures of 'cost' for different uses may be derived through the application of one or more different cost standards:
 - MC will promote efficient resource allocation but is difficult to measure.
 - LRIC is more practical to measure than MC and is still a marginal concept and will therefore promote economic efficiency. However, neither LRIC or MC recover residual joint and common costs and therefore do not ensure the long term financial viability for the firm.
 - FDC allocates all firm costs to services and involves subjective judgement in such allocation. FDC takes no account of past inefficiencies or future changes (e.g. in technology) and is therefore less suitable for pricing than it is for financial reporting.
 - EDC is a "halfway station" between FDC and IC. Use of ABC techniques enables a better understanding of cost causation and a more rigorous basis for price setting. Neither FDC or EDC take account of changing technologies or past inefficiencies.
 - SAC will not encourage economic efficiency and in practice calculation is complex and subjective.

KEY POINTS: SECTION 4 CONTINUED.....

- Prices should be set at an amount equal to the LRIC plus a premium/margin, such that across all services the aggregate premium/margin above total LRIC is sufficient to recover joint and common costs and allow the firm to remain financially viable.
- Whichever cost standard is used the cost attribution and allocation methodology is fundamental in industries where a high proportion of costs are incurred to support multiple services.

5. EXISTING COST ACCOUNTING PRACTICES AND COST ALLOCATION METHODS OF COMMUNITY OPERATORS

5.1 Introduction

To develop detailed recommendations on the most appropriate cost accounting practices for interconnect charges that are consistent with existing national practices it is necessary to have an appreciation of the existing practices of Community operators. This section presents the results of interviews with TOs and NRAs in respect of cost accounting practices in each Member State of the Community. In particular it examines existing cost accounting methods, and changes planned by TOs and NRAs. It builds upon work already carried out in the Commission study "Regulatory Requirements on Cost Accounting Systems within the framework of ONP", February 1992.²⁵

The section discusses the financial reporting requirements of Member State operators, both external and internal, and the resulting information requirements placed upon the costing systems. It also examines the cost standards adopted by Community operators and sets out information regarding their existing costing systems capabilities. Given the context of this study section 5 also reviews the relationship between costs and retail tariffs in each Member State, the status of interconnection and the relationship between interconnect charges and associated costs. Finally it also summarises existing information TOs maintain with respect to the magnitude of costs associated with the USO in each Member State.

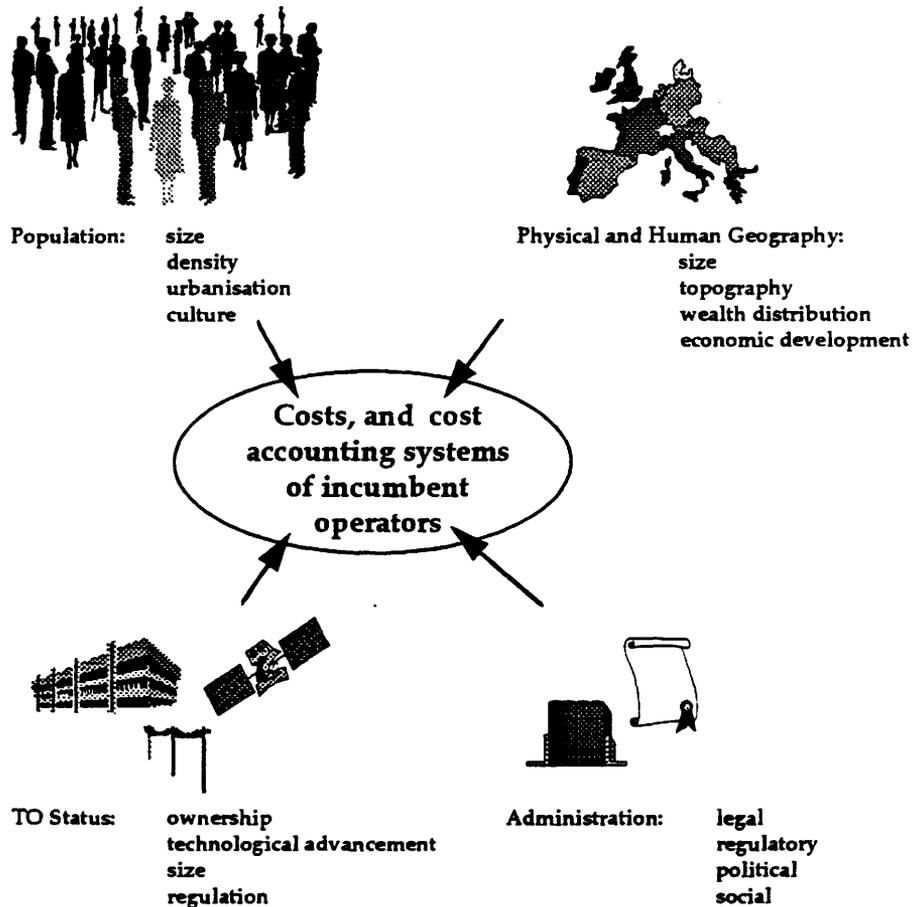
Most operators consider detailed information about their costing systems and cost information to be confidential as they contribute to their competitive advantage. In the interests of commercial confidentiality section 5 does not present a detailed country by country analysis of the existing cost accounting methods of Community operators. Instead the analysis draws out the range of practices currently adopted, understood and planned for future implementation with some specific country examples.

²⁵ Wissenschaftliches Institut für Kommunikationsdienste GmbH (WIK) (Weinkopf, Marcus). Regulatory Requirements on Cost Accounting Systems within the Framework of ONP. A study carried out for CEC-DG XIII. Final Report. Bad Honnef, February 1992.

5.2 Background Information

The European Community includes countries of vastly different sizes, topographies, demographics, histories and cultures all of which have tailored the telecommunications industry to arrive at the patchwork of design, policy and network architecture that exists today. As discussed in section 4 this of itself has implications on the TO's cost structure and the cost accounting systems that have evolved. It is worthwhile looking in more detail at this background to understand the source of a number of the issues which currently affect the interconnection debate and to appreciate some of the practical problems associated with formulating a pan-European solution.

Factors influencing TO costs and their cost accounting systems



5.2.1 *Population and Geography*

The incumbent operators in Europe have all developed primarily within their national boundaries and often even within regional areas of the country. Tele Danmark was established in 1991 from the combination of the four old regional companies. Portugal and Italy have regionally and functionally divided monopolies which are similarly undergoing merger. The merger in Italy of SIP (national services), Italcable (intercontinental services), Iritel (international services), Telespazio (satellite links) and Sirm (radiomaritime links) forms a new incumbent company responsible for telecommunications services - Telecom Italia. Otherwise the Member States have historically had one incumbent operator. Given this national perspective it is understandable that the incumbents each have developed in accordance with the particular historical, cultural, political and other factors unique to that nation.

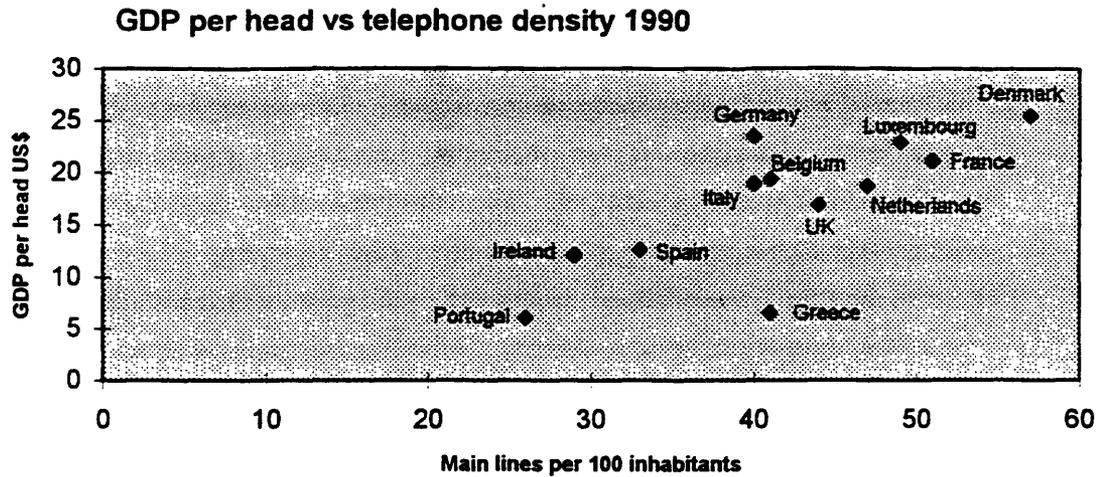
Population size, density, distribution, and culture have all had an impact on the incumbent operators. The capacity of the network is determined by the size of the population and the demand they place upon it. The coverage and architecture of the network has been determined by the size and density of the population.

Geographical diversity also plays a part in determining the incumbent status. Network rollout is undoubtedly easier on flat land with homogeneous population density than on mountainous terrain or under seas to connect island populations. Some incumbents have had much larger nations to cover than others (compare Luxembourg to Germany). The existence of vast mountain ranges and sparsely populated rural areas means that the costs of setting up the network are disproportionately high in some parts of the country than others. Where tariffs are averaged this means that there are some interesting cross subsidies and wealth redistribution effects.

Further, networks are likely to be constructed firstly in urban areas where the demand and the return on the investment are likely to be larger. Then, gradually, universal service obligations (USOs) will result in expanding the network to those areas that are less attractive to the industry. Such network rollout has not been completed in all the European Community Member States but is treated as a matter of great importance in these nations. It is generally a belief amongst economists that telecommunications confer benefits upon regions including increased employment

and general economic growth²⁶. It is therefore to the benefit of the nation as a whole to pursue universal service policies.

Graph: 5.2A



Source: OECD, Communications Outlook (1993), Guinness (1994), Arthur Andersen Questionnaires 1994

The link between economic growth and telecommunications is evident from graph 5.2A above. It is notable that the countries with the highest GDP figures per head of population are to be found generally in those countries with the most penetrative networks. Whilst this simplistic view may ignore all the other factors which go to make up improvements in wealth, the correlation between GDP and telecommunications is undeniable whichever is the cause and the effect.

5.2.2 TO Status

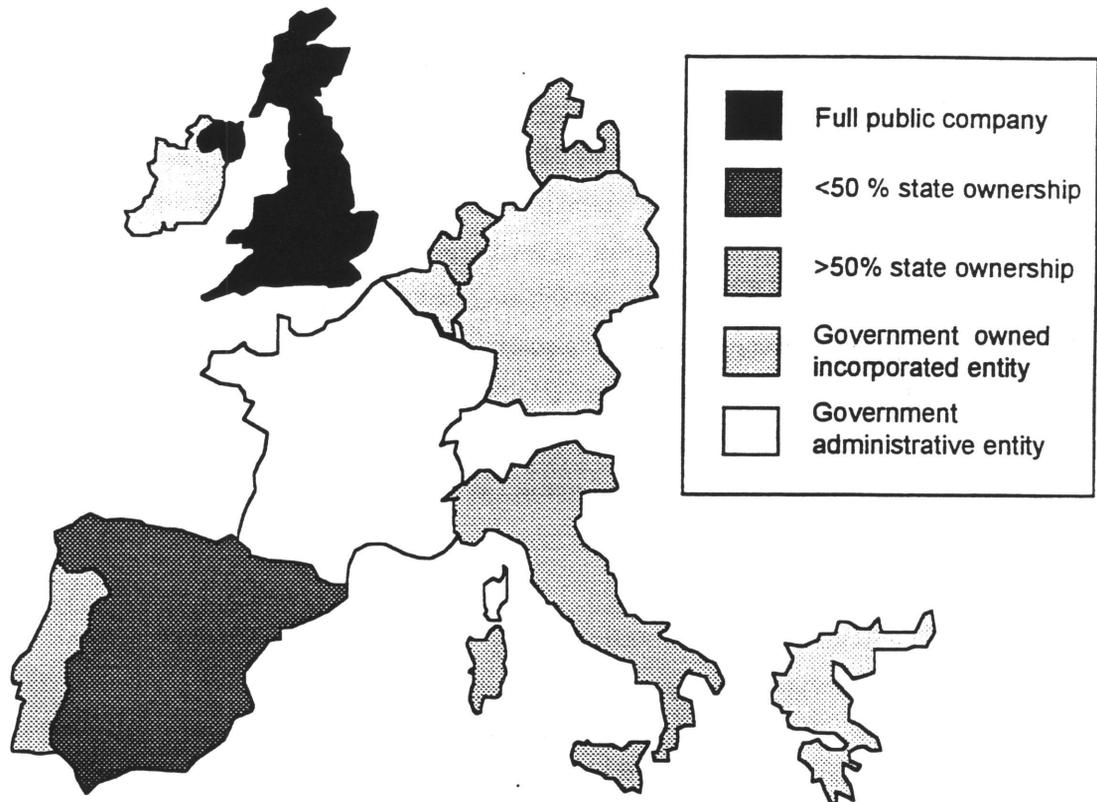
Ownership

The current situation in Europe is predominantly one where the provision of voice services is the restricted domain of the state-owned, corporatised TOs who enjoy monopoly rights (excluding mobile), the notable exception being the UK. In some nations the monopoly rights have been divided either geographically or functionally as in Portugal and Italy. Portugal's telecommunications industry, for example, has until recently been divided into two regional TOs for Lisbon/Porto and the rest of

²⁶ Cave, Martin, Claire Milne and Mark Scanlan. Meeting Universal Service Obligations in a competitive Telecommunication Sector, Report to DG IV. CEC, March 1994.

the country, with a submarine cable and satellite company and a wireline service company. Denmark also had a regionally divided monopoly until in 1991 Tele Danmark A/S was formed by unifying the regional entities. The Italian and Portuguese TOs are currently undergoing similar mergers.

Incumbent operator ownership



Whilst competition is evident amongst certain telecommunications products and services in Europe such as mobile and customer premises equipment, wireline fixed network voice telephony services continue to be offered only by the incumbent TO in all European countries except the UK.

The UK has the most competitive market - but the situation is still far from unregulated competition. Germany may well be the next country with competitive wireline voice telephony with consideration currently being given to a number of potential wireline competitors.

Mobile voice communications is where the most intensive competition is building up. In the UK two cellular operators and two PCN operators are competing for

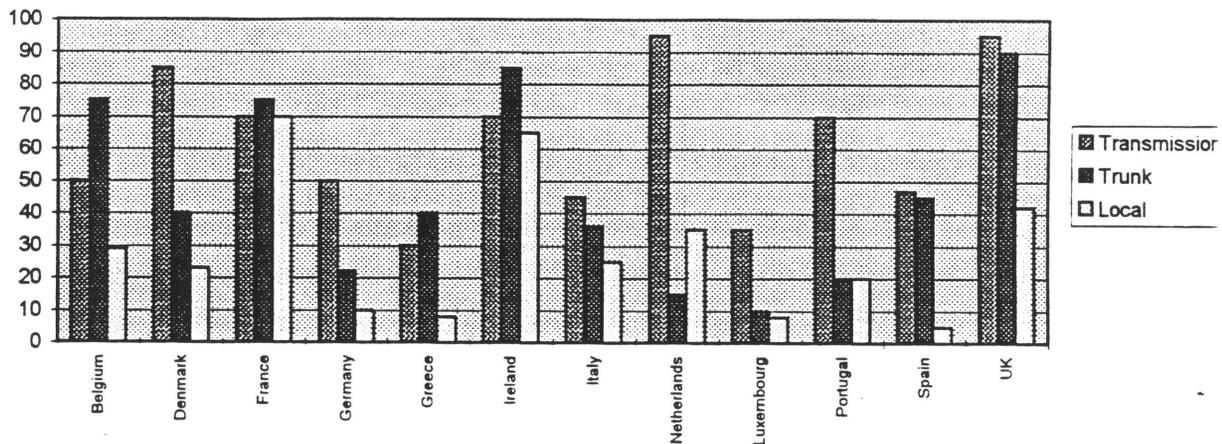
customer attention with 6 service offerings. In Germany two well established mobile operators have recently been joined by a third competitor. France have a functioning mobile duopoly with a third mobile licence recently awarded. Denmark, Greece and Portugal also currently have a functioning duopoly in mobile communications and it is anticipated that second licences will be issued in all those countries where mobile is currently monopolised before the end of the year.

Technological Advancement

Technological advances are changing the nature of the networks and therefore the underlying cost base and recoverability of recorded asset balances. Radio based networks may prove to be a more cost effective solution to serving remote areas. Cable TV companies are already providing local telephone services for more than 300,000 homes in the UK²⁷ and the other European countries are watching the developments in the UK to see if such infrastructure liberalisation could be effective in their Member States. Digitalisation is increasing the service capabilities and effectiveness of the TOs, affecting the cost base of the TOs, and their abilities to capture detailed cost and revenue data (e.g. itemised billing).

Graph: 5.2B

Network digitalisation (%) in 1990



Source: OECD (1993) Arthur Andersen Questionnaires (1994)

Graph 5.2B above demonstrates the various stages of digitalisation within the Community in 1990 - again highlighting the differences between the Member States.

²⁷ The Economist, August 1994.

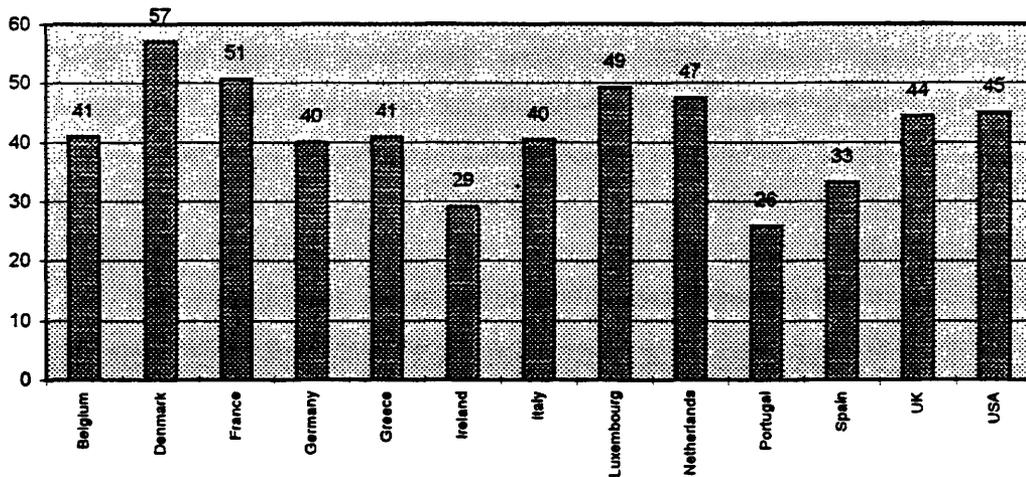
It should be noted, however, that many incumbents have put significant investment into digitalisation since 1990.

There is no benefit to comparing the investments in networks across Europe. Problems in the definition of the "network" and differences in the timing of the investments means that the historical costs of the network are not comparable. The same networks may be valued differently dependent upon the technology of the network and this, together with the time value of money, serves to illustrate one of the criticisms of basing interconnect charges on historical network cost.

Expenditure on the network in the future will to some extent depend on the coverage already achieved and the need for further network rollout. Network rollout is also an issue that will need to be taken into consideration in interconnect charges where such rollout is still required.

Graph 5.2C

Main line penetration per 100 inhabitants



Source: Arthur Andersen Questionnaires (1994), individual TO accounts (1992-1994) and OECD (1993)

Graph 5.2C above demonstrates the variety of penetration rates across the European continent. Here, penetration is described as main lines per hundred inhabitants, where main lines represent the lines which run from the Customer Premises Equipment (CPE) to the Public Switched Telephone Network (PSTN) and which have a dedicated port on a telephone exchange. Much of the variety evidenced by the penetration rates relates to the extent to which the network rollout has taken place in each country. Countries where significant network rollout is still ongoing include Greece, Portugal, and Spain.

The limitation of such analysis should, however, be borne in mind. For example, no account is taken of average family sizes, or the degree of business-line switch boarding which both vary considerably in the Community. These, and other factors, would explain why Greece has a comparatively high penetration (where one would expect it to be lower due to incomplete network rollout) and Ireland has a relatively low penetration (where one would expect it to be higher).

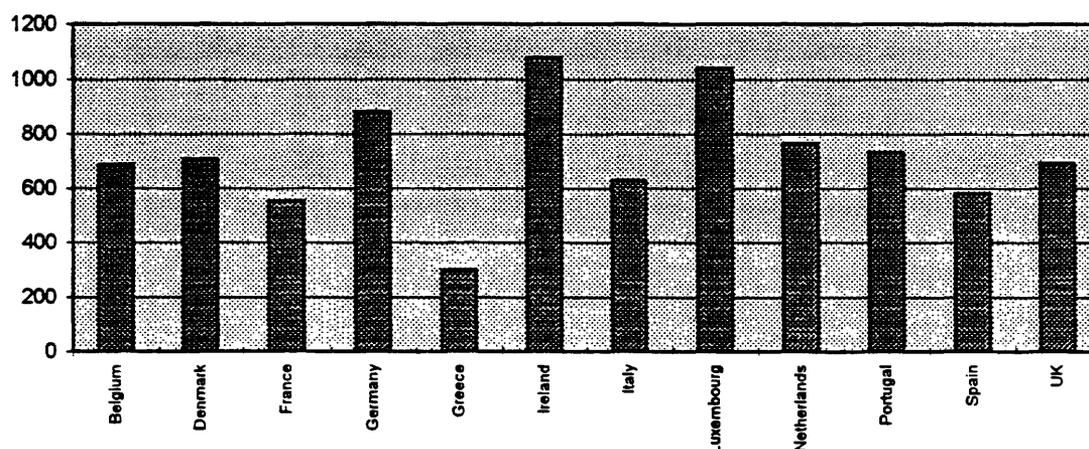
Size of TOs

TOs of a larger size will, by necessity, have more complex and potentially even more sophisticated cost accounting and cost allocation systems in an attempt to help improve the manageability of the business. In this regard one would expect, for example, the cost accounting systems to be more complex in France Telecom, Deutsche Bundespost Telekom, Telecom Italia and British Telecom than in Tele Danmark, PTT Telecom BV or Entreprise des Postes et Télécommunications.

The importance of telecommunications to a nation can also be viewed as a driver for improved products and services, investment in new technology or other improvements and therefore alterations in the cost base of the industry. "Telecommunications revenues per main line" is a statistic often viewed as an indicator of the importance of telecommunications to the country.

Graph: 5.2D

Telecommunications revenue per main line (ECU)

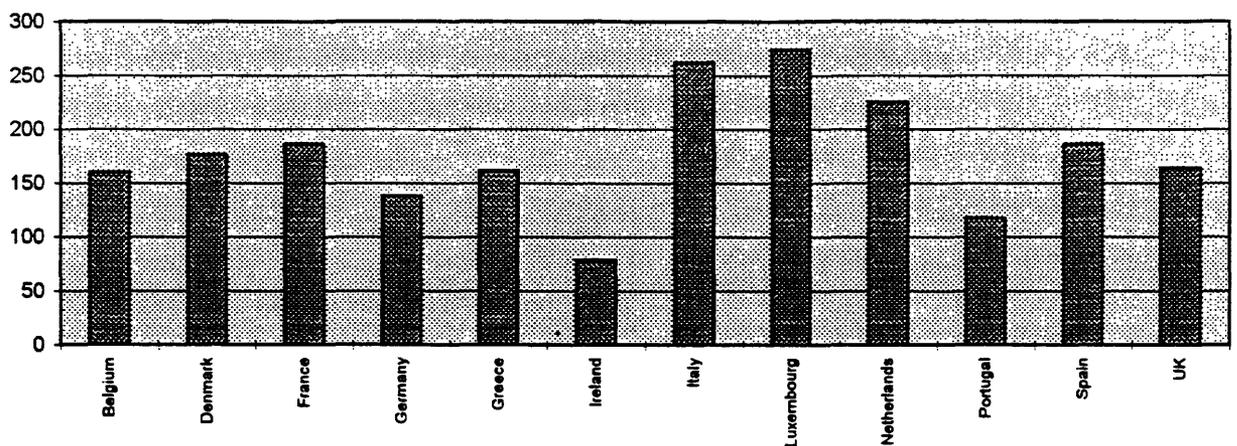


Source: Individual TO accounts (1992-1994), OECD Communications Outlook (1993), Arthur Andersen Questionnaires (1994)

Graph 5.2D above indicates a degree of diversity in the extent of telecommunications revenues achieved from each main line in the Community. Ireland, Luxembourg, Germany and the Netherlands indicate particularly high revenues per main line - a function of the importance attributed to telephone communications in these countries along with other factors such as the mix of international, trunk and local calls, size and simplicity of the networks, etc. Contrastingly, Greece has a very low revenue per main line - a function of the undeveloped state of their network and its under utilisation.

Examining main lines per telecommunications employee gives an indication of the manning levels of the Community operators. It is a generally held belief that monopolies are usually overmanned such that with the onset of competition a large degree of rationalisation, or downsizing, is necessary thereby affecting the cost base of the organisation.

Graph: 5.2E
Main lines per employee



Source: Individual TO accounts (1992-1994), OECD, Communications Outlook (1993), Arthur Andersen Questionnaires (1994)

Graph 5.2E above illustrates that the smaller Member States (Luxembourg and the Netherlands) particularly demonstrate high efficiencies based on the "main lines per employee" statistic. This mainly derives from their smaller and less complicated networks. According to this indicator Italy would also demonstrate efficient use of their network. Ireland and Portugal demonstrate a much lower number of main lines per employee - a function, perhaps, of the fact that both these countries are still developing their networks and have relatively high employment levels.

The UK, whilst the most competitive market in voice telephony in Europe, does not seem to demonstrate a high degree of efficiency. However, graph 5.2E ignores a number of factors. Firstly, the UK has a high degree of external switchboarding where companies may only have a few lines serving several people. Also, the ongoing trends of the past few years have seen British Telecom's employment levels drop from just under 250,000 in 1990 to just over 150,000 in 1994 thus demonstrating the downsizing influence and search for efficiencies which have been brought about by competition.

Regulation

The diversity of telecommunications in Europe extends to the regulatory regime in each country. Regulation has an important role to play in the transition period from monopoly to a fully competitive market place and in particular the regulation of interconnect agreements.

The current status of the NRAs around Europe is important to consider as it impacts the authority of the NRA to implement policy and demand information. It also indicates current regulatory demands which the TO must be capable of complying with, and helps identify the roles which the nations currently expect the NRAs to be capable of carrying out.

Role of the Regulator												
	Bel	Den	Fra	Ger	Gre*	Ire	Ita	Lux	Net	Por	Spa	U.K.
Promote competition	✓	✓	✓			✓			✓	✓	✓	✓
Control tariffs	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
Control costs			✓			✓				✓	✓	✓
Control structure of Telecom industry	✓	✓	✓			✓					✓	✓
Set industry standards for accounting & reporting	✓		✓				✓			✓	✓	✓
Issue licences to operate as a TO	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Quality watchdog/control	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
Deal with consumer issues		✓	✓	✓		✓			✓		✓	✓
Others (e.g. control numbering)	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

* - no information provided

Source: Arthur Andersen TO and NRA Questionnaires (1994)

The table above indicates the views of the operators and NRAs of the regulatory role in their respective Member States. In most European Community countries the primary goal of the NRA appears to be the controlling of the operator tariffs and the issue of new licences. Few respondents answered that the NRA is responsible for controlling costs or setting industry standards in accounting and reporting.

Many of the NRAs have only recently been established in their current form but all twelve Member States have now separated the NRAs from the operators. Belgium and Denmark are two examples of where the NRA has only recently been established and so the role which the NRA is seen as having to fulfil has not yet been fully determined. This is also partly true in Ireland.

One area of social policy that regulators appear to be mindful of is the issue of employment protection. Incumbents historically have employed large numbers of people. To lose even small proportions of such large workforces due to restructuring and downsizing is often a political issue of extreme sensitivity.

One of the principal aims of liberalisation is to ensure incumbent operators improve their efficiency. This will be achieved in a number of ways, but primarily through improved business processes, staffing levels and improved effectiveness. This may therefore provide a conflict between political employment policy objectives and telecommunications policy. If the Community is to benefit from a liberalised telecommunications environment, downsizing of a number of incumbent TOs is likely. If this is not permitted due to the effect on employment, inefficiency will remain a feature of the industry.

In conclusion, the European Member States can be seen to be very different in terms of geography, history, culture, etc. The incumbent TOs and particularly their network structures and cost bases have developed out of their unique histories in their individual nations. The incumbents are generally long established organisations but often only recently corporatised and sometimes privatised. The regulatory environment is also generally in the early stages of development.

5.3 Financial Reporting Requirements

As discussed in section 4.2 cost accounting systems have developed to meet the information needs of users. The financial reporting requirements placed upon TOs

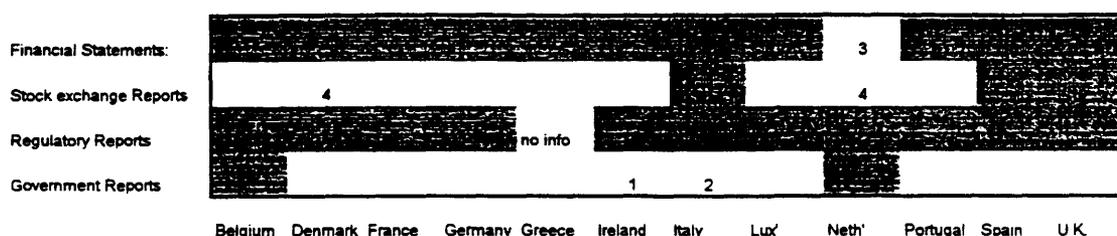
dictate to a large extent the level and detail of revenue and cost information collected, analysed and reported for those organisations. If information is not requested, either internally or externally, then it is unlikely that the TO will produce such information.

Therefore, by understanding the information requirements placed upon Europe's TOs it is possible to gain a valuable insight into the information management of the organisation, and therefore to obtain insight into the cost accounting systems adopted.

5.3.1 External Reporting Requirements

Graph: 5.3A

Types of financial report prepared by incumbents



Notes:

- (1) Progress Reports : Implementation of 3/5 year plan
- (2) Progress Reports : Implementation of 3/5 year plan, demand status & quality of service no segmental information produced until EC 4th Directive of 1993.
- (3) Financial reports are produced by KPN, the group holding company; an annual concession report is produced by PTT for the government.
- (4) These incumbents have been privatised since receipt of questionnaire. Stock exchange reporting should therefore become a feature of these TOs

Reports produced
 No reports produced

Source: Arthur Andersen TO and NRA Questionnaires and Interviews, 1994

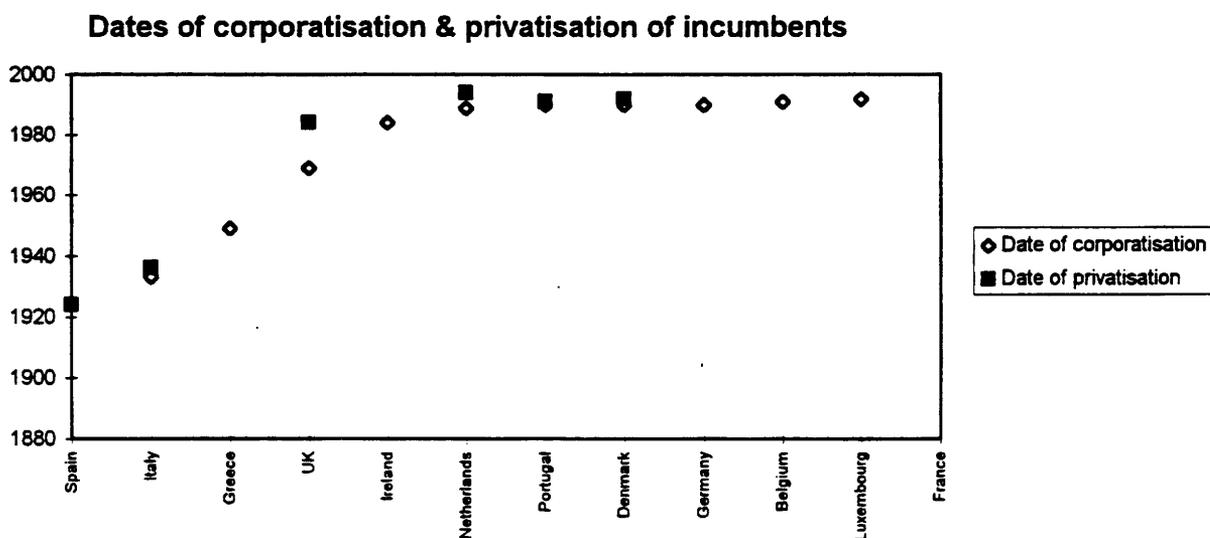
The external reporting requirements placed upon European TOs are not currently very extensive. Financial Statements are currently produced by the incumbent TOs in each Member State except for PTT Telecom BV in the Netherlands. These financial statements are in most instances fairly detailed requiring as a minimum the presentation of a balance sheet, profit and loss account and various footnote disclosures including cash flow statements in some Member States. PTT Telecom BV produce a "Concession" report for the Dutch government on key performance indicators with financial statements being produced by KPN, the holding company for the national telecommunications and postal companies. However, the fact that consolidated financial statements are produced is evidence of the ability of the Dutch

incumbent to produce much of the data necessary for the preparation of financial statements.

The financial statements produced all adhere to the requirements of local Generally Accepted Accounting Principles (GAAP) and other relevant legislation (e.g. Companies Act (UK), Law on Commercial Accounting (Luxembourg)). At a broad level these have been harmonised throughout the Member States subject to this study as a result of the EC 4th and 7th Directives which have been adopted in all 12 Member States.

The requirement to produce such financial statements generally arises from the point in time that a company is corporatised. Prior to corporatisation a number of the incumbents were only required to prepare accounts on cash accounting principles or limited financial information to enable government control. The cost of individual products and services was not a significant issue for either managers or policy makers. As long as total revenues were in excess of total costs by an extent sufficient to fund investment, and to provide a contribution to state treasuries no-one focused on the relative profitability of different services. Except for France Telecom, all the incumbent TOs in Europe have now been corporatised. However, this corporatisation has only been a recent phenomenon in the majority of European TOs as shown in figure 5.3B below.

Figure 5.3B



Nb. Italy has undergone reorganisation in 1994 to formulate a new incumbent company - Telecom Italia. SIP has been used here for the purposes of demonstrating the recency of requirements to prepare financial statements.

Source: OECD, Communications Outlook (1993), Arthur Andersen interviews (1994)

In many countries corporatisation was seen as a first step prior to privatisation (shares listed on a stock exchange), and the sale of part of the government's interest in these organisations to the public. Where privatisation has occurred, this is indicated above also.

Figure 5.3B demonstrates the comparative recency of corporatisation amongst most of the incumbent European TOs. The fact that for many TOs the corresponding reporting requirements have not been in place for long means that the historical accounting information often does not possess the rigorous detail that exists in long standing independent companies which have been subject to such reporting requirements for many years. As a result, in many of these organisations the historical information is not robust and the cost accounting systems are still in the early stages of development or refinement. By way of example, Germany's Deutsche Bundespost Telekom did not maintain a full fixed asset register up until the end of 1992 when a count was conducted in conjunction with the implementation of a new cost accounting system. Complete historical cost analyses of fixed assets are also not maintained by Belgacom, Tele Danmark A/S, Entreprise des Postes et Télécommunications and OTE.

As detailed in section 5.5.5 most European incumbent operators are also either in the process of implementing more detailed cost accounting systems or planning such improvements.

The necessity for additional and more detailed external financial reporting information often becomes greater with privatisation. Currently only Denmark, Italy, Portugal, Spain, the UK and recently The Netherlands have incumbent TOs which are public enterprises. Such countries possess accounting systems that must be capable of handling the burden of extra stock exchange reporting both locally and in other countries where the financial instruments are publicly traded, such as the form 20-F for the New York Stock Exchange.

Detailed information is often required by the government in cases where the incumbent TO is state owned. As "owners" of the business this is a formal method of finding out how the company is performing. For example, in Ireland the management have to produce a progress report on the implementation of the company's 5 year plan as well as quarterly reports to shareholders on quality performance indicators and profit forecasts. SIP of Italy also has additional reporting demands placed upon it by the licence with a requirement to prepare reports on the

implementation of 3 year plans annually, the demand conditions monthly and the quality of service six monthly. Such demands may be under review with the formulation of the new Italian incumbent - Telecom Italia.

With the opening up of the market to competition, the NRA places demands upon TOs for sufficient information to ensure that the old monopolies do not abuse their dominant position (e.g. through cross subsidisation of competitive services from monopoly services) or that new entrants exploit inefficient arbitrage opportunities. Such regulatory intervention necessitates increased information demands upon the TOs. Whilst regulatory reporting requirements are a form of external financial reporting requirement, their use is of particular importance to this study and they are therefore analysed separately in the next section.

5.3.2 *Regulatory Reporting Requirements*

Most of the questionnaire respondents stated that some form of regulatory reporting requirements were placed upon their organisation. However, the degree to which those regulatory requirements place additional demands upon the cost accounting systems of the TOs in each Member State varies. Such variety stems from the regularity of the reporting demands, the extent to which the NRAs involve themselves in pricing policies, investment decisions, etc., and the degree of competition in the market place.

Regularity of Reporting

In the majority of the Member States the TOs are required to produce reports and other specific information requirements for the NRA in line with statute, or contracts. Such situations require the TOs to have cost accounting systems that are capable of producing the information (at least where the requirement is so regular that it discourages the use of "one-off" data collection exercises).

In addition, most NRAs in the Community are empowered to request ad-hoc reports as and when the information is required for a particular function and do so to varying degrees. For example, tariff changes have to be approved by the NRA after assessing cost information in Belgium, France, Germany, Ireland, Italy and the Netherlands. Such demands often call for one-off costing exercises and do not necessarily indicate the ability of the costing systems to cope with evaluating the ongoing costs of particular services.

Luxembourg and Denmark provide two examples of where the full extent of regulatory reporting is irregular, or ad-hoc. Furthermore, the limitations of the costing systems restrict the reports which the regulator can realistically request. This contrasts with those Member States where the reporting requirements are laid down specifically in the legislation or regulatory framework such that the costing systems have to be adapted to be capable of producing the necessary reports, e.g. in the UK Oftel have a requirement for BT to produce Financial Results by Service.

In Luxembourg Article 22(1) of the "Concession" licence enables the NRA to request virtually any information from the operator, Entreprise des Postes et Télécommunications.

In Denmark there are no standard regulatory reporting requirements. At present Telestyrelsen is unable to 'demand' any information from Tele Danmark A/S. However, Telestyrelsen does 'request' externally audited information on cost allocation methods applied to ensure these are in accordance with the EU rules. Currently Telestyrelsen is utilised mainly for implementation of legislation, discussion of telecommunications issues and handling customer queries and complaints.

NRA Involvement in the Business

In some Member States the regulatory role appears to be blurred with that of an investment monitoring role, i.e. where the NRA is "an extension" of the government and the state continues to be the owner or major shareholder of the business. Countries where this is the case include Belgium, Ireland, Italy and the Netherlands. There is clearly significant potential for conflicts where such a situation exists.

In Belgium Belgacom has a "Management Contract" with the government which stipulates that Belgacom must produce a Strategic Plan. The financial plan forms part of this overall strategic plan and contains information of results by service or groups of services including turnover, costs, investments and profits. In this way the government via the Belgian Institute for Post and Telecommunications is appraised of the performance of the state owned asset. In addition the Belgian Institute for Post and Telecommunications can also request data on tariffs by service from Belgacom at any time.

In Ireland, the NRA performs a dual function of "shareholder" and regulator receiving annual reports and 5 year company plans of Telecom Eireann annually, but with no segmental or additional detail. In addition the Department of Transport, Energy and Communication receives ad-hoc reports on non-financial data, applications for increases in investment and any other information that they may require. The Department of Transport, Energy and Communications is currently considering proposals to split this dual function formally in the future.

In Italy, the operator is required to produce 3 year plans for the NRA setting out its main objectives, strategies, investment decisions and financial forecasts. In addition, to ensure optimal costing within the organisation, the operator has to produce reports on productivity standards with comparatives from other TOs.

In the Netherlands PTT Telecom BV has to produce a "Concession Report" which describes how all the company's obligations have been met including a summary profit and loss account. In addition PTT Telecom BV has to provide a Multi-year policy report together with an annual update which surveys the prospects for the next five years together with expected infrastructure investment. The Netherlands has recently undergone privatisation and hence requirements may therefore be under review.

Degree of Competition

One of the most significant long run impacts on management and the information they require to effectively manage their business is the level of competition. Where only certain services are exposed to competition it is necessary for the NRA to view separate cost and revenue information for each service to ensure that the cost and/or pricing structure are within the regulatory constraints and that no unfair cross subsidisation is being undertaken between regulated and unregulated services.

To regulate such regimes the NRAs generally require cost, revenue and other information to be broken down into the individual regulated and unregulated services. Such demands place segmental data capture requirements upon the costing system with potentially more elaborate cost allocation methods. At present such service cost and profitability reports are produced by British Telecom, Telecom Eireann, France Telecom, PTT Telecom BV, Telefónica, Belgacom and Deutsche Bundespost Telekom. However, these usually comprise the allocation of cost to the revenues derived from different services. They are therefore more akin to statements

drawn up using tariff based costing principles than cost orientated tariffing principles. Not all of these reports are publicly available.

As interconnection becomes more of an issue, the regulatory role will be extended to regulating interconnect agreements and ensuring fairness and efficiencies in the market place. In no other country in Europe is this more apparent than in the UK. Here the regulation is stricter and more extensive than in any other Member State with consequent demands on the complexity and abilities of the cost accounting system of the incumbent TO, British Telecom.

Oftel require British Telecom to produce a "Financial Results By Service" report on the revenues and costs associated with the regulated fundamental service offerings and a report on any changes to controlled prices to ensure that the price-cap restrictions have been met. From all TOs (i.e. not just British Telecom) Oftel request a number of reports including separated accounts for the different service provisions, the provision of telephony equipment and the production of telephony equipment. These accounts are required annually and consist of Profit and Loss statements and capital employed information for each of the Business sections. In addition the Director General can require from all operators such documents, accounts, estimates, returns and reports that he may reasonably require to carry out his functions under the Telecommunications Act 1984. In the near future British Telecom will also be required to produce current cost accounts which require enhanced costing data and will therefore place additional demands upon the cost accounting system.

Future changes to NRA reporting requirements are examined in section 5.3.6 below.

From the above, regulatory requirements can be seen to be quite varied throughout the Community. In most Member States NRAs impose very little regular financial reporting requirements of any significant nature. Consequently demands upon the cost accounting systems also vary. As the market evolves the NRAs reporting requirements will change. This is likely to place new demands on TOs cost accounting systems which may then require further development.

5.3.3 *Internal Reporting Requirements*

In order to better understand the full capabilities of the TOs information systems, particularly the cost accounting systems, it is important to determine whether management decisions are based upon cost information derived from systems

integrated with those which support the external financial reports or from separate or supplementary sources such as projected or "forward looking" cost and revenue information.

Our interviews with most incumbent TOs suggest that management and other internal cost information is sourced primarily from the same system responsible for the external financial reporting. Most TOs indicated that management information was prepared from "other sources" of data but generally these sources are forward looking budgets and plans which in the main are based upon historical cost information from the external financial reporting system together with subjective adjustments to take account of expected trends in the industry.

By way of example, PTT Telecom BV in the Netherlands rely on their external financial reporting system for their regular management reporting. Use is made of other information sources for ad-hoc reports and projects.

Reports indicated by respondents as produced from information sourced from areas other than the external financial reporting system are generally prepared without the use of a separate accounting system, although reliance may be placed on different cost standards. This suggests that the information systems of the Member State operators are generally simplified and historical accounts orientated. With the onset of competition the internal information requirements of the management will become more demanding as the efficient allocation of organisation's resources and customer and service profitability together with customer satisfaction become the key issues for competitive success.

In the competitive UK marketplace Mercury Communications Limited demonstrates this process with extensive internal management reporting drawing from activity-based management analyses, benchmarking reports and detailed segmental reports product, call type etc. Increased customer orientation is also evident with analyses by retail business unit and market sectors.

5.3.4 *Requirements to Produce Segmental Information*

All incumbent TOs have to produce data of sufficient detail for financial statements. Any analyses of revenue, cost and profitability into more detailed pools than the company reported results as a whole can be termed segmental analyses. Examples

of such segmental analyses include service and product profitability analyses, fixed assets by geographical location, by asset type, by service, etc..

The requirements placed upon TOs to provide segmental information in their external and internal reporting determines the level of detail which the costing system has to be capable of producing in a disaggregated form. Increased disaggregation of financial information is often used to assist management of these large businesses. In monopoly organisations the primary goal is usually to make a profit on the operation as a whole whilst maintaining required social obligations. With competition, however, management become increasingly concerned about the profitability of different services and customer groups to determine the best markets in which to operate and to ration investment. Such differences in outlook are important to this study as they are reflected in the demands upon the cost accounting system.

Segmental analyses of varying degrees of sophistication are conducted by all organisations to determine profitability and efficiency of the different parts of the business. The "ideal" situation would be one where the full details of the costs of all the individual parts of the business was known together with a knowledge of the cost drivers and the interaction of the different parts of the business in determining those costs. This would enable businesses to price the cost to the business of, say, making a call from one location to another at different times of the day, or, the cost to the business of interconnecting operators using specific parts of the network. The actual situation is one where more rudimentary information is collected.

In broad terms the capabilities of incumbents' cost accounting systems to produce segmental information is currently limited. The overall impression is one of more rudimentary information being collected than would be the case in a truly competitive operation. Limited profitability studies appear to be carried out with revenue information collected when cost information is not and vice-versa. Much of this has to do with the difficulty of collecting the information. For example, it is easier to record the revenues received than it is to allocate the associated costs of the network to the different user groups as predominantly they all use the same network.

Even where it would appear segmental information is maintained it is often more a function of administrative simplification than of production of information suitable for decision making. Cost and revenue data is analysed by such administrative

regions by British Telecom (counties), PTT Telecom BV (13 districts and 32 regions), SIP (revenue and direct costs analysed into "compartmental" regions and strategic business areas), Denmark (subsidiary company regions) and Spain (provinces). Whilst such information is not so specific that it could be used for decision making it does help in making the business more manageable.

It is interesting to note, however, that where information is not already obtained about corresponding costs or revenues the operators interviewed show a keen interest to capture these costs or revenues.

Of all the cost segmental information not currently generated by the operators it is the cost of the individual service elements that most TOs indicated a willingness to produce. Such information would give operators the ability to set truly cost orientated tariffs for the services offered which is not the case at present. This ability would specifically enable the calculation of the cost orientated interconnect charges which TOs will be expected to provide.

Operators are also very keen to obtain information on the costs of servicing different user groups and the costs of making individual calls. Obtaining such information would allow the operators to ensure profitability across the range of customers or at the very least ensure a more accurate measure of the costs of the USO would be possible.

The abilities of the European incumbent's present accounting systems are not as sophisticated as they could be, but TOs are demonstrating a keen interest in collecting additional, more detailed and very useful information to develop a better understanding of their cost base and enable true cost orientated charging.

In terms of demands upon the costing system it is fair to state that in most European TOs the segmental requirements of external and internal reporting do not pose stringent demands upon the cost accounting system. Most TOs are only capable of rigorously analysing geographical, service and customer profitability on a very aggregated basis. Most incumbent TOs interviewed acknowledged this as an area where improvement was needed in the light of future liberalisation. Indeed, this will be a prerequisite to their success in competitive arenas. This is evidenced in the UK marketplace by Mercury Communications Limited who already conduct detailed analyses by products and services, call types, market sectors and geographical areas. BT, in facing up to competition also conduct similarly detailed analyses.

5.3.5 *Financial Planning and Forecasting*

Financial planning and forecasting is an area in organisations where forward looking cost data and alternatives to the external financial reporting system would often more usually be used. From our questionnaires and interviews the following major points arose:

- Most TOs understand the processes required to create the forward looking data but the use of relevant cost information is not always rigorously employed as there are few compelling competitive reasons for doing so.
- There is widespread dependence on the use of the external financial reporting system as the source and/or basis for much of the planning and forecasting.
- External financial reporting information is generally coupled with market studies and investment appraisal reports to determine future capital expenditure forecasts.
- Where universal service obligations determine the need for capital outlay incumbents generally do not carry out investment appraisal.
- Most incumbent TOs acknowledge that this area of information needs to be greatly developed.
- In competitive environments such as the UK, financial planning and forecasting is a much more thorough and detailed process utilising capital budgeting forecasts, demand and engineering studies, and with limited use, if at all, of historical cost data.

5.3.6 *Planned Changes to Reporting Requirements*

The general consensus of opinion amongst TOs and NRAs in Europe is that reporting requirements will change dramatically in the short and long term. These changes will arise from more intensive regulation of the industry during the liberalisation process and the management demand for more meaningful information for decision making and control of the business as markets become competitive. Consequently it is anticipated by most operators that their accounting

systems will require some development, or even replacement, to keep pace with the additional requirements placed upon the organisation.

In Belgium, the Belgian Institute for Post and Telecommunications anticipates some significant changes over the next few years. Belgacom expects the regulation to develop along the same lines as the other European nations whilst maintaining some control over the employment of the organisation.

The Danish NRA, Telestyrelsen, is going through the process of implementing the procedures that it will apply to regulate the industry. In addition Telestyrelsen is implementing an indexed based method of price control for which additional reporting demands will be placed upon Tele Danmark A/S to ensure compliance with the new price-caps.

In France, over the next few years it is anticipated that France Telecom will be required to separately account for the operations of the network from the other activities with the implementation of a corresponding new internal pricing policy. Additionally TOs will be required to separately account for the different activities of the business. The Direction Générale des Postes et Télécommunications also anticipates greater access to information on the methods of cost allocation and the breakdown of costs (e.g. by network use) per product per TO. This will enable the NRA to ensure the suitability of regulatory reports for specific purposes.

In Germany, from the financial year 1993 onwards the NRA, the Federal Ministry of Post and Telecommunications, requires detailed segmental information on costs and revenues for all of the fundamental products and services offered by Deutsche Bundespost Telekom.

The Irish NRA is currently reviewing the regulatory regime. The Department of Transport, Energy and Communication is looking into a move away from the shareholder type information previously requested to more statistical reports from operators to aid regulation in the changing industry. Annual Accounting Separation reports may become due from Telecom Eireann in balance sheet and profit and loss account format. These regulatory requirements are likely to place additional demands upon, and therefore develop, the cost accounting system of Telecom Eireann.

Telecom Eireann is reviewing the information needs of management in internal reporting. The use of Activity-Based Costing for cost attribution within the historical FDC system is being considered for cost statements on individual activities as a means of cost control and additional useful management information.

SIP also anticipates collecting more detailed management information. Financial data will be collected by service, customer groups, and network elements along the lines of British Telecom's current FRBS model. Benchmarking will be introduced to compare costs with those of other TOs. More forward looking investment appraisal and capital budgetary information will also be collected in the near future.

In Luxembourg the development of further external reporting requirements very much depends on the potential introduction of new laws. The incumbent, Entreprise des Postes et Télécommunications, anticipates the development of more detailed cost information by service and business unit for management purposes.

In the Netherlands, the Minister of Transport, Public Works and Water Management is considering the requirement for additional and more detailed cost and revenue data on voice services with additional ad-hoc reports to assist in the regulation of interconnect and the funding of the local access loss and the USO. PTT Telecom BV is looking to collect more detailed cost and revenue information for its own internal use.

In Spain the Ministry of Transport, Tourism and Communications is setting up the requirement for accounting separation reports between the network and other services on an annual basis. In addition the costs of public service obligations will be analysed in a future required report. Telefónica is looking at improving the cost system to produce greater detail on costs for cost management.

In the UK, British Telecom will be required to produce current cost accounts from 1994/95 onwards which will be subject to an independent audit from the following year. The company itself is looking at producing ad-hoc reports utilising incremental and marginal costing techniques, collecting more detailed customer information in the drive for competitive customer orientation and general enhancements to cost information detail with improvements in the cost accounting system.

Mercury Communications Limited have stated that competitive pressures are responsible for the future additional reporting requirements they foresee. A 'flexible' employee information system is to be established using a building block approach which will enable tailoring of the system to the many different users, services and products, and to changing customer requirements.

A general pattern can therefore be said to exist. NRAs are requiring more details on the historical cost make-up of the incumbents to ensure fair interconnect agreements, the absence of discriminatory cross subsidisation and to learn the extent of the burden of public commitments such as the USO and local access loss. The TOs are demanding more detailed and more meaningful cost information as they orientate themselves towards customers and prepare themselves for future competition. Such additional requirements will, as a matter of course, place additional demands upon, and enforce improvements and changes in, the cost accounting systems of the TOs. Of all the respondents only Luxembourg's *Entreprise des Postes et Télécommunications* expressed the view that the additional future requirements currently anticipated would not require significant investment in new or modified accounting systems.

5.3.7 Conclusion on The Importance of Financial Reporting Requirements to Cost Accounting

As recently corporatised entities the majority of the European incumbent TOs have cost accounting systems which are geared towards the external financial reporting system. The information demands placed upon the organisations are similar in degree of detail, especially where disclosure is governed by European Community Directives. The cost accounting requirements and cost allocation methodologies employed for external financial reporting may not be state of the art but they describe a common denominator of costing system ability for European TOs.

Most incumbents and NRAs agree that the reporting demands placed upon the TOs in the future, both internal and external, will encourage the improvement and even replacement of the costing systems in the future. Such development of the accounting systems would come about by competitive forces in time but may be encouraged by regulatory reporting demands for additional and more detailed information in the interim.

5.4 Cost Standards

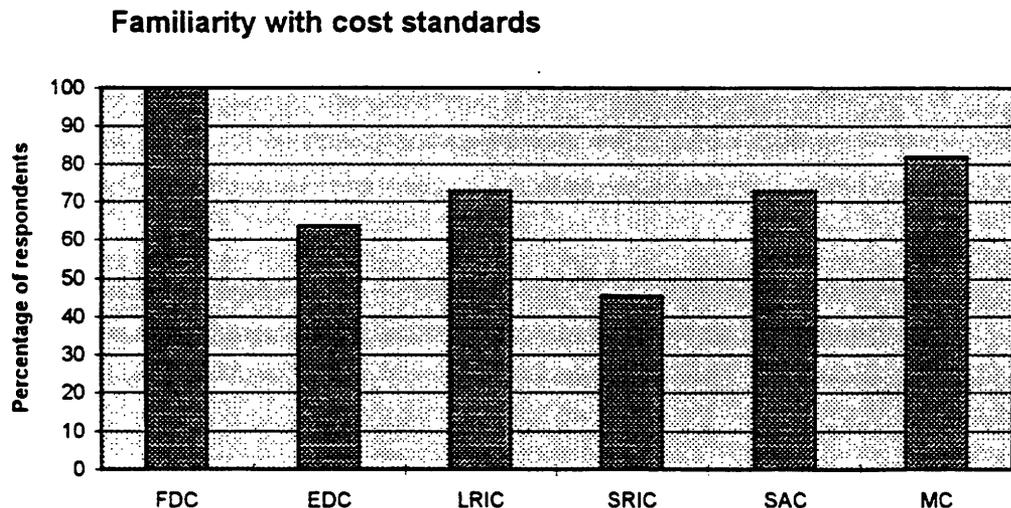
Having now reviewed the internal and external reporting requirements to understand the demands for information placed upon the accounting system it is also sensible to review the cost standards adopted. An analysis of the cost standards used by organisations gives an understanding of how TOs view costs in the reporting system and the types of cost information used by TOs for different purposes.

Cost standards are an important element of the accounting system as use of different standards can reveal very different answers to the specific applications to which they are applied. This argument has been pursued more fully in section 4. This section describes the current use and potential use of the different cost standards and provides details of the feasibility of the implementation of specific cost standards in the overall solution to the question of interconnect charges.

5.4.1 Incumbent Operators

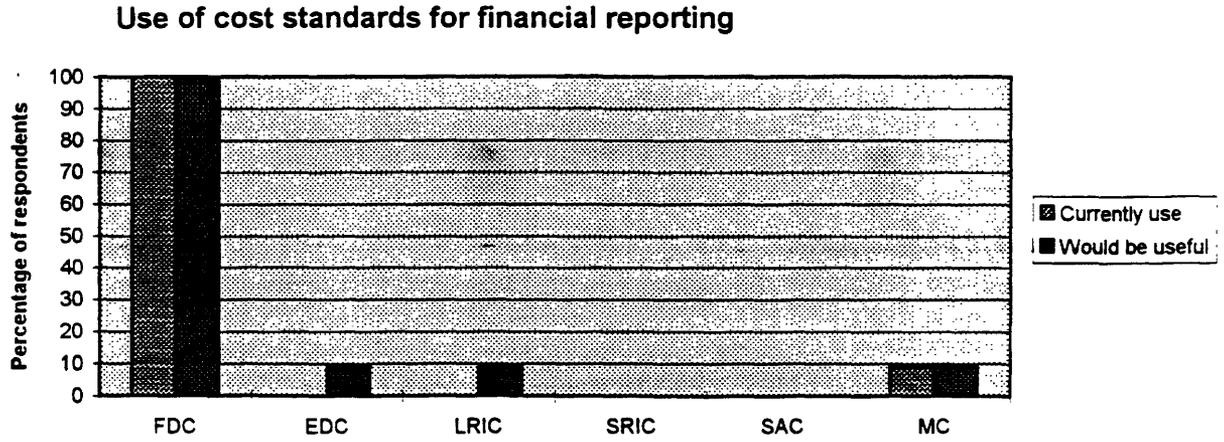
The following graphs indicate incumbent operators' awareness, use and views on the usefulness of cost standards for different applications. It is therefore possible for incumbents to consider more than one cost standard to be appropriate to a particular application.

Graph 5.4A



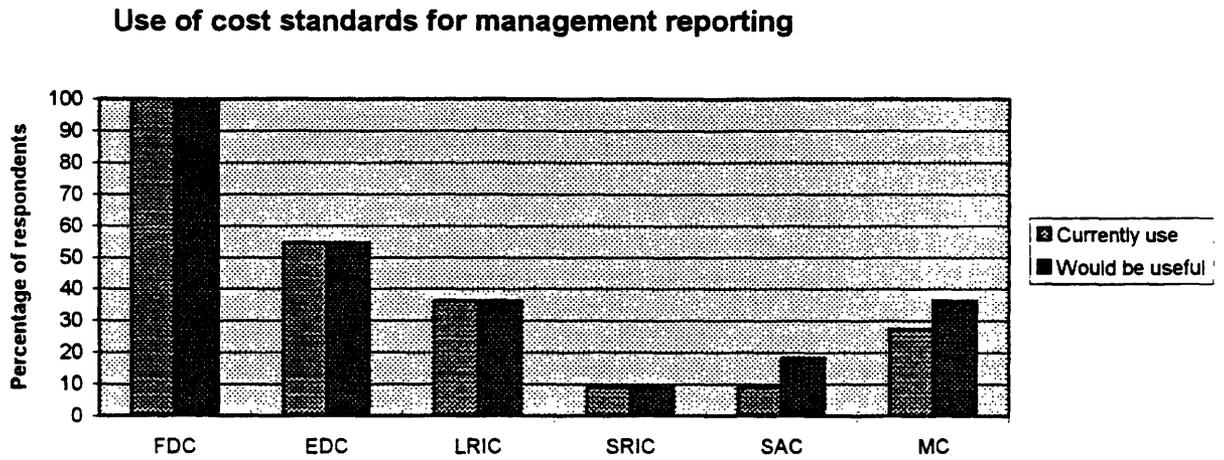
Source: Arthur Andersen incumbent operator questionnaires (1994)

Graph 5.4B



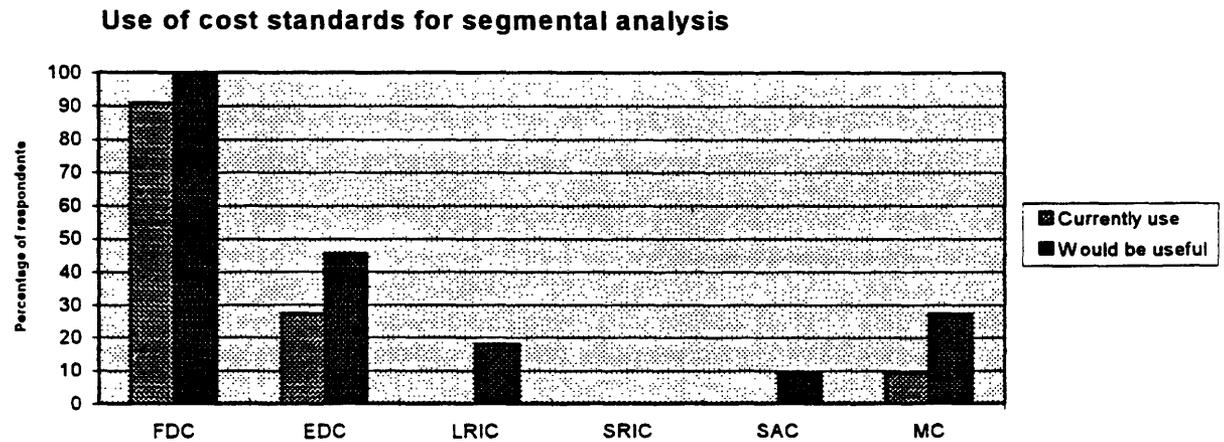
Source: Arthur Andersen incumbent operator questionnaires (1994)

Graph 5.4C



Source: Arthur Andersen incumbent operator questionnaires (1994)

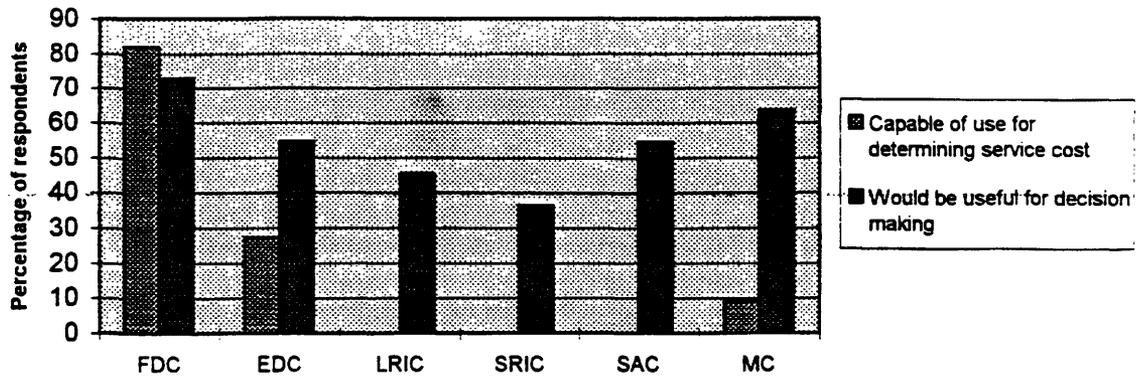
Graph 5.4D



Source: Arthur Andersen incumbent operator questionnaires (1994)

Graph 5.4E

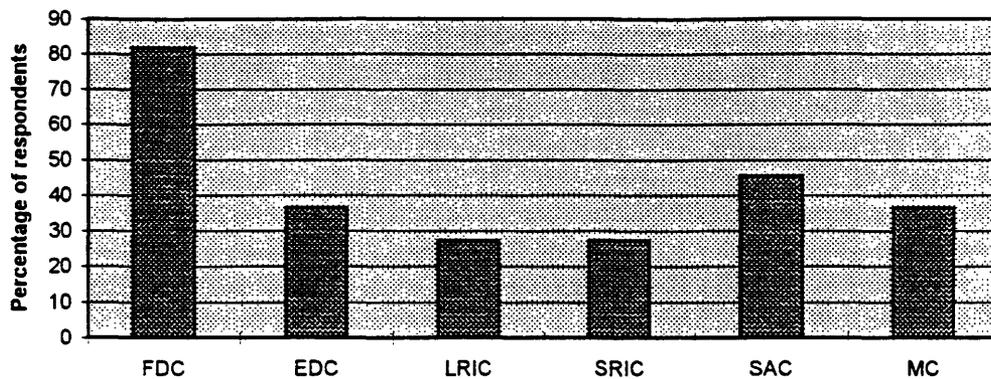
Use for determining service cost and usefulness for decision making



Source: Arthur Andersen incumbent operator questionnaires (1994)

Graph 5.4H

Planned use of cost standards within the next 10 years



Source: Arthur Andersen incumbent operator questionnaires (1994)

The most revealing information from the graphs above is the ubiquitous use of the FDC cost standard amongst incumbent TOs. All of the incumbent TOs who responded are currently utilising the FDC cost standard for their financial reporting requirements (in Luxembourg's Entreprise des Postes et Télécommunications this is combined with marginal cost standard elements) and for their management reporting requirement. Most European TOs are also using FDC for their segmental reporting requirements.

None of the European TOs have a system capable of using long-run incremental costing or stand-alone costing to determine service costs.

This is much the picture one might expect at the outset. FDC is the most appropriate cost standard for financial reporting purposes and one usually required by law for financial reporting. The requirements placed upon the incumbents in most European countries up until now have been mostly in the area of external financial reporting with very little rigorous demand for internal, managerial, information. Thus FDC is the cost standard chosen.

Incumbent TOs generally expressed an awareness of cost standards other than FDC but few TOs utilise other cost standards. In no incumbent TO is it evident that the operator is running two different cost accounting systems utilising two different cost standards. Where more than one cost standard is in use this means that for one-off budgeting, forecasting or other ad hoc reports consideration has been made of other cost standards for the calculations.

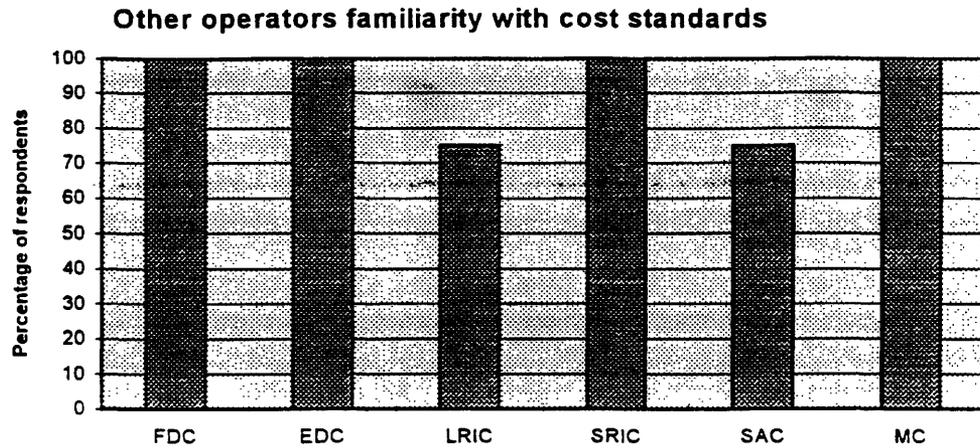
EDC is the second most popularly utilised cost standard but generally for management and segmental reporting. As with FDC this is probably due to the simplicity of calculation.

Amongst incumbents familiarity and usage is rarest for the 'incremental' and 'stand alone' cost standards. This is unfortunate given that these two cost standards are theoretically sound as the basis for decision making and pricing decisions from an economic perspective. Incremental costs are useful as price floors for decision making while stand alone costs can be used to establish a price ceiling for decision making. However, it is notable, that of the 8 respondents (Belgacom, Tele Danmark A/S, France Telecom, Telecom Eireann, SIP, PTT Telecom BV, Portugal Telecom and British Telecom) who expressed familiarity with the long-run incremental cost standard 6 stated that they either utilised the standard currently (Belgacom, Tele Danmark, Telecom Eireann and British Telecom) or believed it would be useful to do so (PTT Telecom BV, SIP).

There is more appreciation of the usefulness of other cost standards to FDC in the area of decision making than for any other application. However, this appreciation has generally not been translated into actual utilisation of alternative cost standards to FDC.

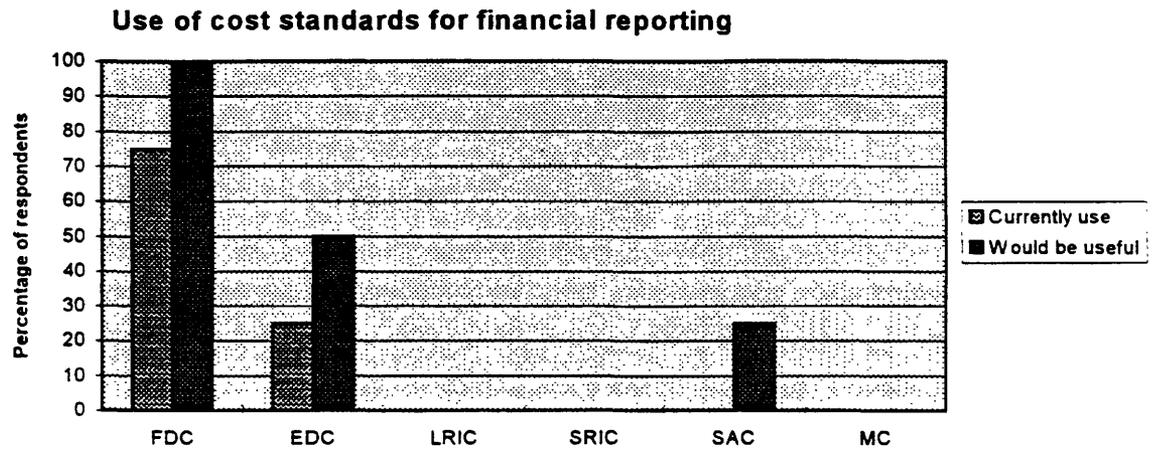
5.4.2 Other Operators

Graph 5.4I



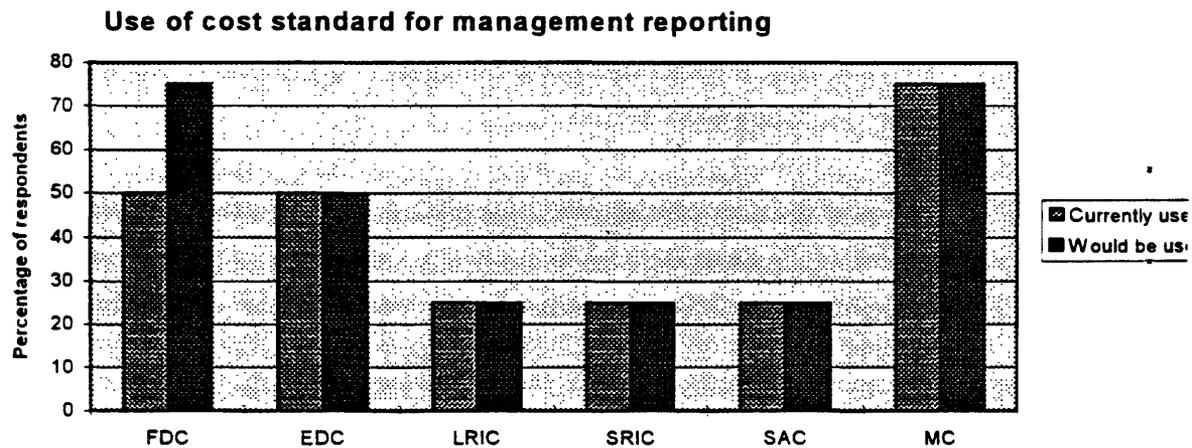
Source: Arthur Andersen other operator TO questionnaires (1994)

Graph 5.4J



Source: Arthur Andersen other operator TO questionnaires (1994)

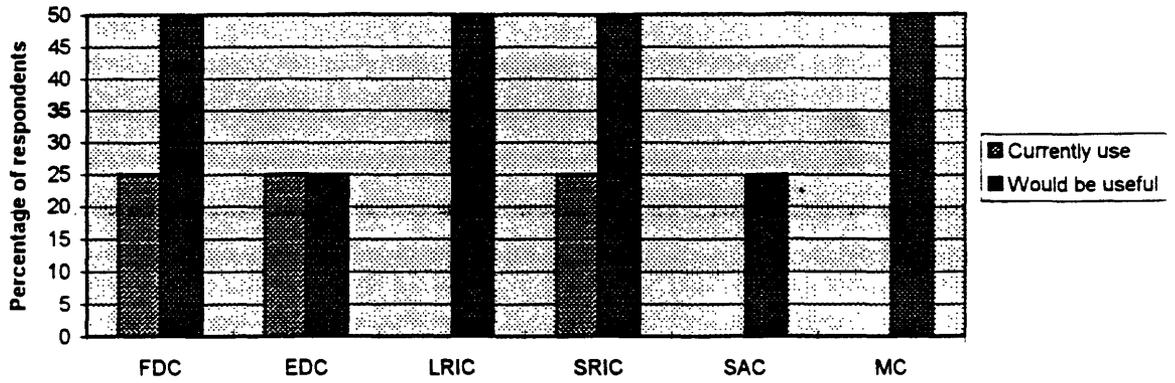
Graph 5.4K



Source: Arthur Andersen other operator TO questionnaires (1994)

Graph 5.4L

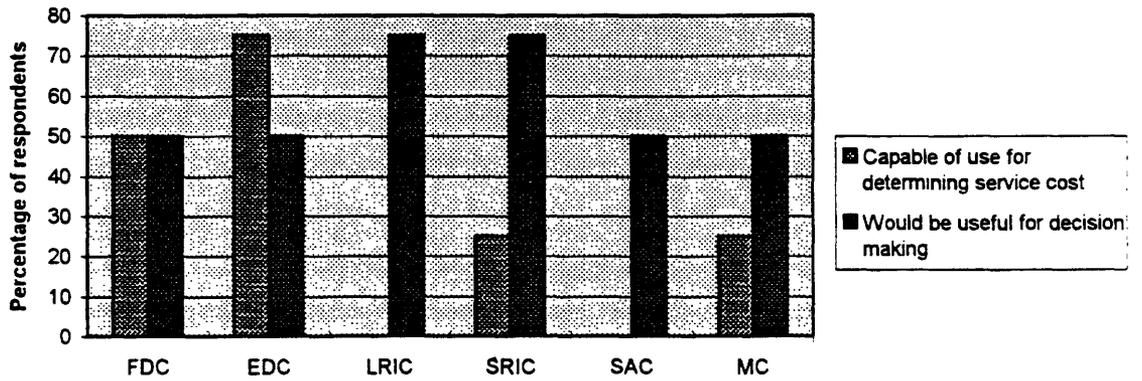
Use of cost standards for segmental analysis



Source: Arthur Andersen other operator TO questionnaires (1994)

Graph 5.4M

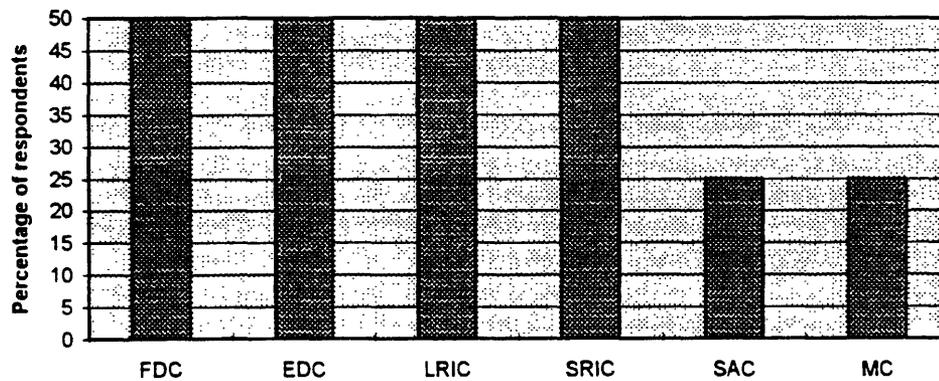
Use for determining service cost and usefulness for decision making



Source: Arthur Andersen other operator TO questionnaires (1994)

Graph 5.4N

Planned use of cost standards within 10 years



Source: Arthur Andersen other operator TO questionnaires (1994)

A comparison of graphs 5.4A and 5.4I reveals that there is more awareness of cost standards other than FDC amongst the mobile operators and wireline competitors interviewed as part of this study. Mannesmann Mobilfunk, Cellnet, Vodafone, and Mercury Communications Limited all indicated awareness of the FDC, EDC, SRIC and MC costing standards. In addition, they also utilise other types of cost standard to FDC to a greater degree than the incumbent operators. Mercury Communications Limited, Vodafone and Cellnet all utilise MC for management reporting. Less use is made of MC for such applications amongst incumbent operators.

Mercury Communications Limited, the wireline competitor in the UK, has developed its accounting system based on the concepts of Embedded Direct Costing to allow its retail business units to push accountability for contributions down the organisation and thereby increase customer responsiveness. This system is augmented by Activity-Based Costing to attribute costs using a direct or indirect causal link between cost drivers and activities.

It is interesting to note that FDC is not held in such high regard for management reporting, segmental analysis and decision making by the TOs in competitive arenas as it is by the incumbent operators in non-competitive markets. As can be seen by graph 5.4M this is especially true with regard to decision making where the incremental cost standards are viewed by "competing" TOs as more useful than FDC. Such interest in, experimentation with, and utilisation of, other cost standards to FDC is a function of the more competitive environment in which these organisations have developed and an indicator of the likely trends in a more liberalised European market.

5.4.3 *Regulatory Awareness*

The TOs have indicated generally more awareness of the issues associated with the use of different cost standards than the NRAs. All the European NRAs are fully aware of the FDC cost standard but awareness of the other cost standards is generally below that of the operators.

Less than half of the NRAs indicated an awareness of the other types of cost standard, and support for these standards is even weaker with only 1 respondent indicating that they might consider each cost standard useful.

Furthermore, NRAs generally expressed no intention to see any other cost standard than FDC utilised for any application in the future. To some extent the lack of comment is due to current consideration of the issue as is the case in the Netherlands and Ireland. However, this general popularity amongst NRAs of FDC is an important issue for several reasons:

- If NRAs are unfamiliar with the range of cost standards they are also unfamiliar with the potential advantages and disadvantages, uses and abuses of the different standards.
- The FDC standard utilised by all the incumbent operators and familiar to the NRAs is not suited to all the management information needs of a modern TO, particularly in the area of service costing and pricing (see for example appendix 3 for commentary on the "death spiral")
- NRAs are generally responsible for ensuring fair treatment for consumers and fair competition between the new entrants and the incumbent. With interconnect charges being the biggest single cost to new entrants the interconnect tariff is of great importance to their success. Use of FDC in interconnect involves allocations of some costs which is, by definition, arbitrary and therefore interconnect charges can vary considerably in size with the use of different allocation methods.

Summary of Cost Standards in General

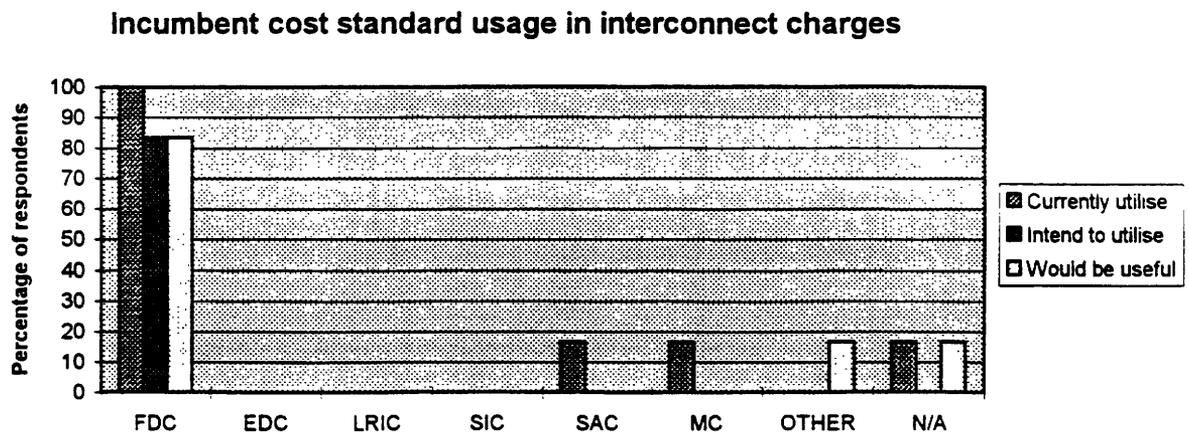
From the above, FDC can be seen to be the cost standard that is most familiar to TOs and NRAs in Europe and the most used by incumbent TOs. All incumbent TOs use FDC for their external financial reporting and hence NRAs prefer FDC because it enables them to tie regulatory reports back to audited figures and hence provides "confidence" in the regulatory reports. The competitors in more liberalised markets generally appreciate the applicability of other cost standards to particular procedures more than the incumbents. Use of the alternative cost standards to FDC is also concentrated amongst operators in competitive markets.

A practical, implementable solution to the question of interconnect charges requires the consideration of the current use of cost standards in interconnect and the flexibility of the accounting systems to be adapted to different cost standards. It is these areas which are examined in the next sections.

5.4.4 Cost Standards in Interconnect

The graph below indicates the current use of cost standards in interconnect charges. Given that some TOs are connected to more than one other operator, and some interconnect charges may incorporate elements of more than one cost standard - it is possible for more than one cost standard to be currently utilised by each respondent.

Graph 5.4O



Source: Arthur Andersen incumbent operator questionnaires (1994)

It has already been discussed in section 4 that the use of incremental costing with an additional margin for a contribution to joint and residual common cost plus a return on investment is theoretically the optimum solution for use in pricing decisions. Practically speaking it is shown in graph 5.4O above that little use is currently made of the incremental costing standards and at present there appears to be little interest in its potential development for later use by the incumbent operators in interconnect. This may be explained in part by the perceived practical difficulties of its implementation but may also be explained by the incumbent TOs perception of their inability to support existing cost structures if a move is made to an incremental cost based approach to interconnect charging.

The graph 5.4O above indicates that FDC is still the favoured cost standard in terms of current application and future application in the area of interconnect. This is not surprising given that most of the TO's accounting systems are set up to produce FDC based information, but what is more surprising is the lack of interest in the other cost standards - rarely even indicating an appreciation of their worth as useful information.

Entreprise des Postes et Télécommunications proved exceptional in revealing their intention to use elements of SAC and MC cost standards in setting the charges for interconnect.

The results obtained above are hardly surprising. FDC is the most suitable cost standard to be utilised in interconnect from the incumbent operator's stand point as many would presume it ensures the highest recovery of costs with the declining costs of technology.

This preference for FDC is not so widely held amongst competing TOs. Mercury Communications Limited (MCL), the wireline competitor to British Telecom in the UK, expressed a different opinion. MCL currently use FDC in their interconnect agreements with British Telecom and others but state an intention to consider the use of the incremental cost standard in the future. MCL's preference for incremental costing over FDC in interconnect may serve to reduce the costs of interconnect with British Telecom but MCL are also considering offering incremental cost based agreements to new entrants thus indicating the strength of their opinion that this is the best cost standard for interconnect charges for the particular conditions they face.

5.4.5 *Practicality of Adopting different Cost Standards*

To determine a practical and implementable solution to interconnect charges consideration must be given to the opinions of the TOs on the adoption of different cost standards or potential barriers to their adoption.

Specific comments on why certain cost standards may be impractical to implement in TOs have been put forward by a number of incumbents. FDC, predictably, but also EDC received no comments of impracticality in implementation. Contrastingly, LRIC is perceived to be problematic by a number of incumbent TOs.

France Telecom do not advocate the use of LRIC as "it is easy to make mistakes in computation and interpretation of the results". SIP regard the change required in the management accounting system and management practices to be too great to make application of LRIC feasible. Belgacom also expressed their opinion on the impracticality of the LRIC standard but without offering an explanation of their reasoning.

SRIC is also deemed impractical by SIP for the same reasoning applied to LRIC. It is interesting to note, however, that operators in competitive environments generally hold different opinions. Whilst Mercury Communications Limited appreciate the subjectivity attached to forward looking cost standards they are developing incremental costing techniques "within the wholesale parts of their business where historical costs are irrelevant for decision making given the rate of technological change." British Telecom and Vodafone are also developing incremental cost based decision making tools for the future.

SAC is deemed impractical by Belgacom, PTT Telecom BV, Mercury Communications Limited, and British Telecom. PTT Telecom BV, the only TO to offer the reasoning for their belief, stated that for service pricing it is "almost impossible to gather information and the price per product will be very high as almost all the costs [in TOs] are fixed, common or shared". However, PTT Telecom BV do consider SAC to be useful for project costing and certain other applications.

MC also received a comment on impracticality from France Telecom who believe the cost standard makes "no sense for highly capitalised services such as telecoms".

On the more specific topic of "the practicality of adopting a cost standard to determine service cost" FDC received the most support. A few TOs did put other cost standards at the top of their list. Belgacom and PTT Telecom BV believe that EDC is the easiest cost standard to adopt for costing services while Entreprise des Postes et Télécommunications proposed MC as the most practical solution. The determination of service cost is not a process closely linked to the financial reporting function and these responses bear out the closer relationship to management reporting where operators utilise different cost standards to FDC in their management reporting function.

EDC was the next most highly regarded cost standard to FDC for the purpose of service costing. This is very encouraging with EDC possessing some of the theoretical benefits of the incremental cost standard and the more practical elements of a historical cost basis.

The main conclusions to be drawn from this data are that FDC utilised as the cost standard for interconnection would give the most palatable solution to the incumbent Community operators and that incremental costing, whilst theoretically the optimum solution, would not be a practical solution for the incumbent operators

of the existing Member States. EDC seems to be a solution that might prove acceptable to the operators whilst maintaining an incremental approach that would find favour as a more theoretically appropriate solution.

The cost standards to be utilised by TOs in the future is an issue of current debate by NRAs in many Member States e.g. France, Ireland and Belgium.

Generally, however, NRAs are quiet on this issue. Few NRAs were willing to advocate the use of other cost standards than FDC in the future. Even the Netherlands Directorate General of Telecommunications who indicated a preference for EDC, LRIC and SIC for management reporting within PTT Telecom will only 'require' PTT to utilise FDC in the future.

5.4.6 *Planned Changes to Cost Standards Used by TOs*

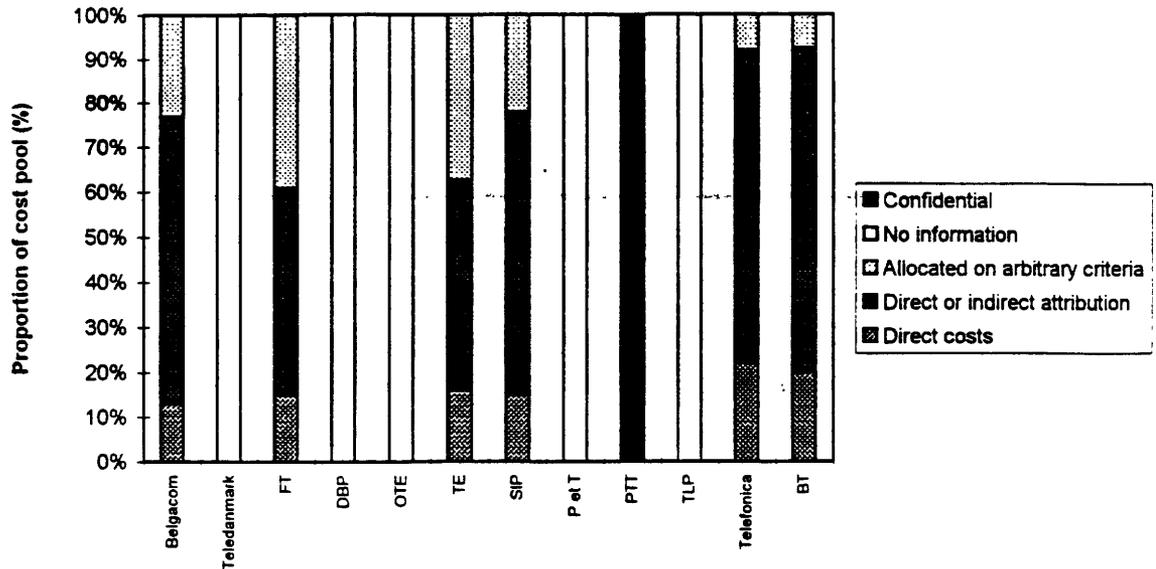
Few TOs in Europe currently foresee changes to costs standards utilised in their cost accounting system. In the UK, Ireland and the Netherlands this issue is currently under discussion for interconnect and in all cases other cost standards to FDC are being considered. Generally, however, incumbents are of the opinion that they will go on utilising FDC until such time as they require, or are required, to use a different cost standard. Entreprise des Postes et Télécommunications and Belgacom believe that voluntary uptake of other cost standards will result from management information demands within the organisation.

5.5 *Cost Accounting Systems Currently used by Community Operators*

Having established that the FDC cost standard is used by all the incumbent operators of the Community it is now necessary to look in more detail at the cost accounting systems which use FDC. As discussed in section 4, FDC requires all costs to be allocated to products and services. However, as demonstrated in graph 5.5A below only between 10% - 20% of a TO's cost base are direct costs. The remainder are joint and common costs which require indirect attribution or more arbitrary allocation.

Graph: 5.5A

How cost pools are allocated to network components



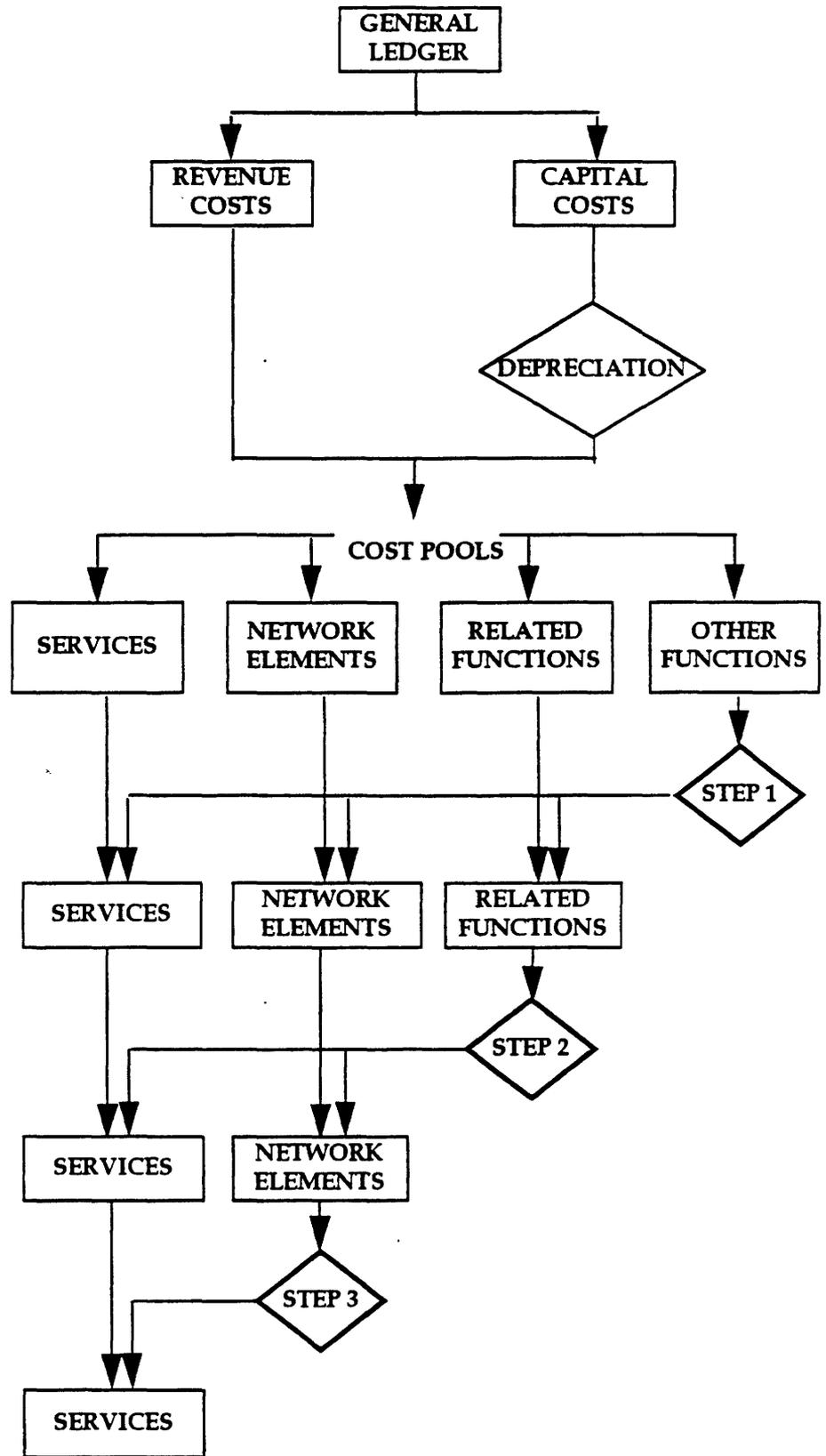
Source: Arthur Andersen Incumbent Operator Questionnaires (1994)

Therefore the important aspects in determining service costs are the cost accounting practices and cost allocation methods that allow cost data to be captured, recorded, grouped, and attributed with only the residual costs being arbitrarily allocated.

The flow of costs through a typical TO utilising the FDC cost standard is illustrated in figure 5.5B below. The diagram demonstrates the number of areas where subjective decisions are made to arrive at the final destination of product or service cost.

Figure: 5.5B

Flow of costs through the cost accounting system



More detail regarding this diagram is given in section 9.9.

In order to establish the practicality of a pan European solution to interconnect it is necessary to understand the comparability of accounting systems amongst the Community operators to determine the level of detail to which the recommendations are feasible and implementable. In order to achieve this we will now look at distinct areas of the cost flow through the system.

5.5.1 Fixed Assets Data Capture

Data capture is the first stage in the cost flow process. If cost information is not captured in an appropriate form in the first place it will not be possible to attribute that cost to any products or services.

If unbundled services are to be offered to interconnecting operators then the TOs must be capable of producing costs by service and geographical area.

Fixed assets generally make up the largest cost of TOs and as such we have analysed their capture here.

To produce costs by service TOs need to separately identify the assets used by each service. Equally, for costs to be collected geographically the assets used in each geographical location need to be identified.

In order for unbundled services to be offered, both service asset data and geographical asset data need to be collected and connected in a complex database. None of the incumbent TOs indicated any ability to collect and analyse their costs in such a manner.

Our findings indicated a general lack of rigorous historical fixed asset information by a number of European incumbents.

Full fixed asset registers are maintained and reconciled to the general ledger by British Telecom, PTT Telecom BV, France Telecom, Telecom Eireann, SIP and Telefónica. Tele Danmark A/S maintains a fixed asset register but states that the nature of some of the costs (cable was used as an example) do not lend themselves to capture on a register. Deutsche Bundespost Telekom has only maintained a full fixed asset register since 1992. Similarly, Luxembourg has only been collecting fixed asset register information for acquisitions since January 1993. Belgacom also do not maintain a full fixed asset register.

A number of the operators indicated that they do not maintain sufficiently detailed registers to identify the costs of the individual assets including Belgacom, PTT Telecom BV, Entreprise des Postes et Télécommunications and Tele Danmark A/S. The fixed asset registers of Entreprise des Postes et Télécommunications and Belgacom are also not capable of separately identifying the costs of individual asset groups such as switching, transmission or service. Full registers would have to be compiled in such organisations via a fixed asset count if the depreciation of the assets is to be applied to service cost in a reliable manner.

Some TOs maintain geographical fixed asset information in the form of the company structure such as SIP, France Telecom, Telecom Eireann, PTT Telecom BV, Telefónica and British Telecom. Such analysis confers a benefit upon the organisation in terms of dividing the organisation into more manageable units but is probably not of great use in assigning costs to products.

Whilst the limitations of some of the European incumbent fixed asset recordings are obvious from the above analysis there are some cases where fixed assets are recorded in such detail to enable meaningful attribution of depreciation to products and services. For example, PTT Telecom BV of the Netherlands runs a new "componist" system for leased lines business and other telephony services. This system allows the costs of assets to be attributed to individual equipment elements allowing more accurate historical costing of services.

More commonly, however, examples of greater detail and complexity in recording fixed asset information are to be found in TOs which operate in competitive markets.

Mannesmann Mobilfunk, for example, have a complete historical cost fixed asset register which identifies the individual assets and enables grouping into switching, transmission or service etc. The fixed asset register is also capable of analysing each asset type geographically, and re-analysing the assets into other cost classes (such as local loop, constructions, local exchanges, etc.). Vodafone, the UK mobile operator also indicated similar capabilities in their fixed asset data capture.

Even these competing operators, however, did not indicate an ability to analyse their fixed assets in the detail required for unbundling service costs for interconnect.

5.5.2 *Amortisation and Depreciation Policies*

The Telecommunications industry is one where fixed asset costs form the bulk of the investment. The depreciation or amortisation of those fixed asset costs also generally makes up a large element of the operating costs to be applied to products and services. The accounting policies on depreciation are therefore important to the determination of service costs.

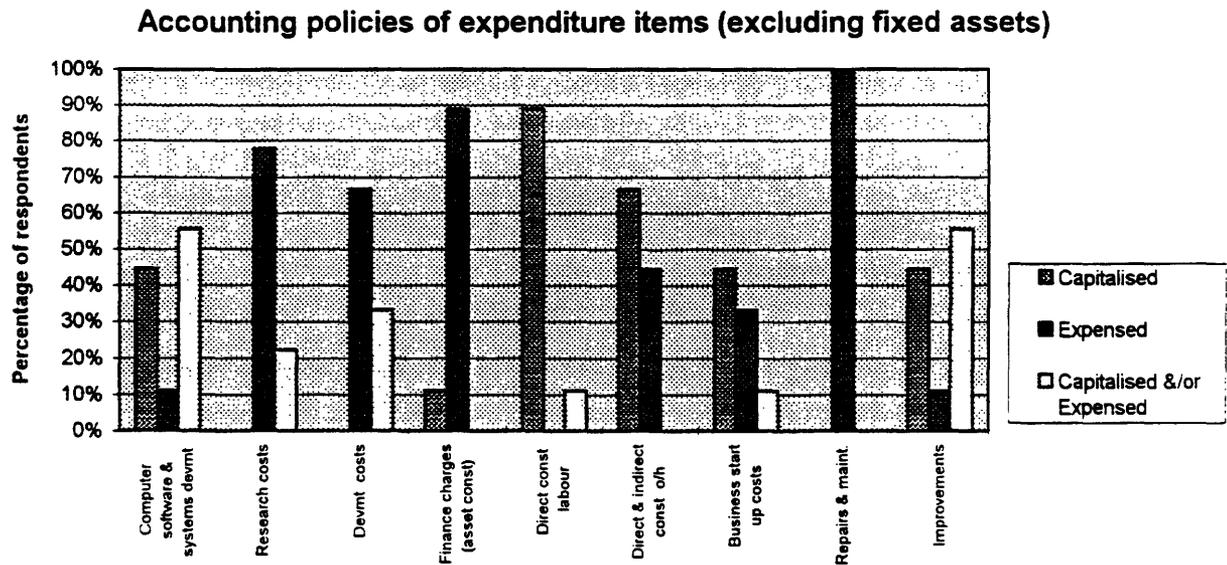
As with the revenue Vs capital differences amongst European TOs outlined below large disparities exist over the amortisation of this capital expenditure to the profit and loss statement through different depreciation and amortisation policies. The table in Appendix 9 indicates these vast differences - not just in the number of years over which expenditure is released to the profit statement but also in how the assets are categorised in the first place. For example:

- Tele Danmark depreciate land at 5%. No other country respondents depreciated land at all;
- Telefónica has a separate asset category for subscriber equipment - no other respondents separately categorised such assets and so no comparison is possible at that level;
- Deutsche Bundespost Telekom has to categorise and amortise its assets according to tax authority tables. Although some scope is given for assigning estimated useful economic lives there is no comparable system employed in other European TOs;
- Buildings are depreciated over 60 years by Telecom Eireann, 25-33 years by SIP, 20 years by Tele Danmark and up to a maximum of 10 years by PTT Telecom BV;
- Fixed assets under construction and advance payments are depreciated in the same way as the fixed assets to which they relate by Belgacom. These are not depreciated by OTE, PTT Telecom and BT and not separately analysed by any of the other operators.

5.5.3 Revenue Vs Capital Cost

The second stage in the cost flow process is to determine whether a cost is to be attributed to any of the expense cost pools or to be capitalised for later amortisation into the cost pool. In order to assess the comparability of the accounting policies of European TOs generally we analysed the policies adopted for certain types of costs. The results of our analysis are illustrated below.

Chart: 5.5C



Source: Arthur Andersen Questionnaires (1994)

Despite the implementation of the EC 4th and 7th Directives there is still much diversity in the accounting treatment of different types of expenditure which perhaps reflects the range of alternatives permitted under the Member States' accounting standards. Graph 5.5C above demonstrates the variety of ways in which European TOs treat certain expenditure types. Almost an equal number of respondents capitalise direct and indirect construction overhead as write it off. Similarly there is a general lack of consensus on the treatment of computer software and systems costs, development costs, business start up costs, and improvements. Of the nine categories of expenditure evaluated only one - repairs and maintenance - received universal agreement on accounting treatment.

Research costs almost received universal agreement with only Portugal Telecom and Telefónica stating that they might capitalise such costs. The general pattern revealed, however, is one of inconsistent accounting treatment amongst European

TOs. With the Commission's intention to base interconnect charges on service cost this diversity of accounting treatment is concerning.

The comments received from the European TOs suggest that with an identical cost structure each TO could in theory arrive at a different measure of service cost based on their different accounting treatment of expenditure alone, and hence would calculate different interconnect charges.

5.5.4 *Degrees and Methods of Allocation*

To determine product cost for interconnect and other services the costs collected and recorded by the organisation have to be analysed into business areas and ultimately the product pools.

Degree of Allocation

The number and type of levels to which costs are allocated in the costing systems is different amongst the TOs. Some operators indicated that only one level of costs was maintained. More commonly, others stated that direct costs are recorded on 3 or 4 levels with more levels required for indirect costs. The information provided by TOs is sufficient to conclude that the operators all collect and analyse costs differently without elaborating on the actual levels of cost allocation used by each organisation.

Methods of Allocation

A variety of methods are used by the European TOs in allocating residual joint and common costs to reported segments. Whilst no one allocation method is particularly wrong the fact that a variety of methods are used goes further towards demonstrating that the European TOs could all come up with different product costs from the same cost base.

Many of the operators use more than one type of cost allocation method for different types of costs and different analyses. This implies some thought is given to the most applicable attribution and allocation methodology utilised. Some operators, however, do not even go so far as to specify particular allocation methodologies. For example, Entreprise des Postes et Télécommunications describe their allocation methods as "Judgemental". Whilst this may not be the most scientific approach to cost allocation, it may not be much better or worse than the other methods applied

and merely highlights the degree of subjectivity in costing within the telecommunications industry.

There is an increasing awareness of Activity-Based Costing amongst European TOs, especially in the operators in more competitive markets. Activity-Based Costing seeks to attribute costs based on the cost drivers of the business and not merely some connected or causally 'associated' criteria. In most cases the current use of ABC is, however, limited. For example, one TO explained that their use of ABC techniques was currently restricted to limited applications (e.g. for cash collection, billing and transport).

5.5.5 *Changes to Cost Accounting Systems*

Most TOs seem to have undergone recent changes to their cost accounting systems. Only PTT Telecom BV stated that a change in accounting system took place more than two years previously, but even here changes are currently underway. The fact that this area of the business is becoming more closely scrutinised is evidenced by the immediacy of the anticipated changes. Most TOs stated that updating the cost accounting system is a continuous process and anticipated changes would therefore take place within the next year. Telefónica is the only exception anticipating the next change in their accounting system not to take place before 1 January 1998. Generally the reasons given for anticipated changes were to give more detail, more accurate information, more relevant information and more control over the business.

This anticipation of change in TOs accounting systems should make the job of the NRA much easier when requesting new information.

5.5.6 *Accounting System Conclusions*

These results serve to illustrate the lack of compatibility between the accounting systems of the Community operators despite the Community's attempts at unifying accounting treatments across the continent. Such incompatibility indicates the difficulty in designing a detailed pan-European solution to the question of cost orientated interconnect charges. As stated above, two operators with identical cost bases could calculate entirely different service costs and therefore tariffs and charges.

The current capabilities of incumbent TOs accounting systems do not conform to the rigorous standards that will be required in fully competitive environments, or even

generally for the implementation of accurate cost based interconnect charges, but most TOs appreciate the way forward and anticipate changes in the future.

5.6 Costs and Tariffs in each Member State

The European Commission has a desire for cost orientated interconnect charges. As discussed in further detail in section 6.3, a number of the issues pertaining to interconnect charges have resulted from historical imbalances between costs and revenues geographically, by service, and by subscriber group resulting in cross subsidies. These have arisen out of the political and social policies of the governments and NRAs as much as the price elasticity of demand for the different services. This section describes in broad terms how prices currently relate to costs within the Community incumbents and to determine how TOs and NRAs are currently planning to address any imbalances. This information is relevant due to the contributions that might be made towards retail tariff imbalances through interconnect agreements.

5.6.1 *Geographical Averaging*

Historical social policies in many Member States have resulted in the geographical averaging of tariffs. Geographical averaging incorporates by its very nature a form of cross subsidisation. If this is inherent in retail tariffs and not reflected in cost orientated interconnect charges in particular, this will distort the competitive retail position and encourage inefficiencies through artificial arbitrage opportunities.

Of all the Member States only Denmark possesses tariffs which reflect the different costs of serving different geographical regions. Geographical variation is evident in the different cost and tariff structures of the historical regional monopoly companies. Bearing in mind the topography of Denmark and the relatively uniform population density and wealth distribution outside of Copenhagen this achievement is perhaps easier for Denmark than it will be for the other European nations. Some other incumbents have geographically varied tariffs but not always to reflect the cost differences of geographical regions in their tariffs, for example Belgacom and SIP.

Belgacom charges lower subscription fees in rural areas (a feature that is to be eradicated shortly) and also domestic calls are cheaper in rural areas than in urban areas as long as the call is within the local call area. This latter geographical variation was set up to enable rural populations to call more people on the cheaper

local tariffs due to the lower inherent value of service in rural locations where fewer people could be reached within a similarly sized geographical area. This tariff difference was not therefore set up to rebalance tariffs with the underlying costs.

SIP possesses some small regional variations with specific connection fees for rural areas and unmetered local calls provision in minor local networks (generally less than 10,000 subscribers). However, these minor geographical tariff variations bear more relation to a social policy than an attempt to set tariffs such that they relate closer to the underlying costs of providing a service.

On the whole therefore, with the exception of Denmark, the European Member States maintain geographically averaged tariffs.

Geographical Cost Collection

Five Member State incumbents (Belgacom, France Telecom, Telecom Eireann, PTT Telecom BV and British Telecom) reported that they are able to estimate geographical data to be able to establish the full cost to the different regions of maintaining averaged tariffs throughout the network (Not by service). Three more Member State incumbents (SIP, PTT Telecom BV, Portugal Telecom and Telefónica) expressed an interest in obtaining information on the full cost of geographical variations. Entreprise des Poste et Télécommunications is the only incumbent which stated that it felt geographical information would not be useful and this may be understandable in view of the size of Luxembourg. No response was received from Greece.

Planned De-averaging

Most Member State incumbents and NRAs are non-committal on whether tariffs are to be geographically de-averaged in the foreseeable future. Only two incumbents (France and the Netherlands) stated that de-averaging is an issue under current consideration. One incumbent (Belgacom) has indicated its intention to partially de-average its tariffs. This situation is likely to be a reflection of the unpalatable nature of geographically de-averaged tariffs as far as political policy is concerned, with governments unwilling, rather than unable, to risk permitting such a potentially unpopular change to telecommunications retail tariffs. The legality of such geographical de-averaging is also not always certain.

5.6.2 *Service Averaging*

The historical cross subsidisation that exists between services is also an issue to be addressed either by rebalancing or through interconnect charges. Some of these cross subsidies give rise to a major part of the local access loss. Consideration of service averaging is therefore important to this study to establish the size of the issue and understand current plans by the IOs and NRAs to address it as an issue.

Except for Denmark, local access losses are a feature of all the Member States. Denmark report that they have rebalanced their tariffs to reflect the underlying costs of their business. Consideration of the size of the service tariff imbalance (the local access loss) is given in section 5.8.2.

In the UK, Condition 13 of BT's licence, which establishes the terms for interconnection, entitles BT to a contribution towards its access deficit, i.e. the local access loss. This constitutes an acknowledgement of the cross subsidies present in BT's retail tariff structure. Such "Access Deficit Contributions", or ADCs, have so far been waived by the Director General of Telecommunications to allow competition to develop, but as soon as the operator's share of the market exceeds 10% partial payment for ADCs will be forthcoming. Once BT's share of the market falls below 85% all other licence holders will be liable for ADC payment.

Other cross subsidies that exist within all the European telecommunications operators are between the Business and Residential services. Most respondents also agree that subsidies are made from international services to domestic telephone services.

Except for Luxembourg and Italy, all of the European incumbents who responded currently measure the full cost and revenue imbalance by major revenue lines indicating an ability to measure the necessary rebalancing required should the political environment be conducive to such a change. The importance of rebalancing tariffs by service in a competitive environment has not gone unnoticed by the operators with seven of the incumbent respondents indicating an intention to rebalance tariffs at least partially. This information is an encouraging sign of the preparation of the European incumbents for the impending competition.

5.7 Existence of Interconnect in each Member State

This section provides details of current interconnection in the Member States and the way in which TOs would like interconnection agreements to be developed in the future.

Six Member States incumbent operators have yet to interconnect with an external TO (for these purposes excluding mobile operators which are (part) owned or run by the incumbent) being Belgium, Ireland, Italy, Luxembourg, the Netherlands and Spain. In four Member States external interconnection only extends as far as a second mobile operator. This incorporates Denmark, France, Greece and Portugal. Beyond this there is Germany with a third mobile operator and the UK.

The UK is the most liberalised market of Europe with four operating mobile/PCN operators, a regional monopoly wireline competitor in Hull (Kingston Communications Limited), a major wireline competitor (Mercury Communications Limited), a large number of locally competitive cable networks and other expanding new entrants such as Energis, and competitive access providers such as Colt and MFS. Many more licences have been issued to companies to operate a telephone service but most of these have yet to commence operations.

The fact that there will be much more interconnection in the future is well understood by most incumbents. Consideration is being given by some TOs to standardised interconnect agreements which would make the process of interconnection more efficient and less costly in terms of negotiations and legal proceedings.

5.7.1 *Separate Costing of Interconnect*

To formulate cost orientated interconnect charges requires the collection of costs associated with the interconnection. This section describes the current abilities of the incumbents and other TOs to collect such information and any plans to address this issue in future.

Where interconnection exists in Europe it is usually the case that the interconnect charge is not based upon separately analysed costs for the specific demands of the interconnect arrangement. Of all the respondents to this section of the questionnaire

only one operator stated that they separately collect all the costs associated with providing network access to a TO and this was a UK mobile telephone operator.

Denmark and France stated that the interconnect cost was estimated based on fully allocated costs of the business as a whole. In the UK the British Telecom interconnect charge to Mercury, the major wireline competitor, is based on the Financial Results By Service (FRBS) an approach which uses FDC to allocate costs to the different network elements of the regulated services. Whilst this does not separately collect the costs it is a more thorough approach to costing interconnect than that operating in Denmark and France. Seven Member States' incumbents (France, Germany, Ireland, Italy, Luxembourg, the Netherlands and Spain) stated their intention to be able to separately identify all the costs associated with interconnect. Some operators avoided answering the question directly.

This situation is inconsistent with the European Commission intention to base interconnect charges on their related costs but illustrates a general awareness of the issue and a willingness, in the main, to develop costing systems to record the relevant costs.

5.7.2 *Regulatory Involvement in Setting Interconnect Tariffs*

NRAs in Europe appear to be contributing to the formulation of most interconnect agreements. Most incumbent respondents stated that their interconnect charges are first formulated through negotiation and then either approved by the NRA or the NRA is brought in where the negotiations are proving unsuccessful. It is rare that the NRA does not get involved at some point in the interconnection negotiation process.

5.7.3 *Products and Services in Interconnect*

If interconnect charges are to be based on cost then it is important for TOs to be able to understand what services and network elements should be available to them through interconnect and which ones they would like to purchase. It is clear from the questionnaire responses and interviews that European incumbents and interconnecting TOs outside the UK generally do not have a detailed list of the specific types of unbundled products and services that they require.

Respondents indicated the general bundled products and services that they seek from interconnecting operators and in all cases they were prepared to offer those same services to the interconnecting TO. This may, however, just imply that the products and services the respondent wishes for from interconnection are merely those products and services or bundled offerings that the respondent is prepared to supply.

The respondents generally did not answer this question in the level of detail that would indicate a thorough understanding of the specific products and services that might be individually provided, e.g. switching services, local loop transmission, trunk transmission, call terminations, directory enquiries, emergency numbers, etc. This is probably due to the bundling of services by the incumbents and the current inability for those services to be costed or tariffed separately.

The only major barrier indicated by respondents to the potential unbundling of service offerings was raised by France Telecom in the form of "Technical feasibility, the security of the network operation and the accounting and billing complexity".

5.7.4 *Interconnect Charges*

Without exception, respondents indicated that the form of interconnect payment currently made, promoted by the regulator and preferred by the operators was that of rate per unit (the units more often than not relating to minutes of use). This is generally regarded as the simplest form to utilise and the most transparent and easily verifiable method. However, this use of customer tariff orientated methods of charging for interconnect ignores the cost basis of providing the service.

The incumbents therefore will require a large effort to move from the current situation of tariff orientated costing to the cost orientated tariffing of interconnect charging outlined above.

5.8 *Universal Service Obligation (USO)*

5.8.1 *Definition*

Questionnaire respondents were aware of the concept of USO. Most of the operators were unable to provide us with a sufficiently detailed definition from which it would be possible for them to quantify the magnitude of the cost of the USO. A number of

respondents did not differentiate their definition significantly from our glossary definition or describe those differences.

Most respondents understand the definition to be to ensure that all basic public telephony services are available to those that request them. Four respondents extend the definition to ensuring the prices of those services are affordable, with others stating that prices have to be geographically uniform.

These different definitions, and part of the reason for the differences in the detail provided, derive from the different wordings applied in the statutes of the countries and their interpretations of the European Commission definition as laid down in the Council Resolution of 7 December 1993. In broad terms the operators may feel that the differences are minor, but the subtle inclusion and exclusion of different services may make more dramatic impacts on the magnitude of the USO.

Most respondents provide emergency telephone services free of charge and special services for the deaf/blind or otherwise disabled and a number of operators provide preferential rates for low usage callers or other social groupings. However, from there the similarities end. A number of TOs mentioned particular USO or public service obligation costs which are specific to that Member State. For example, two incumbents, France Telecom and Portugal Telecom, provide free services to public bodies and France Telecom often pay for unpaid Ministry telephone usage. France Telecom also has an obligation to provide various information services. The production and distribution of publications such as directories is another cost that is regarded as a USO cost in some Member States.

The definition applied to USO can therefore be seen to be quite loose and not capable of rigorous application for determination of the costs associated with meeting USOs.

5.8.2 *Magnitude*

The size of the USO is an important issue to this study.

Nearly all European TOs and NRAs, however, are unable (or unwilling) to categorically state the magnitude of the USO. Many of the questionnaire respondents attempt to measure the costs associated with the USO, but, from discussions with the various operators it has become clear that such "measurement"

is more of a guesstimate. They were not prepared to disclose the calculations in most instances.

Research carried out by Analysys for the Bangemann committee has provided a more uniform approach to the magnitude of the USO and Access Deficit in each country. The results of their investigations and calculations are covered in section 7.6 below.

5.8.3 *Funding*

An analysis of the current methods for sharing the costs of the USO and canvassing current opinion in the Member States illustrates whether a policy of incorporating the costs of the USO into interconnect charges would prove impractical.

Currently with most European nations possessing only one fixed line operator, it is the monopoly provider who bears the costs of the USO and social obligations. Belgium and France are two exceptions where the costs are spread amongst the operators. In Belgium this is carried out on the basis of relative turnover. In France the access deficit or local access loss, the USO and the other social obligations are all considered as a whole and contributions are sought through the interconnect agreements (e.g. France Telecom with SFR).

5.8.4 *Confusion with the Access Deficit*

A large number of the respondents, both TOs and, more importantly, NRAs do not differentiate between the USO and the Access Deficit. Whilst it is true that a proportion of the loss on providing local access relates to the connection of customers who are uneconomic and might otherwise have not been connected, it is not true to say that all the costs associated with the local access loss are USO costs. Many customers with whom the incumbent has a local access loss may actually prove economic when call revenues and other externalities are taken into account. Such customers should not be considered a part of the USO as the operators would connect to these customers whether or not an obligation had been placed upon them to do so. This distinction is expanded in section 6.3.

5.8.5 *Concluding Comments on the USO*

The obligations most operators are concerned about recovering concern the local access loss created by restrictions on tariff rebalancing. If these costs were eradicated through rebalancing of tariffs then the major element of the USO (according to operator definitions) will have been eliminated.

It has been estimated that the most major USO and local access losses are borne in the countries that are still to complete their networks. This situation may not still be the case when the markets are finally liberalised and the interconnect agreements have to be formulated. With no local access loss and reduced USO costs there would be little cause for any shared funding.

Where it is still considered that the costs of the USO are material enough to warrant sharing of the burden the definition of the USO needs to be tightened to enable a more rigorous appraisal of the magnitude of the obligations before the funding is shared.

KEY POINTS: SECTION 5

- Cost Accounting systems have developed in national isolation, taking into account the idiosyncrasies of local demographics, geography, TO status and administrative regime.
- The costs of individual products and services has not historically been a significant issue for government owned monopoly entities. As long as total revenues exceeded total costs sufficiently to fund investment and provide a contribution to state treasuries no-one, either management or policy makers, focused on the relative profitability of different services.
- Many cost accounting systems are still tailored to support the external reporting requirements and do not possess the rigour or detail found in accounting systems in organisation in competitive industries.
- The extent and detail of external financial reporting requirements varies considerably across the Community. Most TOs have to produce financial statements. Some TOs are public and consequently have additional reporting requirements.
- Regulatory reporting requirements are particularly varied in their extent and detail across the Community from irregular and one-off ad hoc reporting to regular and detailed profitability by service analyses.
- Most TOs and NRAs anticipate dramatic changes to reporting requirements with consequent effects on the TOs cost accounting systems.
- FDC is currently used by all incumbent operators. There is only limited appreciation and even less utilisation of other cost standards.
- TOs operating in more competitive environments tend not to hold FDC in as high regard as incumbent TOs in non competitive environments. Alternative cost standards are also more well known and appreciated by these operators.

KEY POINTS: SECTION 5 CONTINUED.....

- NRAs did not demonstrate as much awareness of the various types of cost standard and the issues they raise though much of this may be due to a reluctance to comment given current consideration of the cost standards to be used by operators.
 - Few TOs indicated a willingness to change their current cost standard.
 - Accounting systems vary widely across the Community in terms of:
 - cost collection detail
 - degree of cost analysis
 - capitalisation Vs expense
 - attribution and allocation methods used
- such that given the same network operation each TO would derive different service costs and even different firm costs.
- Cost attribution and allocation methods are generally unsophisticated. Only limited use is made of Activity-Based Costing techniques.
 - Outside of the UK existing interconnect charges in Europe tend to be either based on the existing retail tariffs, or tariff orientated in their calculation and charging methods.
 - The USO is not defined in detail, nor costed rigorously and there is much confusion amongst TOs and NRAs between the USO and Access Deficit.

6. FORMULATION AND ESTABLISHMENT OF INTERCONNECT CHARGES

6.1 Introduction

This section assesses the ways in which interconnect charges should be established and formulated, and details the principles for determining interconnect charges on an ongoing basis. It builds on work previously carried out in the Commission Study "Interconnection Agreements in Telecommunications", January 1993²⁸.

Prior to this, however, it presents some thoughts on the factors influencing interconnect charges from our review of worldwide interconnect regimes. It also reviews the principal cost and tariff "anomalies" existent in most retail telecommunication markets that need to be considered for inclusion in the interconnect regime.

6.2 Factors Influencing Interconnect Charge Formulation

Before advocating the principles for establishing and formulating European interconnect charges in the future it is perhaps sensible to review how interconnect charges have been set in practice historically.

Work already carried out in the Commission study "Interconnect Agreements in Telecommunications" set out in considerable detail the approaches already taken to interconnection in the telecommunications industries of the USA, Japan, Australia, the UK, France and Germany. Review of this study reveals that the interconnect charge regime has developed differently depending upon a number of factors.

The most significant differentiating factor between different interconnect regimes can probably be attributed to the structure of the industry at the time competition is introduced and, more importantly to the governments' objectives for the structural

²⁸ Wissenschaftliches Institut für Kommunikationsdienste GmbH (WIK). (Neu, Werner and Karl-Heinz Newmann). Interconnection Agreements in Telecommunications. Study prepared for The Commission of the European Communities DG XIII. Bad Honnef, January 1993.

development of the national telecommunications sector in the future. Some governments segment the local, national and international long distance markets licensing operators to compete only in particular segments e.g. the USA. Elsewhere, for example in the UK and Australia, governments do not draw this distinction and allow competition in all segments of the market. Not only do these policy initiatives affect decisions on how many interconnect points are required and where they should be, more importantly they create different dynamic pressures on the interconnecting operators depending upon whether their relationship is complementary, e.g. one operator reliant on another for end to end service; or whether they are competitive, fighting for revenues from the same customer.

The view taken by governments with respect to the speed of liberalisation, and therefore the willingness to encourage market entry by making entry conditions favourable through subsidies or waivers of certain obligations, will also significantly affect the interconnect regime evolving, as will the choice between immediate open competition or a transitional period of duopoly as was the case in the UK and is the case in Australia. Another significant factor influencing the interconnect regime is the historical rate structure of the industry and the degree of tariff imbalance existing in the retail market.

Furthermore there are other factors to consider. As Robert Alban²⁹ has stated

"Perhaps naively, it is assumed that the sole objective [of an interconnect charge is to determine an efficient charge for the use of essential facilities]. Obviously actual determinations of interconnect prices involve factors other than economic efficiency. For example governments often seem to consider the political repercussions of the resulting price structure for services".

In the USA, Australia, the UK and, tentatively in Germany, the approach to interconnect charges has been to base the charges on cost. However, the costs have been defined very differently. In the USA they have been based on some measure of fully distributed cost but in Australia they have been more closely aligned to incremental costs.

²⁹ Alban, Robert. "Interconnect Pricing". Telecommunications Policy 1994 18(5) 414-420.

In New Zealand the interconnect charges have been left to the market to determine with little regulatory intervention. Theoretically it is contended that they have their origins in the efficient component pricing rule advocated by Baumol.

In Japan and France a different approach to interconnect charges has been taken, with interconnect charges determined based upon retail tariffs.

In the UK the approach embodies much of the US approach. Some argue that through the implementation of access deficit charges (ADC's) the UK regime also embodies an approximation of Baumol's efficient component pricing rule approach.

Overall there are a range of approaches to interconnect charging, many of the differences having their origins in the factors discussed above. Most commentators would agree that the least satisfactory approach is the one based upon retail tariffs utilised in the Japanese and French approach.

Any recommendations at a Community level for the formulation of interconnect charges will need to be flexible enough to deal with these different factors and any other differences that are likely to arise between different Member States.

6.3 Costs and Tariffs

Given the Commissions desire for cost orientated tariffs and to see interconnect charges become cost orientated, it is instructive to review the existing relationships between costs and retail tariffs. This will provide valuable insight into some regulatory imposed imperfections in the retail market that will need to be considered in the formulation of cost orientated interconnect charges to achieve efficient market outcomes.

Monopolists' Tariff Structures

Most TOs in the European Community are at present still operating as at least dominant players in most of their businesses, and most have a monopoly over the provision of voice telephony services. Their tariff structure, particularly for voice services, has arisen to a great extent as a result of their genesis in public sector monopolies. They have historically been managed to a strategy determined by regulatory and political policy with the aim of providing universal service, and have

cross subsidised markets to achieve this. They have then been regulated on the total profitability of the regulated business. The costs of individual products and services was not a significant issue for either managers or policy makers. As long as total revenues were in excess of total costs by an amount sufficient to fund investment, and to provide a contribution to state treasuries no-one focused on the relative profitability of different services. The resulting tariffs often do not reflect the underlying costs of service provision that one would expect under normal competitive commercial conditions. Further, the information that many of these organisations have with respect to service costs and profitability is rudimentary since there has historically been no reason to collect this information in a rigorous fashion.

A number of the cost and tariff distortions are worth considering in further detail.

The Universal Service Obligation

The USO arises where national practice requires the TO to provide services to customers whom they may otherwise have insufficient economic incentive to serve (e.g. phones for the disabled, rural residential lines or low volume lines). Apart from those subscriber groups receiving explicitly subsidised services they are uneconomic subscribers primarily because averaged tariffs means that the very high costs of access provision to some customers is not covered by the averaged connection costs and line rentals together with the margin on call revenue. The economic cost of meeting the USO, in monopoly situations, has been met by recovery through tariffs on more profitable services. Hence the relationship between service costs and tariffs will reflect this redistribution effect between different subscriber groups and different service offerings.

Tariff Imbalances and the Local Access Loss

There are other reasons for cost and tariff imbalances for particular service groups beyond the USO. Most TOs would argue that they make a loss on the provision of local access. However, this "access deficit", as it is called in the UK and certain other Member States, is not the cost of providing universal service. When viewed together with the margin made on call revenue, many subscribers included in the local access loss are economically profitable. The tariff imbalance therefore gives rise to a local access loss recovered fully through call revenues, (albeit only partially in the case of USO customers).

This distortion in the cost-tariff profile is important to understand however, because if through the competitive process the incumbent TO still provides access but an interconnecting operator carries the call traffic, the dominant operator will lose the ability to fund the local access loss arising on their subscriber base. This is the principle behind the system of Access Deficit Contributions (ADC's) that BT seek from interconnecting operators in the UK.

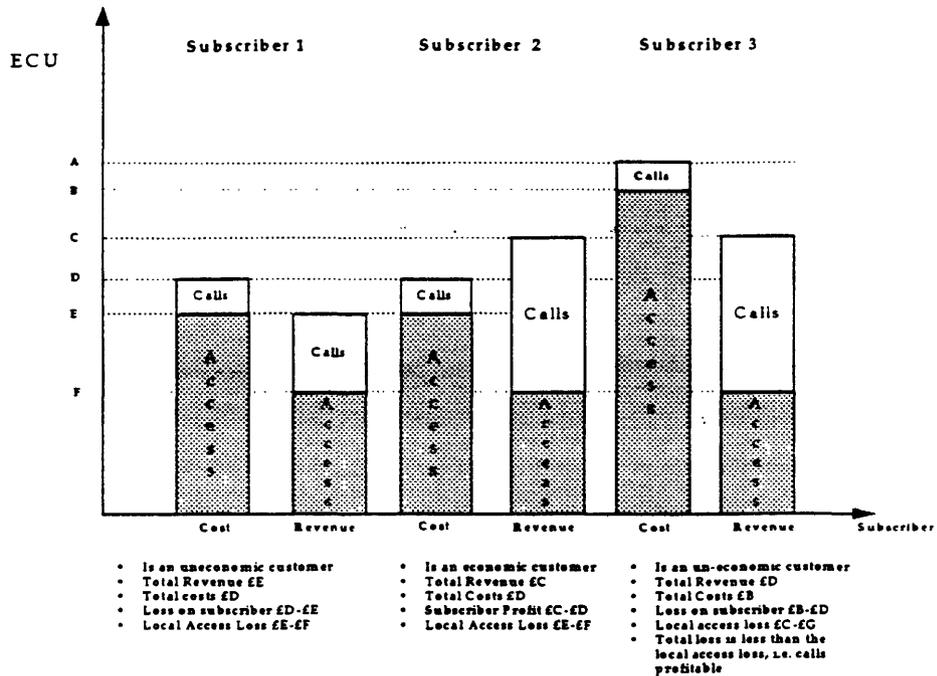
Access Deficit

There is much confusion between the costs of providing universal service and the "access deficit", and hence our use of the term local access loss. In reality the "access deficit" is made up of two components, part relates to the cost to operators of meeting their USO and part to the local access loss as detailed above. The two are linked, and the confusion arises, because in many jurisdictions the USO requires geographically averaged tariffs at affordable prices. The local access loss portion of the "access deficit" arises primarily from imbalanced tariffs and the USO portion of the access deficit arises primarily as a result of averaged tariffs and specific targeted subsidies where the costs of providing access is not offset by the margin on call revenue.

Care must be taken not to confuse the two as the access deficit calculated by many TOs is far greater than the costs of meeting the USO. From cost causal principles one might conclude that the USO and local access loss should be recovered in different ways and not via a single mechanism.

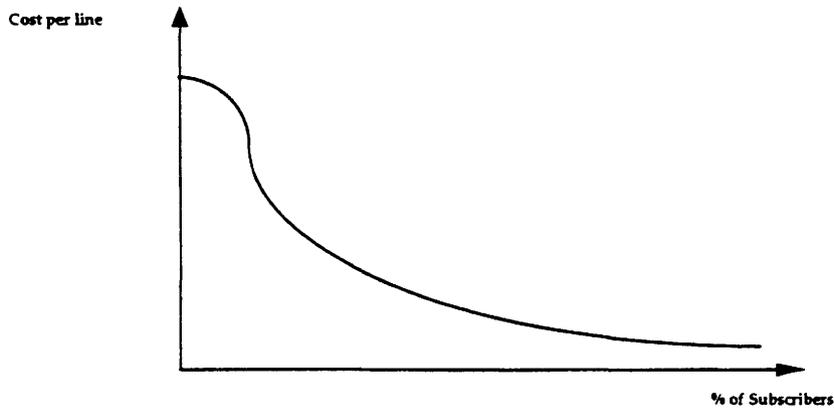
The difference between the tariff imbalance driven local access loss and averaged tariff driven cost of USO can be shown graphically below. Subscribers 1 and 2 are identical in every respect except calling patterns. Subscriber 3 has identical calling patterns to Subscriber 2 but is much more expensive to provide access to, perhaps because he/she is a rural subscriber in a mountainous region. Therefore Subscribers 1 and 2 both have an equal local access loss but Subscriber 1 is an uneconomic subscriber and Subscriber 2 is economically profitable. Similarly Subscriber 3 is an uneconomic subscriber despite being identical in calling patterns to Subscriber 2.

Costs and Revenues of Subscribers

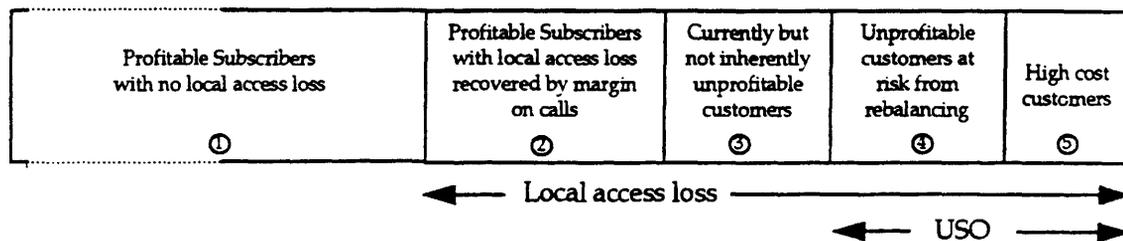


For any operator's subscriber base the relative cost of providing access to the network for a particular subscriber and the revenue received from the initial connection cost and line rentals will vary. However, the number of subscribers that are very costly to connect because of their geographical location to the network is likely to be fairly small. This can be represented graphically as follows:

Cost per line Vs % of subscriber base



When the costs of line provision is considered together with the margin earned on call revenue there are therefore different categories of subscriber. For a typical TO's subscriber base this can be represented as follows:



Unfortunately, rigorous data on the relative costs and sizes of the subscriber groups is not available and the above analysis merely attempts to explain their relationship.

- ① Access revenue exceeds access costs, total revenue exceeds total costs.
- ② Access cost exceeds access revenue but resulting local access loss is recovered from the margin on call revenue.
- ③ Access cost exceeds access revenue and resulting access loss is not currently recovered from the margin on call revenue. However these subscribers would not leave the network if tariffs were rebalanced.
- ④ Access cost exceeds revenue and resulting access loss is not recovered from the margin on call revenue. These subscribers would be at risk if tariffs were rebalanced and might leave the network. (Therefore these are USO customers).
- ⑤ These are the USO customers where the cost of service is very high and will never be recovered from revenue, either because of targeted subsidy or extreme expense of providing access.

Interconnect Charges and Recovery of Cross Subsidies

For cost orientated interconnect charges it is therefore necessary to consider whether, and if so how, the retail tariff and cost imbalances and averaging imbalances should be built into efficient interconnect charges.

Although the local access loss and the costs of USO arise from analytically separable causes, interconnect charges could in principle contain a component based upon either a service based calculation of the deficit or a subscriber based definition of the deficit, or on both.

For example consider a monopolist TO providing 3 services to 3 customers.

SERVICE				
Customer	A	B	C	Total Profit
1	-10	-2	4	-8
2	-4	2	8	6
3	-1	3	10	12
Total Profit	-15	3	22	10

The monopolist makes a profit overall of 10 and therefore can afford to cross subsidise the loss making product A, and customer 1. Obviously if a new entrant emerges and interconnects with the TO it might take over only service C or serve only customer 3. In practice formulae may be constructed to ensure that the cross subsidy lost by the incumbent due to the new entrant taking over service C or customer 3 is replaced by a cross subsidy built into the interconnect charge. In all cases the system of charging is arbitrary and this will always give potential for disputes.

The need for cross subsidy charges arising due to tariff imbalances could in theory be removed if tariffs were rebalanced. The cross subsidies to share the funding of averaged tariffs are more difficult to deal with. This is discussed in more detail in section 9.7.

6.4 Formulation of Interconnect Charges

The formulation of cost orientated interconnect charges should be based upon a consideration of what the costs arising as a result of interconnection are likely to be. For the time being we will overlook the specific cost standard adopted, as this will be addressed in later sections.

Many commentators and academics have tried to prescribe what charge elements should exist in interconnect regimes. From a purely pragmatic position it is possible to suggest that interconnect regimes could have two subsets of charge elements. The first relates to costs that arise as a result of one party buying interconnect services from another, the cost causative elements, and the second are charge elements added

to try and compensate for price distortions in the retail market that arise as a result of obligations and/or tariff constraints imposed by regulatory authorities for political and/or social policy objectives - the so called "access charge" elements.

The charge element for interconnection services can be broken down into connection costs and conveyance costs. The "access charge" element can be split into an element that takes account of historical tariff imbalances and current regulatory constraints on the speed of tariff rebalancing in the retail market (the most significant being the local access loss) and an element that results from regulatory obligation to provide socially desirable but uneconomic services (e.g. pay phones) or to serve groups of uneconomic customers e.g. the deaf, socially disadvantaged, remote rural subscribers etc. The extent to which each is included in the final interconnect charge will often depend upon the factors mentioned above, the degree of structural asymmetries arising from interconnect or particular political or social objectives.

Therefore the interconnect charge, and the costs that need to be determined can be divided into 2 separate charges incorporating 4 principal elements.

A. Charge elements attributable to the interconnection services provided

A1. Connection Charge

A2. Conveyance Charge

B. Charge elements resulting from obligation and/or tariff constraints imposed by regulatory authorities - the so called "access charge"³⁰ elements

B1. Local Access Loss Charge (or tariff imbalance charge)

B2. Universal Service Obligation Charge

To formulate these charges it is necessary to understand the underlying costs, and in each case they should be the costs of an "efficient operation", otherwise the

³⁰ This is a Commission term and should not be confused with the glossary of terms definition given in Appendix 1.

inefficiencies of one organisation will be passed on to another through the interconnect arrangements.

Connection Charge - This charge recovers the one-off costs relating to the physical connection of one network to another, including network adaptation (e.g. equal access, network integrity) and network redimensioning costs.

Conveyance Charge - This charge recovers a number of costs: firstly the costs arising from the use of the physical connection between the two networks to permit the transfer of calls from one network to another; secondly the usage costs incurred where one operator utilises another operator's interconnected network to handle a call (e.g. call set up, signalling, switching, transmission, access to special services and capacity) thirdly the supplementary and ancillary costs (such as monitoring and recording of network activity, billing); and fourthly, overhead costs (e.g. accounting, management).

Local Access Loss Charge - As stated above most operators do not recover the fully distributed cost of providing exchange lines from initial connection charges and line rentals, and thus even for customers that are profitable when call revenues and costs are considered a "loss" is incurred in providing access.

To the extent that an interconnecting operator attracts the dominant operators call business, the incumbent's contribution to its local access loss is reduced. The incumbent operator would argue that the interconnecting party should be required to pay a contribution to these losses on delivery of the call in addition to the cost orientated charges for connection and conveyance to ensure that the interconnecting party pays the full cost of local access.

This element will be required only where such local access losses are material, and will only exist whilst there are political and social constraints on the rebalancing of tariffs preventing the elimination of these losses. As political and social circumstances allow rebalancing of tariffs, the loss on local access as currently defined might be expected to be eliminated. However, this may take some time, and in the meantime, a mechanism for measurement and recovery of the local access loss may be required. This matter will be addressed further in sections 8 and 9.

Universal Service Obligation Charge - As stated in section 6.3 the USO arises because national legislation in a number of countries, either explicitly or implicitly

requires operators to provide service to customers whom they may otherwise have insufficient economic incentive to serve (e.g. rural residential lines or low volume lines). The so called cost of universal service results from the additional net expense incurred in serving such customers and fulfilling the USO. The public service obligations in certain Member States may be included with these costs.

In monopoly situations, such costs have been recovered through higher tariffs on other more profitable services. In moving to a competitive environment, it becomes necessary to calculate the cost to the operator of providing universal service, and to decide whether, and if yes, how and at what stage, new operators interconnecting with that operator should be required to share in the provision of these services and/or their funding. One method by which this contribution could be made is through the interconnect regime. The operator should not be entitled to include in this category subscribers which were originally expected to be profitable but are not, nor, in principle, those which are unprofitable solely because their market potential has not been exploited.

Whilst not always separately identified in the final interconnect charges, each of the above components require consideration. Some elements may be excluded or modified by the regulator to encourage market development. For example as a result of the lack of equal access in Japan and other market imperfections the Ministry of Post and Telecommunications required NTT, the dominant operator, to incur the costs of installation, maintenance and operation of interconnect facilities and rejected NTTs request to recover these (and indeed its USO costs) through interconnect charges. In the same way the FCC, after initial divestiture, attempted to compensate new entrants for the lack of equal access by initially allowing rival long distance operators discounted interconnection charges on lines so affected.

Oftel, the UK regulator, in an attempt to promote competition has waived the Access Deficit Charges, designed to recover the local access loss for new entrants, until their market shares exceed certain limits. Similarly in Australia the interconnect charges of OPTUS, the second carrier, are based upon directly attributable incremental costs with no contribution to historical sunk or joint and common costs for the duopoly period.

We recommend that the "access charge"³¹ elements discussed above should not be included in the interconnect charge but may be dealt with separately within the interconnect regime.

6.5 Unbundling

In setting cost orientated interconnect charges it is necessary to ask two questions. Firstly, what are the relevant costs that prices should be orientated with, and secondly, what are the interconnect products and services interconnecting operators want to purchase. Put simply, "what cost" and "the cost of what". We will review the "what cost" question in section 9 but firstly we should examine what it is interconnecting operators want to purchase from incumbent operators. Until this is known it is not possible to be precise regarding the cost allocation methods and cost accounting practices that need to be developed.

US West stated in their submission to Oftel in the UK, that an interconnecting operator essentially wants to purchase two broad categories of component. The first are components that the operator could either provide itself or purchase in a competitive market (if one exists) and the second is any essential component of the service which is unique to the assets owned by the other operator. A good example of the latter is call completion, as every operator may have exclusive access to its customers.

Depending upon the degree of infrastructure competition present in any particular market this split will require regulatory distinction between those transactions that are subject to market forces and that can be regulated through general competition policy rules, and those where an unavoidable and enduring element of monopoly creates a "bottleneck" which requires specific action by the regulator. Therefore unbundling requires each logically discrete physical function performed in providing interconnection to be specifically identified and costed, separately priced, and offered on a stand-alone basis. Thus for the interconnection of a competitive operator's node to an incumbent's subscriber that operator would as a minimum

³¹ This is a Commission term and should not be confused with the glossary of terms definition given in Appendix 1.

expect to be able to see unbundled and individually cost orientated charges for the link between the node and the incumbent local switch, the physical interconnection of the facility at the local switch, the local switching performed and the conveyance of the call over the local line.

It is impossible for interconnect charges to be cost orientated without such unbundling because each unbundled interconnect service has different underlying economics. To aggregate all of the elements into a single undifferentiated charge would not reflect the very different cost structures of each of the functions. Accordingly unbundling is necessary to ensure that costs and therefore the charges of each unbundled element reflect what is purchased, i.e. that interconnecting operators only pay for what they want to receive.

If correctly structured such unbundling will therefore restrain abuses of market power by creating a transparent regime where the relationship between the costs incurred and prices charged is more easily visible to those purchasing the interconnect services and also to the NRA.

The above would appear to indicate that with the introduction of service and infrastructure competition regulatory involvement will be predominantly focused on bottleneck services, such as call completion, leaving market forces to control potentially competitive services. This may not be the case in the short term. Dominant operators will remain dominant for some time and therefore the terms and conditions for interconnection to all unbundled services will remain fundamental to the promotion of efficient competition. This will require continued regulatory involvement. This is not to deny however that as competition develops for certain interconnect services the regulatory burden will be reduced.

US West³² suggest that the starting point for interconnection is that operators should be able to choose from a "menu" those elements of interconnection that are most suitable for their own business case. They state that these elements should be separately identified and costed and made available on an unbundled "building

³² US West Inc. Submission to OFTEL in response to "Interconnection and Accounting Separation." 19 June 1993.

block" approach. US West claim that this process of isolating network cost elements is possible and that they are currently implementing this approach in the US.

US West defined network building blocks as:

"a cost element or group of cost elements representing the smallest feasible level of unbundling capable of being tariffed...The assumptions underpinning the building blocks are that they:

- are practically tariffable;
- represent generic network functions i.e. they are unrelated to customer classifications or current service definitions;
- are designed based on actual network cost variables - i.e. density, distance, band width etc;
- have points of demarcation which fit a logical network design and reasonable expectations of points of interconnection in an unbundled environment;
- have costing methodologies which are reasonable and transparent;
- should be priced so as to reflect the avoidance of undue cross subsidisation and the difference between essential monopoly (bottleneck) and non essential (competitive) building blocks."

Recent experience in the UK has shown that the identification of what are the unbundled network elements that should be made available to interconnecting operators is not an easy task. However one thing is clear, the identification of the unbundled elements should not be left to the incumbent and NRA alone. Participation by existing and potential competitors is necessary to understand what it is they wish to buy. Whilst Oftel's original consultation started in June 1993, at March 1994 following a number of industry workshops the unbundled interconnect list was not complete. However Oftel's March statement did include a preliminary list. This is reproduced in Appendix 8.

6.6 Establishment of Interconnect Charges

Having looked at the formulation of interconnect charges it is necessary to analyse who should be responsible for their establishment and the framework in which they should be established.

The interconnect charges that a competitive new entrant pays to the dominant TO are likely to be a significant input cost, the variability of which is likely to make his economic business case either favourable or unfavourable. Section 8 discusses the implications of this on market efficiency. Accordingly the market needs to know how interconnect charges will be determined, if not to know them explicitly, and to have confidence that there will be no undue discrimination in the interconnection charges it faces as compared with those faced by the incumbent operator or other competitors. Without this minimum knowledge it is unlikely that efficient competition will develop as the returns required to reward investors for exposing themselves to this level of risk are likely to be prohibitive.

As a result potential new entrants need to have confidence in the interconnection regime and the regulation of it to ensure that the charges they face are known, or will be equitable, and that they are non discriminating. This requires transparency of information regarding interconnect charges and in particular this may require the NRA's involvement in the establishment of interconnect charges.

The principal objective of interconnection is to facilitate efficient competition. For this objective to be attained there are a number of fundamental characteristics that interconnect regimes must exhibit. These were enunciated by Oftel in their June 1993 Consultative Document on Interconnection and Accounting Separation and received wide industry support.

- **Transparent Interconnection charges.** Interconnect charges should be published together with sufficient information about the methodology employed to calculate them to allow competing operators to understand how they relate to the underlying costs. This requires the dominant operator to produce a published price list for interconnect services together with details of the underlying cost data and cost allocation methodologies adopted in reaching the charges.

- Charges should be efficient and sustainable. This means that charges should encourage efficient resource allocation but also allow the operator to recover its costs and make a reasonable return on capital employed.
- No undue discrimination. Interconnecting competitors should receive the same interconnect terms and conditions relating to price and non-price factors as each other, and as the dominant TO applies to itself. Therefore interconnect agreements should be in the public domain to allow comparison between the terms different operators obtained from individual carriers, and abatement of interconnect charges should be applied if competitive new entrants receive asymmetrical interconnect services from the incumbent.
- Sufficient Information. There must be adequate information available to competitors to give them confidence in the interconnect agreements they reach.

Independence and non discrimination can be achieved if the NRA is made responsible for the development of the rules to establish the cost structure, charges and terms and conditions for interconnection to incumbents. The charges should be based on objectively established principles and the process should allow for the identification of the various elements of interconnect services that competitors may like to purchase and their individual costing and charging. In this way competitive new entrants to the market will be able to predict the interconnect charges they will face, and therefore establish their business plans. Without this process they will not have confidence that they are investing in a market which provides the incumbent operator with no cost advantages in the use of interconnect services. Without these characteristics there is a risk that instead of facilitating competition, interconnection may serve as a barrier to market entry.

In the European context it will be necessary for the Commission to establish a set of principles for interconnect that are flexible enough for different Member States to achieve their own political and social objectives whilst ensuring the benefits of liberalisation are available to all European citizens without cross border distortions. Whilst we acknowledge the principles of subsidiarity it will be an opportunity lost if these principles are not agreed in sufficient detail at a Community level. The Community may suffer if their establishment is left to Member State NRAs and the inevitable delays that would result.

If interconnect charges are to be made cost orientated it is therefore necessary to determine what are the relevant costs and what are the interconnect services that need to be costed. In order to examine the cost allocation and cost accounting methods, compatible with national practices, which would be necessary for implementing an efficient scheme of interconnect charges it is first necessary to review in more detail the costs associated with meeting the USO and how they should be incorporated into interconnect charges and the way in which efficiency should be promoted through the setting of interconnect charges. These topics are covered in sections 7 and 8 respectively.

6.7 Accounting Separation

When establishing a cost allocation methodology and the general accounting principles to be used in setting interconnect charges, it is vital that the established principles are not only implemented but are seen to be implemented. In this regard, accounting separation has frequently been cited as a means of providing greater transparency in the interconnect process.

It is of great concern to new operators entering the telecommunications market, that the incumbent operator may use its monopoly position in certain areas to cross subsidise its activities in competitive areas in order to force the new operators out of the market. The intention of accounting separation is to show the profitability and the returns achieved by the incumbent in different areas of its business and hence, to be able to identify where cross subsidies may be in place.

When markets are liberalised a number of methods can be used to ensure that the incumbent TO does not abuse its monopoly power. The most extreme step to ensure that the incumbent does not extend its monopoly advantages from the parts of its business enjoying monopoly status to those operating in liberalised and competitive markets is to structurally separate the incumbent into independent economic entities under separate ownership. Structural separation was chosen in the US with the divestiture of AT&T.

Many governments do not find structural separation attractive. An alternative is Organisational Separation into separate entities under common ownership. Our experience suggests that organisational separation, in the absence of structural separation is not very effective.

Some NRAs, OFTEL included, have decided against structural separation on the grounds that it would not solve the difficulties in defining terms and conditions of access to the monopoly assets, and may prevent the exploitation of economies of scope by companies offering integrated services. Instead they have suggested Accounting Separation. This is often proposed as a surrogate for structural separation on the basis that it will allow the key objectives to be met without the large costs associated with restructuring the incumbent operator.

Whilst many benefits may accrue from accounting separation, maintaining the incumbent TOs existing structure will not lead to the change of mind-set and culture that might be expected to be brought about by structural or organisational separation. In the short run, however, if the only objective of proponents of accounting separation is to engender arms length trading on a commercial basis between different parts of the incumbent's business, the results will be somewhat arbitrary. The independence of action between a customer which controls more than 85% of the market, and a supplier which controls a similar proportion of the network capacity will be questionable.

It is not our intention in this study to extensively debate the merits of accounting separation verses structural separation. Suffice to say if accounting separation is followed as an initial step this does not remove the possibility of further separation being placed upon the long term agenda. The adoption of accounting separation supports the evolution of the industry. Most major US telephone companies and several PTOs in Europe and Asia have reorganised themselves into market facing businesses supported by a core network organisation together with other support services. The changes in organisation are said to improve customer focus and competitiveness and increase the accountability for company resources and profitability. If companies are required to separately account upon this basis it will aid transparency of information and go some way to meeting the information needs of potential competitors.

In addition, accounting separation has been effective in the US, albeit separation between different business units. Over the past several years the FCC's requirements for separation of regulated and non regulated businesses together with external audit have been further refined. Although there are critics who say the process has become minutely detailed, it is generally regarded as more efficient and effective in serving customers than organisational separation might otherwise have been.

Notwithstanding the foregoing, if accounting separation is to be effective several control features will be needed. Such control features may necessitate disclosure of competitive and sensitive information by the incumbent operator, and in time by other major operators. The level of disclosure is likely to become significant and is likely to be regarded, by the incumbent at least, as onerous. Internal segment reporting systems, including transfer charge mechanisms will be required to support the new accounting structures.

For there to be faith in the accounting separation a high level of disclosure will be necessary. In the absence of such confidence the objective of reforms will not be achieved. To avoid some of the arguments against publishing commercially sensitive information disclosures may be differentiated between service specific profitability analyses submitted to the NRA and aggregated service profitability analyses for public disclosure.

If accounting separation is to achieve transparency the level to which the incumbent is required to separately account is an issue which requires the balancing of sufficient information to give comfort to the industry with the commercial confidentiality of the incumbent. In the UK, Oftel have suggested the separation of British Telecom into Retail, Network and Access business segments. There is scepticism amongst new entrants as to the availability of cost information of the level of detail required for sufficient transparency. An example from the US in Appendix 9, shows the levels of detail that can be achieved and comments on its usefulness in the provision of transparent information for interconnecting operators' comfort and confidentiality concerns.

Given that accounting separation will be the product of the operator's cost accounting system, it is subject to all of the strengths and weaknesses of the cost allocation methodology used by the operator and the cost accounting principles employed. The first issue with regard to accounting separation, relates to which items are to be accounted for separately. Should accounting separation reflect the different business segments from a product/service perspective or from an underlying network perspective, and from which ever perspective the separate accounts are shown to what level of detail should information be provided. Hence the nature of accounting separation is closely linked to the issue of unbundling. There will clearly be a trade-off between the expense involved and the level of detail required. If particularly detailed accounts are required operators are also likely to raise concerns with regard to commercial confidentiality.

For accounting separation to be effective, there should, as a minimum, be separation of those services which are deemed to be monopoly services from those which are thought to be competitive. At the appropriate level of detail accounting separation will enable a new operator to have confidence that the interconnect tariffs are cost orientated.

Once the appropriate level of detail and areas to be costed have been agreed upon, confidence in the results of the accounting separation process will only be as strong as the confidence in the accounting methodology and allocations used to arrive at the individual service results. Hence, it is vital that if the purpose of accounting separation is to provide confidence in the fairness of the interconnect charges being set, that details of the cost allocation methodology used are also made public.

While accounting separation may appear as an additional burden on incumbent operators, we are aware of a number of operators in increasingly competitive environments who are finding it necessary to restructure their operations into separate business units and to account for these separately. Operators are doing this to align their processes and operations more closely to the needs of their customers. In the process, they are developing more sophisticated cost accounting techniques to enable them to understand service cost and profitability for both the services and for customer groups, and are developing transfer charge mechanisms to assist with their performance measurement. These are the same systems and techniques necessary to support accounting separation.

KEY POINTS: SECTION 6

- The diversity of interconnect regimes around the world indicates that a number of factors can influence the formulation and establishment of interconnect charges.
- Interconnect charges should be based on the underlying costs of an efficient operation and incorporate the following elements:
 - Connection Charge
 - Conveyance Charge
- The costs arising from obligations and/or tariff constraints imposed by regulatory authorities should be recovered separately from the costs of interconnect services or as a separate part of the interconnect agreement. This incorporates the following elements:
 - Local Access Loss Charge
 - USO Charge
- The Local Access Loss arises due to imbalanced tariffs and should be eradicated through removing the barriers to rebalancing costs and tariffs. Where this is not possible consideration may be given to sharing these costs amongst TOs.
- The USO arises mainly due to targeted subsidies and geographically averaged tariffs and may be reduced by de-averaging.
- Interconnect charges cannot be cost orientated without unbundling services since the unbundled services have different underlying economics.
- The objective of interconnect is to facilitate efficient competition. This requires:
 - transparency
 - efficient and sustainable charges
 - no undue discrimination
 - sufficient information

RECOMMENDATIONS: SECTION 6

- Interconnect Charges should be based on the underlying costs of an efficient operation, and in all cases contain two elements attributable to the interconnect services provided. These are:
 - The Connection Charge.
 - The Conveyance Charge.
- Separate charges within each element should be developed to reflect the traffic sensitive and non traffic sensitive costs and the distance and non distance related costs.
- Further Charge elements resulting from obligations and/or tariff constraints imposed by regulatory authorities do not relate directly to interconnect. As such they should be recovered separately from the costs of interconnect services, or, at a minimum as a separate part of the interconnect agreement. This incorporates the following elements:
 - The Tariff Imbalance or Local Access Loss Charge.
 - The Universal Service Obligation Charge.
- Interconnect Charges should be set to facilitate competition. In order to achieve this objective, NRAs in each Member State should ensure that the interconnect process is transparent giving rise to charges which are efficient and sustainable. Accounting separation under the review of the NRA is one way transparency may be achieved. In addition, NRAs should ensure that agreements are not unduly discriminatory and that confidence in the agreements is promoted through the availability of sufficient information.
- Interconnect charges should be based upon the cost of unbundled network elements. NRAs should liaise with TOs and potential operators to develop a list of the unbundled network elements which interconnecting operators wish to purchase. A co-ordinated European approach would be an efficient means by which this process could be achieved and would ensure cross-border consistency.

7. THE UNIVERSAL SERVICE OBLIGATION AND INTERCONNECT CHARGES

7.1 Introduction

This section assesses the way in which universal service costs should be taken into account when establishing interconnect charges. This part of the study, without determining the current or expected cost of providing universal service, discusses the general magnitude of such costs and provides an analysis of the alternative charges. This section builds upon the work carried out in a study for DG IV³³

In particular, this section discusses the nature of the USO obligation, its definition and whose responsibility it should be. Having discussed the responsibility for the USO it looks at the costs of meeting the obligation and the responsibility for funding it.

7.2 Background

It is often said that the introduction of competition into the telecommunication sector endangers the fulfilment of social policy goals such as universal service. Our understanding of the Commission's underlying aim is to ensure that the economic benefits of competition within the European telecommunications sector are achieved without foregoing the social benefits which have traditionally been available through state controlled monopolies and their cross subsidisation of such obligations. This section takes a broad look at how this aim may be achieved and suggests how such costs could be handled in a competitive environment.

The field work interviews for this study shed very little new light on this subject. European TOs and NRAs do not have a clear and precise definition of their USO. Generally an implicit approach has historically been taken to their funding which has not required TOs to rigorously define and cost the USO. Accordingly this

³³ Cave, Martin, Claire Milne & Mark Scanlan. Meeting Universal Service Obligations in a Competitive Telecommunications Sector, Report to DG IV, CEC, March 1994.

section sets out preliminary ideas, mainly derived from the existing expertise of the study team members, reviewed jointly in light of the other findings of this study. Considerable further work could usefully be done to confirm and refine these ideas.

7.3 **Compatibility of Competition and Universal Service**

The argument that competition endangers universal service arises from the fact that traditionally internal cross subsidies (some of them large) have flowed from international and long distance call revenues to support local calls and the cost of local access, and from urban to rural areas. Critics claim that the advent of competition logically calls for the ending of such cross subsidies, and that without them, the cost of basic service will inevitably rise to the detriment of many ordinary customers, some of whom may even be forced off the network.

Whilst there is some strength in this argument, the contrary position is that to the extent that cross subsidies are indeed large (which is not always the case), regulatory oversight can ensure that:

- Price rebalancing takes place at a reasonable rate and only to a clearly justified extent, which avoids "market shock" whilst not denying unnecessarily the benefits of competition;
- Vulnerable subscriber groups who could suffer from price rebalancing receive targeted attention and safeguards.

A brief look at the actual experience in countries where competition has started and the consideration of typical usage patterns shows that with a reasonable rate of price rebalancing the vulnerable groups are a minority. With adequate planning, their interests can be looked after and all groups can benefit from competition. Accordingly we believe that the objections to competition based upon the threat that it poses to universal service are ill founded. Rather, there are some strong and compelling arguments why, properly regulated, competition can in fact benefit universal service:

- It will improve efficiency and thereby lower prices, enabling more people to afford to join the network;

- It will foster innovation, bringing new technologies to market. Some of these may well be of special benefit to disadvantaged groups (e.g. radio technologies for rural distribution or for mobility impaired people etc.);
- The combined effects will generate market growth making previously unprofitable markets commercially attractive to one or more competitors;
- More revenues will be available to fund genuine social obligations;
- Properly managed, operators may compete for reputations as well as for markets, wanting to outdo each other in "good works", (or at least in the appearance of good works).

In future it seems likely that the question will no longer be whether competition and universal service are compatible, but whether competition should be part of the definition of universal service. Certainly, equal access to alternative long distance competitors could become part of the definition of basic service. The UK Director General of Telecommunication has spoken of a choice among 2 or 3 service providers as his aim for every customer.

7.4 What is the Universal Service Obligation (USO)?

Definition

Whilst all European operators recognise the EC definition of universal service there is widespread agreement that no national definitions were available that permitted detailed identification of the obligation, and therefore allowed the obligation to be costed.

The Council Resolution of 7 February 1994³⁴ has pooled the relevant references in the European Commission literature and legislation which identify some elements to

³⁴ Council of the European Communities. Council Resolution of 7 February 1994 on Universal Service Principles in the telecommunications sector, 94/C 48/01. Official Journal of the European Communities No. C48 p1-2.

serve as a basis for a definition of universal service. A definition has been provided to the EC in the report to DG IV by Cave, Milne and Scanlan as:

"services that are supplied to customers or groups of customers at a loss, even when the firm supplying them is operating efficiently and its past investments have been based upon sound business decisions".

There are alternative definitions but all are fairly broad and do not permit reliable costing. For clarity Appendix 4 contains some specific examples of the types of services included in the definition recognised in developed countries.

The above report states that there are four different policy perspectives that relate to universal service, and these are as follows:

- The achievement of universal geographical coverage.
- The geographical averaging of tariffs.
- Low access charges for residential customers.
- Targeted subsidies which are typically directed at the poor, the elderly, the disabled, rural dwellers or low users of the telephone.

The first two elements are normally present in every country, supplemented by either or both of the second two.

Stages of Telecommunications Development

The main aims of any universal service policy are likely to vary according to the state of economic and telecommunications development in a particular Member State. As a result any definition of the USO needs to be flexible enough to take account of the fact that it may represent a different obligation in different countries. USOs are imposed for political, social and economic aims, and these aims are likely to change as telecommunications sectors develop. Cave et al have suggested "Four stages of Universal Service" in which the aims of universal service policy are radically different depending upon whether the network is being established, grown to achieve wide geographical coverage or to ensure mass market take up, or practically is complete. Their table is reproduced below.

FOUR STAGES OF UNIVERSAL SERVICE

	Stage 1 Network Establishment	Stage 2 Wide Geographic Reach	Stage 3 Mass Market Takeup	Stage 4 Network Completion
Notional business penetration*	0-30%	20-80%	70-100%	100%
Notional residential penetration*	0-10%	5-30%	20-85%	75-100%
Telephone company culture	entrepreneurial	administrative (government department)	operational (huge workforce)	commercial (may be privatised)
Management preoccupations	large scale capital investment in new technology	technical network improvements, public service	growing the network, investment in new technology	growing call revenues, marketing
Constraints to network expansion	investment funds, appropriate technology and skills	limited demand due to high cost and prevalence of alternative communication methods	manpower for plant installation to meet mass demand (waiting lists)	affordability of service to poorer households; cultural acceptability of telephony
Typical government policy measures	investment incentives	close government control for security and economic reasons; geographically uniform charges	installation and rental charges kept low to stimulate line demand	cost orientated tariffs, targeted subsidies
Universal service goals	primarily technological (acquire new technology); provide long distance service linking all major centres; provide public telephones where demand warrants	primarily geographic (maintain regional parity); make telephone service available in all population centres; widespread adoption of telephony in business	primarily economic (stimulate economy); widespread residential take-up of telephony; meet all reasonable demands for telecoms	primarily social (achieve political cohesion); telephone affordable to all; telephone service adaptable to special needs (e.g. of disabled people)

* NB Penetration is defined here as separately business and household penetration
Source: Cave, Milne and Scanlan, 1994.

Depending upon which stage network development has reached the relative importance of the four policy perspectives outlined above will differ.

In high income countries household penetration typically exceeds 90% and the universal service goals are largely accomplished for basic services. The principal universal service policy then becomes limited to the fourth policy perspective of providing targeted subsidies to prevent subscribers leaving the network as a result of tariff rebalancing and to encourage non subscribers to subscribe. In middle and low income countries, by contrast, accomplishing universal service goals involves network rollout, rather than the infilling described for high income countries, and hence the first three policy perspectives predominate.

Of current Member States Spain, Portugal and Greece would probably be classified in the third development stage, Ireland is probably border line between the third and the fourth stage; and all other Member States would probably be in the fourth stage. Central and East European economies may better be characterised by the second stage.

The current debate focuses on how technically advanced, and eventually broad band, services should be added to basic service definitions of the USO to ensure there is not an information underclass resulting from asymmetrical access to the "information superhighway". Perhaps this could be seen as a fifth stage in telecommunications development. In summary, USO must evolve to match current economic, ethical, and social needs and also technical progress. This evolutionary aspect to the USO is recognised in the Council Resolution of 7 February 1994³⁵.

In most European Member States it is possible to generalise that the primary goal of the universal service policy is now social, and we should therefore regard universal service as a social obligation on the telecommunications industry. Similarly the rebalancing of the different revenue components to better reflect the underlying cost is overall in the national interest of each Member State and should therefore be encouraged subject to suitable consumer safeguards e.g. constraints on the speed of such rebalancing and ensuring social tariffs are maintained for vulnerable groups.

³⁵ Council of the European Communities. Council Resolution of 7 February 1994 on Universal Service Principles in the Telecommunications Sector, 94/C 48/01. Official Journal of the European Communities No C48 p1-2.

However whilst the freedom to rebalance is restricted, incumbent TOs may continue to make losses on the provision of access under FDC rules. The implications of this are addressed in section 8, but, as noted in section 6.3 above, most of this local access loss is not part of the cost of meeting the USO, a fact often misunderstood throughout Europe.

Further, if permitted by local legislation, in most Member States some degree of geographic de-averaging of prices to better reflect underlying cost may also be economically desirable. This would again be achievable without the risk of failing to meet universal service goals, provided safeguards such as those mentioned above are adequately addressed.

Public Service Obligations

A number of Member States have very strong public service obligations. e.g. France and Belgium. These should be separately considered as they are politically very sensitive but in the short term these can be dealt with in the framework suggested below for the sharing of USOs and their funding. The long term objective should be to remove from the industry the burden of funding such obligations.

Barriers to Joining and Using the Telephone Network

In countries where telecommunications development has reached the fourth stage, the mass market approach to network growth breaks down and needs to be superseded by a targeted approach. This entails understanding why various residual segments of the population have not joined the network. Barriers may include:

- Health factors, such as disability; these may be overcome by meeting special equipment and service requirements.
- Behavioural factors e.g. do not need, do not want, do not like or too difficult, to join the network; these may be overcome (in part) by meeting educational requirements.

- Financial factors, these are multiple but could be:
 - related to the cost of (one or more of) the following: gaining access, period rentals or call charges themselves
 - the consequences of uncontrollable total outgoings, this could be helped by credit limits
 - related to methods of payment or frequency of payment.

Each of these may be overcome by more innovative service offerings and tariff packages, e.g. predetermined credit limits, automatic call barring, incoming calls only.

Current understanding throughout Europe of why potential subscribers perceive such barriers to joining and using the telephone network is not good and the relative size and significance of the various barriers, and how to overcome them needs more research. Only once there is an understanding of what creates the barriers to joining the network can one truly understand what needs to happen to ensure that universal service policy objectives are achieved and penetration increased.

7.5 Responsibility for Universal Service

Industry Responsibility Administered by the NRA

It is important to establish who is responsible for ensuring universal service. This will affect how broadly the obligation is defined and how the relevant costs of meeting the obligation are established. This has obvious implications for the funding of such costs by the telecommunications industry through either interconnect charges or some other means.

Traditionally, the USO has been borne by the incumbent TO and has been funded through cross subsidy. As markets liberalise we question whether this is still the appropriate way of assigning responsibility for universal service goals. To continue to interpret it in this way may provide incentives for the TO either to incur more than economically efficient costs, or to claim they have been incurred, in meeting its obligations. Whilst in the short term such obligations may be asymmetrically

imposed upon the incumbent in order to promote new entrants into the sector, as the market is progressively liberalised the cost of meeting the USO should be shared more equitably amongst competing operators. It is at this point that a common understanding of the responsibility and definition of universal service becomes necessary, to avoid disagreements.

Whilst in law the USO has been the responsibility of the NRA, the burden of interpretation of the law, calculation of the magnitude and funding has effectively rested with the incumbent TO.

The definition of USO and other social requirements in national telecommunications sectors, and plans for their fulfilment, should be the responsibility of each NRA. NRAs will be influenced by their national politics and international developments. They will need to acknowledge the national benefits from meeting basic telecommunications needs (e.g. better functioning of the employment market and crime prevention). Any telecommunications company seeking a licence to operate in a country must expect that either immediately, or once it has become established, it will contribute to the fulfilment of the industry's social requirements either in cash or in kind.

Traditionally these requirements have been regarded as a necessary but undesired burden. A quite different view point is now becoming at least as valid, that social requirements of telecommunications operators present significant market and public relations opportunities. The term social requirements has been used here instead of social obligations because a significant proportion of these may well be met by the industry voluntarily. The opportunity to fulfil a social requirement may actually have considerable commercial value, both through favourable public relations and through the capture of "safe" (and maybe eventually profitable) market segments. New entrants should therefore have the chance to fulfil social requirements directly rather than just contributing in cash towards the potentially inflated social costs claimed by the incumbent.

Assumptions

In the remainder of this section we assume that by the time their markets are liberalised Member States have reached the Fourth Stage and that tariffs have been

rebalanced so that the universal service policy is restricted to targeting subsidies to disadvantaged groups and to prevent people leaving the network³⁶. If tariffs remain unbalanced then this will give rise to a local access loss (see sections 8 and 9 for its recovery).

The provision of service to remote rural areas at nationally uniform, or near uniform, prices has been one of the main areas of controversy. In summary we take the view that in developed countries it is the exception rather than the rule that such activities would fall within the definition of universal service because:

- The cost differential attributed to rural operations is often overestimated³⁷. (Only a very small proportion of lines incur really high costs)
- The revenues resulting from rural operations are very worthwhile, especially over the long term and taking account of incoming as well as outgoing traffic.

From limited evidence available for the UK, we believe that low levels of telephone connection are more likely to prevail in areas of deprived inner-city/suburban housing than in rural areas. The challenges of achieving universal service are more likely to be associated with urban poverty and multiple deprivation than with the supposed high cost of rural provision.

³⁶ If liberalisation occurs before a member state has reached the fourth stage, the cost of the USO is likely to be greater to ensure widespread geographical coverage. Whilst we do not anticipate this will happen given the current liberalisation timetable, if it does, the obligation for wider geographical coverage can be handled in the same way as other targeted subsidies via the "franchise" approach discussed below. Indeed liberalisation in this way may speed up the universal service provision.

³⁷ Mercury One-2-One in its response to Oftel's Consultative Document on Interconnection and Accounting Separation claimed that urban services may actually cost more than rural services due to the number of switching units through which calls need to pass, and that in addition urban subscribers receive more value from the same service because of the greater number of other subscribers they can reach for a particular tariffed service compared to a rural subscriber.

This may or may not significantly contradict received wisdom, but one thing is certain, geographically averaged prices and the respective costs are clearly misunderstood and the inherent cross subsidies promote market inefficiency. Geographical deaveraging will overcome these and the unwelcome effects on universal service goals can be prevented through targeted subsidies.

If no geographical de-averaging has occurred and particular operators still believe they incur an inequitable social cost in providing service to certain geographical subscriber groups that they are obliged to serve they could seek to share the funding of these costs in the way outlined in section 7.7 below. However, we assume that some form of geographical de-averaging is likely to have taken place by the time liberalisation is effective in each Member State.

Franchise Approach to USOs

Establishing and maintaining the social requirements will become an iterative process involving the following steps. Firstly the NRA through wide consultation and debate should determine what "non commercial" services society requires of the telecommunications industry (this can include both USO and public service obligations). Each TO should then be invited to offer such services on a voluntary basis (e.g. in the UK BT's text users rebate scheme and Vodafone's carphones for mobility impaired drivers). Remaining unfulfilled requirements should where appropriate be made the subject of competitive bids, such that TOs could bid to fulfil all or part of a requirement and contracts would be awarded on the basis of a full evaluation including quality and continuity of service guarantees as well as the level of funding requested. Requirements thought unsuitable for competitive bidding or for which no bid is received would then be imposed as an obligation on whichever TO, or TOs, appear to be best placed to fulfil them efficiently. For example the provision of basic services in remote areas may be placed upon one mobile or PCN operator. This means it will not always be the incumbent TO, although in the early stages of liberalisation this is more than likely. This does not mean that in all cases there will not be a significant cost burden on an operator, and where such social requirements are costly to provide, these would then become candidates for shared funding of these costs - see section 7.7 below.

The above process would have to be regularly reviewed, with all commitments made for the duration of the review period. Matching these review periods with price controls and quality reviews may well be appropriate. In this way each NRA could create a climate in which TOs see useful advantage in their non commercial achievements.

7.6 Cost of Universal Service

Cave *et al* stated that "the cost of meeting the USO in any locality consists of the sum of losses incurred by operators in serving customers who they are obliged to serve under the USO, but who they would not otherwise have chosen to serve". They also stated the calculation of this cost should be made on the basis of the cost of an efficient operation.

This requires examination of the cost and revenues associated with particular customers or groups of customers.

The "costs of USO" maybe variously interpreted as, for example:

- The net current annual costs for all lines where current annual costs exceed current annual revenues, or
- The net current annual costs for all lines where lifetime costs exceed lifetime revenues, or
- The net current annual cost for all lines which, once connected, the TO would choose not to serve i.e. to disconnect on commercial grounds, or prior to connection would choose not to connect, or
- The net current annual cost for all lines which, prior to connection, the TO would choose, or have chosen, not to connect.

Due to the current lack of a rigorous definition and the absence of incentives to provide one, most TOs themselves can only estimate total costs at best. This is likely to be on the first basis and to include components of what we have referred to elsewhere as the local access loss and identifiable targeted subsidies.

However, logically the most satisfactory definition is the fourth one above. There is a normal commercial strategy to cultivate currently unprofitable or marginally profitable customers for their future prospects (e.g. student bank accounts, bottom of the range car models) and whilst future prospects are of course never certain it is usual to accept some risk. Similarly it is normal commercial strategy to serve all customers in a given area despite their different profitability without discrimination, thereby minimising administration cost and poor public relations. We therefore

suggest that the "cost of USO" should normally be limited to explicitly identified and required targeted subsidies, for example to disabled groups, the elderly, or remote communities. It should not include customers that are uneconomic because the TO has been unable to exploit the full commercial potential.

It is perhaps sensible to more closely examine what we mean by net current annual costs. Since only a minority of customers are likely to impose a net USO cost, it is reasonable to estimate the cost of provision to these "loss making customers" on an avoidable basis i.e. to calculate what cost would be saved if these customers were either taken off the network or what cost would not be incurred if they were never connected.

On the revenue side it is obviously important that all revenues paid by a USO customer are included in the calculation. There is also a strong argument for attributing some or all of the revenue of incoming calls to that customer, on the grounds that at least some of that revenue would be lost if that customer was removed from the network. A calculation of this kind is practical and has been carried out in Australia.

The net cost of USO as defined above is likely to vary significantly depending upon the level of network development. In high income European countries with well developed networks the avoidable cost of removing a subscriber from the network is likely to be very small. However at an early stage of development when network infrastructure roll out is a high priority the avoidable cost of adding subscribers in new areas are much more significant, and therefore in low and middle income countries the net cost of USO is likely to be greater.

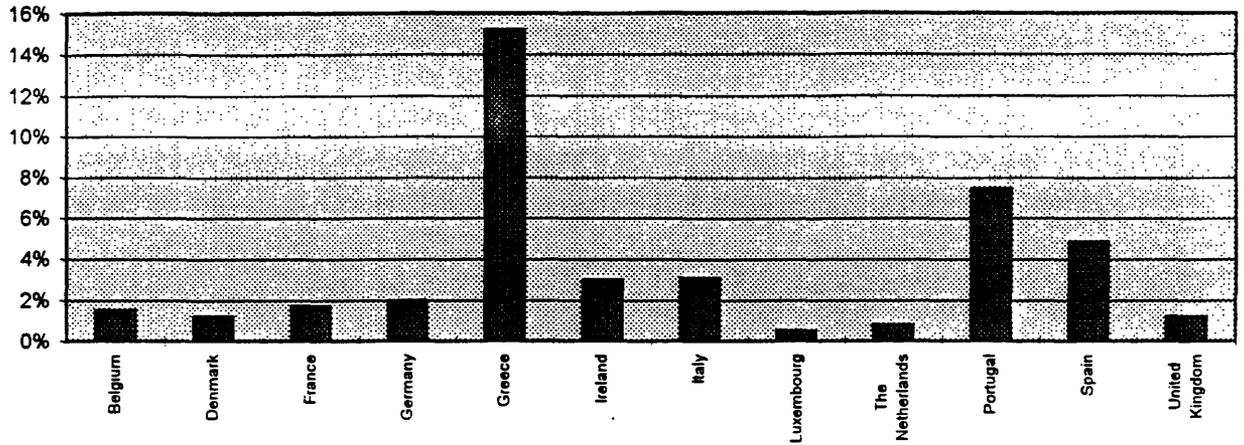
A recent report produced by Analysys for the Bangemann Group has attempted to estimate the cost of the USO³⁸. Whilst only limited details have been made available to us we understand that these estimates are derived from a calculation of the net cost of serving those customers whom it is uneconomic for the TO to serve. The net cost (revenue less cost) in this case takes into account the call revenues generated by users in addition to connection and rental revenues. In the absence of information to

³⁸ Analysys. Provision of Quantitative Data as Background Material for the Bangemann Group. Final Report, 18 May 1994.

the contrary, we assume that the costs in question are fully distributed costs. We are not in a position to comment on the quantitative and analytical techniques used to calculate these costs.

The Analysys research calculated the costs of USO as a percentage of turnover for each European country with the following results:

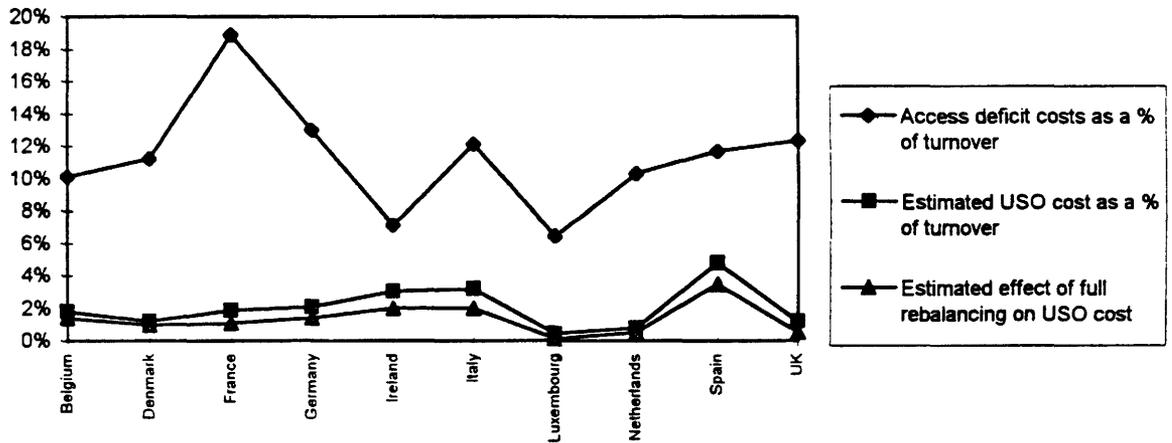
Graph 7.6A
Estimated USO cost as a % of turnover (based on 1992 data)



Source: Analysys, 1994

Analysys then projected the effect on the cost of USO of rebalancing tariffs in 10 Member States.

Graph 7.6B
USO costs and access deficit before and after rebalancing



Source: Analysys, 1994 (based on 1992 data)

Excluding Greece and Portugal, where networks are less well developed, the USO cost estimates ranged from 0.5% to 5% of revenue prior to rebalancing and 0.25% to 3.7% after rebalancing. In each case the highest figure is for Spain. These figures would obviously be dramatically further reduced if the avoidable cost rather than FDC were used.

Having examined the available data³⁹ on the cost of USO and other social requirements in advanced economies we conclude that any method based upon TOs cost and revenue records can produce a number of different answers. If, however, avoidable costs are used and incoming call revenues are taken into account, such costs shrink dramatically. It is probably more reliable to instead formulate the cost of USO by working from the opposite direction i.e. to calculate the number of subscribers requiring subsidy to connect to the network and multiply by the average subsidy required for each. The total sums expended are in any case typically well under 5% and often under 1% of revenues and would be expected to be much lower where calculated on an avoidable basis.

7.7 Funding of the Universal Service Obligation

In the past the cost of meeting USO has been met by implicit cross subsidies from other monopolist services. As telecommunications markets are liberalised incumbent operators will demand that such costs are more equitably shared amongst competing operators. Whilst the sharing of these costs may not be introduced automatically in an attempt to reduce barriers to entry and compensate for other asymmetries in the market in order to facilitate competitive market entry, it is likely that in the longer term, where such costs are material, they will need to be funded in a way that does not put an undue burden upon any operator.

One possibility for funding the costs of USOs is that they should be met out of general taxation, or taxation of the telecommunication sector specifically. Indeed there may be arguments strongly in favour of financing special service provisions such as phones for the elderly or handicapped from general taxation or as part of the

³⁹ See Appendix 5 for Cost data on the USO.

social security system e.g. in Ireland phones for the elderly are paid for by the government.

For those costs not met in this way that are of such magnitude that their asymmetric imposition on the incumbent or franchise holder described above would be inequitable there are some basic principles that should be followed for sharing them.

These should include:

- It is more important to put in place a mechanism for sharing the costs in a way that all operators accept as equitable than to establish the exact costs themselves.
- Any system should not be allowed to become so complex that the administrative costs are large relative to the actual costs involved.
- There is much to be said for a "rough justice" approach whereby each operator carries out some social requirements and bears the corresponding costs.
- Finally any mechanism by which operators are reimbursed for costs they have incurred should be devised so as to create a desirable set of incentives for all concerned. For example, all cost could be reduced by a certain percentage before reimbursement so as to provide an incentive to improve efficiency.

If the approach suggested in section 7.5 were adopted, then each TO would be responsible for identifying the avoidable net cost of "social" activities that it has been awarded, either through the competitive bidding (which process itself would identify any additional cost), or involuntarily. These costs could be vetted by the NRA for reasonableness, perhaps with industry participation. This should be done following the avoidable cost principle set out in section 7.6 above. Only then if a TO was bearing a total social cost that was disproportionate in the light of its competitive position and the goals of competition policy, would any cost sharing be invoked by the NRA.

It may be convenient to use interconnect agreements as the vehicle for income transfers which help to fund social obligations. However the relevant cost will not

generally vary in proportion to any dimension of interconnect, be it either capacity or call minutes, so it is not clear that they should be added onto any existing element of interconnect charges. Generally they may be better relegated to a separate item in the interconnect agreement in their own right, and therefore become more akin to a USO levy on the industry perhaps based upon revenue. These proposals are consistent with current work being done in the USA on a so-called "Net-Trans" system for universal service support⁴⁰.

⁴⁰. Noam, Eli M. NetTrans Accounts: Reforming the Financial Support System for Universal Service in Telecommunications (discussion draft) Columbia Institute for Tele-Information, November 1993.

KEY POINTS: SECTION 7

- Competition will not endanger USO if regulatory oversight ensures
 - price rebalancing is carried out at a reasonable rate
 - vulnerable subscribers receive targeted support.
- Competition will improve universal service because it will:
 - improve efficiency and reduce prices
 - foster innovation
 - generate market growth
 - create more revenue with which to fund genuine USO
 - encourage operators to compete for the provision of social services.
- The definition of USO evolves with development of the network. In most European countries the primary aim of the USO is now social.
- In developed countries, it is the exception rather than the rule that remote rural areas fall within the USO definition as the cost differential is often overstated and the revenues are very worthwhile (especially when incoming and outgoing calls are considered in the long run).
- USO and local access loss must be considered separately.
- The USO should be calculated on an avoidable cost basis and incorporate the net current annual cost for all lines which, prior to connection, the TO would choose, or have chosen, not to connect.
- The USO should be the responsibility of the NRA. Historically, the USO has been borne by the incumbent TO who has been responsible for interpreting the definition and assessing the costs.
- Social requirements of telecommunications operators present significant market and public relations opportunities. New entrants should have the opportunity to contribute to universal service policy in kind not in cash.

RECOMMENDATIONS: SECTION 7

- The NRAs in each Member State should be responsible for defining and identifying universal service obligation services and costing the universal service obligation.
- The following principles for sharing the provision and/or funding of universal service obligations should be used by the Member States:
 - the cost of universal service obligations should be calculated on an avoidable cost basis and incorporate the net current annual cost for all lines which, prior to connection, the TO would choose, or have chosen, not to connect.
 - the provision of universal service and/or the funding of the cost of universal service obligations should be encouraged to conform to the following framework:
 - i. TOs should be encouraged to provide "USO" services on a voluntary basis.
 - ii. Unfulfilled obligations should be offered for competitive tender by TOs.
 - iii. Residual obligations should be imposed by the NRAs upon those TOs best placed to meet them.
 - iv. Where an operator believes the unilateral imposition of universal service obligations upon it is unfair because the avoidable cost is incompatible with its status and competition policy objectives it could appeal to the NRA for shared funding.
 - v. After the NRA has vetted the avoidable cost calculated by the TOs they may agree to shared funding of the cost.
 - vi. Shared funding of universal service obligation costs should be by way of a levy on the industry in a competitively neutral manner and not included as part of the interconnect charge.

8. PROMOTING EFFICIENCY THROUGH INTERCONNECT CHARGES

8.1 Summary

This section discusses the way efficiency should be promoted in the determination of interconnect charges. In particular it deals with the evolution of interconnect charges over time. It examines the question of how best to encourage efficiency and looks at the links with other means to encourage efficiency and control costs and prices, including price-cap controls.

8.2 Types of Efficiency

There are many different and often overlapping definitions of economic efficiency. But, for the purposes of analysing the efficiency of interconnect charges, we consider the following three aspects to provide a complete and mutually exclusive set:

Static technical efficiency. This means that the operators which make up the telecommunications industry should, in combination, use network resources as efficiently as possible to provide any given volume of traffic. In particular, interconnect agreements should encourage efficient investment in network resources. They should discourage both inefficient entry into the market and unnecessary duplication of resources. Interconnect charges which are set too low will encourage inefficient entry by operators who will be able to make money, not because they are more efficient than the incumbent, but because they are subsidised through low interconnect charges. Interconnect charges which are set too high will discourage entry or lead to unnecessary duplication of resources. The new entrant will build its own facilities and the country will lose the economies of scale which could be achieved through the incumbent providing the same facilities and providing them to the new entrant.

Static allocative efficiency. This means that the telecommunications industry should act in such a way that the economy as a whole uses resources efficiently, not just in creating services but also in *consuming* them. Specifically this means that end-user prices should reflect costs of provision so that end-users will act in an economically efficient manner. This in turn means that interconnect charges should reflect the relative cost of providing the different interconnect services. The new entrant's cost

structure (of which interconnect charges are a major part) will then reflect the incumbent's cost of provision and the new entrant will have a strong incentive to reflect its costs in its end-user prices.

Dynamic efficiency. This means the industry increases its level of productivity (through use of new technologies and management procedures) and responds rapidly to market needs. As far as interconnect is concerned it involves setting interconnect conditions which do not constrain technical and market innovation and setting interconnect charges which give incentives to the incumbent to improve its efficiency.

8.3 Efficiency of the Incumbent TO

There is a strong body of evidence suggesting that many of Europe's TOs are not particularly efficient in their operations and that differing levels of efficiency are achieved across the Community. It is largely because of these perceived inefficiencies that Member States are considering the liberalisation and privatisation of their telecommunications sectors. There are three main reasons why liberalisation, and privatisation might help to improve TO efficiency.

- Competition can establish new levels of operational best practice leading to the provision of higher quality service at lower cost. This can put pressure on the incumbent TO to reduce its costs by modernising its network and support systems, re-engineering its business processes and streamlining work practices and employee numbers. Accordingly the technical efficiency of the incumbent will increase, and dynamic efficiency will be improved.
- Price rebalancing can help to remove historical discrepancies between tariffs and costs. This will improve allocative efficiency.
- Privatisation can ensure that the TO needs to account to its shareholders for the profitability which it achieves. Particularly if coupled with price control regulation, the effect of privatisation is to create further pressure within the TO to drive costs down and increase dynamic efficiency.

Compared with these measures, there is little scope for using interconnect charges directly to fuel improvements in TO efficiency. Interconnection with other operators

will have only a marginal impact on the incumbent's business for several years after liberalisation. The level and structure of interconnect charges will not therefore materially impact the TO's efficiency, at least in the short term.

However, if the interconnect charges are set so as to enable competition, then they will have a major indirect influence on the efficiency of the incumbent TO. Conversely, if interconnect charges are set in a manner which discourages competition, then they will indirectly have contributed to the continuation of TO inefficiency. The vital point is that interconnect charges should be set to facilitate competition. In section 4.4.6 we concluded that marginal or incremental concepts of cost are the relevant starting point for pricing decisions.

8.4 Efficient Market Entry

If interconnection charges are set to facilitate competition there is a risk that this could lead to inefficient market entry. By this we mean entry into the market that will lead to higher overall costs in the long term, for example, where new entrants are subsidised in order to enter a market which does not offer an economically sustainable business. If they are, there will be a loss of static technical efficiency which, if prolonged and taken to an extreme, could outweigh the benefits achieved from liberalisation.

This is certainly a danger when the interconnect charge is set equal to any marginal or incremental concept of cost (such as one based upon LRIC) to encourage market entry, particularly for telecommunications networks where:

- There is a large component of residual common costs, i.e. costs which are incurred to support a number of different functions. This means that the incremental cost to support one activity may be greatly reduced (and may even be zero) because some of the costs have already been incurred to support another activity. For example, incremental long distance calls require the existence of local loops, but the capital cost of those loops are likely to have been incurred already (to support network access), and are not truly incremental to the provision of additional long distance calls.
- There is a large component of fixed costs, i.e. costs which do not vary with the number of calls on the network. Indeed, most networks could handle a 20-

30% increase in traffic without any noticeable degradation of service. Does this mean that the incremental cost of these additional calls is zero? It all depends on the size of the increment, and how long is "long run".

As documented in section 4.4.6 above, to encourage only "efficient" market entry, interconnect charges should account for more than the directly attributable incremental costs of interconnect calls. They should contribute a proportion to all residual joint and common costs, even where those costs are already sunk; and they should be calculated over a reasonably large increment and long time-frame. On the other hand, regulators could well argue that the dangers of inefficient market entry are small compared with the benefits of enhancing the efficiency of the incumbent TO through competition. In this argument, it is desirable to use another form of incremental costing, as indeed was done in Australia when Austel based interconnect charges on directly attributable incremental costs.

Inefficient market entry could also result from cross subsidies within existing telephone tariffs. As discussed in section 5.6 in virtually every Member State there is a cross subsidy where usage (particularly long distance and international calls) funds access. We have called this the local access loss. If this loss is not factored into the interconnect charges, there is a danger of encouraging market entry for long distance services which is merely arbitrage (i.e. it is an artificial business, viable only because of the cross subsidy to support the local access loss).

The most efficient means of dealing with this situation is for tariffs to be rebalanced to remove the local access loss. This would enable prices to reflect the real costs of provision, and thus encourage use of the telephone network only where it is cost effective to do so. The only economic argument against this cost orientated tariff, is that high access prices might discourage new network subscriptions and thus reduce the number of people any individual telephone user is able to contact. This effectively reduces the overall economic benefit of the telephone service. The balance between these two arguments depends on the level of penetration of the national telephone network. As discussed in section 7 in most Member States penetration is already high, and it would seem likely that the local access loss is not serving any useful economic or social purpose. It would be much more preferable to allow tariff rebalancing, with safeguards to ensure that there is no "market shock" and that vulnerable subscriber groups receive targeted attention and safeguards.

If, however, tariff rebalancing to eliminate the local access loss is not possible, or where it is possible only over a protracted period, it will be necessary to build a contribution to local access loss into the interconnect charge. We will examine this further in section 9.

8.5 Charging Method

There are three principal methods of charging for interconnect services. Prices may be based on:

- retail tariffs;
- the costs per call minute;
- the cost of interconnect capacity.

If the prices are based on retail tariffs, economic efficiency will be possible only to the extent that retail tariffs reflect the underlying costs of provision. Even if this is achieved, there is likely to be an inefficiency created by the tie created between the tariffing schemes of the incumbent and the new entrant. Because interconnect charges represent a large proportion of the new entrant's cost base then, if they are based on the incumbent's tariffs, the new entrant is severely restricted in its ability to offer innovative tariffing schemes, and "me too" pricing and service offerings will result. This will create some dynamic inefficiency in the market.

If the prices are based on costs, the "pure" charging method would be to relate the interconnect price to the network capacity used, since this reflects the real cost causation. However, the use of capacity charging tends to work against the new entrant, since it has to pay a fixed charge in advance of usage. Most new entrants would prefer an interconnect price based on calling levels, which will allow them to pay for interconnect only after calls have been made and paid for by its customers. Perhaps the most economically efficient arrangement is to give the new entrant the choice of either a capacity or a per-call minute cost-related interconnect charge.

Capacity based charging is not currently adopted in any European TO, although the time of day gradients in retail tariffs and interconnect charges are developed in recognition of the different values placed upon capacity at different times of the day.

In the UK Mercury Communications Limited has applied to get the courts to reinterpret BT's licence condition as encompassing capacity based charging. The practicality of charges based on capacity is not yet certain but a number of countries are investigating the approach.

8.6 Unbundling

For the new entrant there are a number of trade-offs to be considered when considering an interconnect arrangement. For example, they have to determine whether to operate a few large points of interconnect (and thus cut down on their own costs) or to run many smaller ones nearer to end users (and thus cut down on interconnect payments). Under these many different arrangements they may be required to pay for many different cost items. The question then arises to what extent is it worth separately identifying and charging for each alternative interconnect arrangement?

As discussed in section 6 above it is fundamental to unbundle interconnect services if charges are to be cost orientated due to the different economics of network elements deployed in the provision of various interconnect services.

To facilitate interconnect in the UK, Oftel has instructed BT to unbundle its costs and produce a comprehensive list of possible interconnect charges, depending on where and how interconnect is made to the BT network. This certainly increases the choice of new entrants, but it has resulted in considerable work for BT and Oftel, which will have to be regularly updated. Whether all this effort has actually been worthwhile will only be apparent in a few years time. The problem is that, even with comprehensive audit mechanisms in place, it is difficult to prevent operators allocating costs in a "supportable" but anti-competitive manner. Intuitively it only requires the smallest of percentage improvements in the competitive situation to outweigh the expenses of designing and operating the system. Cost accounting systems are expensive; but these costs are negligible when compared with the benefits of creating an efficient telecommunications industry.

8.7 Ensuring Efficiency in The Future

We have argued that efficient interconnect prices need to balance the need to increase the efficiency of the incumbent TO with the requirement only to encourage sustainable market entry. This balance needs to change over time, and it will do so differently depending on the costing approach used in determining the initial interconnect prices.

The use of marginal or incremental cost based interconnect charging tends to achieve efficiency in the incumbent but may result in inefficient market entry. It may provide a good starting point for interconnect prices, but if this approach is to be adopted it is important that an increasing component of the common (overhead) costs (i.e. the common cost contribution) is added to the incremental costs each year to ensure that the new entrants are adding to the overall efficiency of the market.

The use of FDC will help to guard against inefficient market entry, but it may well prevent competitive market entry and will tend to reduce the competitive pressure on the incumbent and thus may not encourage improvements in its efficiency. In this case it is important that there is downward pressure on FDC based interconnect prices and thus on the incumbent's cost base. It seems likely that some form of price-cap should be used, particularly if it is being used also on retail tariffs.

8.8 Efficient Interconnect Charges and Structural Asymmetries

The dominant TO in all countries will have certain structural advantages in their own countries. As a result of this, competitive new entrants will be burdened with severe disadvantages within the market place which require them to incur extra cost, and provide extra incentives to attract customers. These structural asymmetries may not persist in the long term, but in the short term efficient interconnect charges will only be achieved if they take account of such factors.

During the consultative process on interconnection in the UK throughout 1993 and early 1994 a number of structural advantages were highlighted that BT enjoyed over competing operators. These covered such issues as:

- The lack of free ownership of numbers

- The lack of number portability
- The dominant provider's preferential access to valuable commercial information about telecommunication users
- Preferential customer switch access to the incumbents network
- Incumbents control over changes to technical interconnect

If interconnect charges are then to be based upon the cost of service provided inherent in the incumbent's organisation, efficiency will only be attained if the NRA ensures that the services which competing new entrants are buying are the same as those enjoyed by the incumbent. To this end, where the incumbent enjoys some of the structural advantages outlined above it is clear that the interconnect services they receive are of more value than those which are made available to the new entrants. One practical way to offset such structural advantages is to give the competing new entrants temporary abatements of interconnect charges, expressed in terms of a percentage of the charges paid by the incumbent for the interconnect capabilities it receives. This was the approach adopted in the US after the initial divestiture of AT&T.

Through time the abatement should be reduced to reflect the symmetry between the interconnection services enjoyed both by the incumbent and new entrants. Only in this way would the incumbent operators in each Member State be encouraged to make available symmetrical interconnection services. However the "relief" of new entrants for such structural asymmetries through the interconnect charge does not ensure economically efficient outcomes. This will only be attained if the asymmetries are removed.

KEY POINTS: SECTION 8

- There are 3 types of efficiency to consider:
 - Static technical efficiency - i.e. efficiency in the use of network resources;
 - Static allocative efficiency - i.e. efficiency of resource use by the economy as a whole;
 - Dynamic efficiency - i.e. the efficiency with which the industry responds to market needs.

- Liberalisation will improve efficiency through:
 - competition encouraging use of best practices and pressuring costs;
 - rebalancing improving allocative efficiency;
 - accounting to shareholders.

- No one charging method provides the ideal solution. There is a trade-off between low charges that encourage efficiency in the incumbent operator and ensuring that there is no inefficient market entry based upon short term arbitrage opportunities.

- Where a marginal concept of cost is used this will ensure TO efficiency but may result in inefficient market entry. Therefore charges should be set at MC/IC plus a contribution to the residual joint and common costs.

- Where FDC is used to set prices, downward pressure should be exerted on the interconnect charge to encourage TO efficiency (e.g. through the application of a price-cap).

- The structural advantages inherent in the incumbent should be offset by abatement of interconnect charges expressed in terms of a percentage of the charges paid by the incumbent for the interconnect capabilities it receives. This should then be reduced through time to reflect increasing symmetry between the new entrant and the incumbent.

RECOMMENDATIONS: SECTION 8

- Interconnect charges should be set so as to facilitate competition which will then encourage efficiency.
- Where Incremental Cost concepts are used in interconnect pricing, charges should be set above the incremental cost to ensure a contribution to the residual joint and common costs of the interconnected operator.
- Where Fully Distributed Costing is used to set interconnect charges, downward pressure should be exerted on the interconnect charge to encourage TO efficiency. For example, through the application of a price-cap.
- Interconnect charges should be based upon the cost of unbundled network elements.
- The structural advantages enjoyed by the incumbent should be offset by abatement of interconnect charges. Abatements may then be reduced through time to reflect the increasing symmetry between the new entrant and the incumbent.
- The industry needs to investigate the practicality of implementing charges based on capacity.
- New entrants should then be offered the choice of either a capacity or a per-call minute cost related interconnect charge.

9. COST ACCOUNTING PRACTICES TO SUPPORT AN EFFICIENT SCHEME OF INTERCONNECT CHARGES

9.1 Introduction

In this section we draw on the analysis and findings of the previous sections in order to identify the cost accounting practices that should be adopted to support an efficient scheme of interconnect charges. In doing this we focus on the Commission's requirement that such a scheme should be **practical, implementable and consistent with existing national practices**. This section seeks to highlight the key issues and provide broad guidelines and principles to form the basis for future development and progress.

9.2 Background

From the analysis produced in section 6 it should be clear that there is no interconnect regime in existence that provides *the right way* to formulate and establish interconnect charges. Different interconnect regimes reflect different industry structures and the political and social objectives of these jurisdictions.

Interconnect regimes develop as the market develops. This can be seen from a review of the interconnection framework adopted in the US both prior to and since divestiture of AT&T in 1984 to the current date. Similarly in the UK "Issues concerning interconnection have been brought sharply into focus by the Government's decision in 1991 to end the duopoly in wirelines and to open the UK telecommunications market to greater competition"⁴¹. This however does not deny the existence of an interconnect requirement for Mercury Communication Ltd and BT in the UK for the preceding seven years, but one can only presume it was achieved without such a "sharp focus".

⁴¹ Oftel. Consultative Document issued by the Director General of Telecommunications. Interconnection and Accounting Separation. The Office of Telecommunications, June 1993.

Interconnect regimes will never achieve the economically optimal solution, but instead should be constructed to facilitate competitive market entry and thus obtain the benefits of liberalisation in a way that meets national political and social objectives, whilst striking a balance between the interests of incumbents and new entrants, to the benefit of consumers. Therefore whilst it is possible to evaluate the different approaches theoretically, approaches adopted in practice will be sub-optimal, but workable compromises.

At a European level what we can hope to achieve is to suggest principles that should be followed in establishing cost orientated interconnect charges that benefit from the experience of countries which have already been through this process and avoid some of the pitfalls they experienced. Furthermore, we can hope to promote principles that are broad enough to have application across all the Member States despite their diverse industrial organisations, political and social objectives. It is however important to re-emphasise that this is a complex area, and one without an easy solution, as Oftel in the UK have experienced over the last 18 months.

9.3 Appropriate Costs for Setting Interconnect Charges

Section 4.4 examined different cost standards. The cost standard that should be adopted for all pricing decisions in all organisations is one based upon long run costs. If this is not the case the organisation will not recover all of its costs and will not be financially viable, and hence will be forced to exit the market. Whilst conceptually attractive, long run costs are difficult to use in the real world because they are extremely difficult to identify, particularly in network industries such as telecommunications. The cost accounting systems usually adopted by these organisations are based on variants of the FDC standard and as a result rarely provide all the necessary information.

The calculation of long run costs for some business activities is relatively straightforward, but in TOs it is dependent upon a number of complex factors such as the physical environment and technology chosen. Furthermore, it depends upon the accounting policies, particularly projected asset lives adopted by TO management. This is a particular problem in TOs given the high capital intensity and level of technical change in the industry. Since one of the primary regulatory tools is ensuring a cost justification for tariffs and interconnect charges, there is an

incentive for management to choose conservative accounting policies to reduce risk, particularly of network investment.

Theory suggest that this is not a problem in competitive markets in which vigorous competition ensures the right kinds of decisions are taken regarding accounting policies, depreciation policies and fixed asset investments. However this is not true in monopoly markets where the regulator, and even TO management, often do not know the "real" underlying costs of service provision, and one can see why the latter may not want to know.

As discussed in section 4 if a regulator wants to determine costs to ensure that prices reflect them he essentially has two methods. The first is to perform independent cost studies, which can either be based upon historical cost accounts, or alternatively can use an engineering cost study approach. The second is to prescribe to the regulated firm what cost accounting standards should be adopted and to ensure that these are designed to reveal the elusive "real" underlying costs - or approximate them as close as possible.

The latter approach of endogenous cost based regulation was originally adopted in the USA by the FCC but elsewhere regulators have adopted an exogenous, index based price-cap approach. However, this still requires that at the time of setting or resetting price-caps regulators need to understand the "real" costs.

The information asymmetry between regulator and TO, therefore presents some real problems in setting the principles for determining the appropriate costs for pricing any telecommunication service, including interconnect.

Setting the accounting principles for cost orientated interconnect charges is not a straightforward matter and the regulator needs to put them in the context of broader social and political objectives.

9.4 Historical or Forward Looking Costs

As noted in 9.3 the only cost standard relevant for pricing decisions is one based upon the long run, and theory suggests that economic efficiency is achieved if prices are set based upon a marginal or incremental concept of cost. Following economic

theory would lead one to adopt a forward looking concept of incremental cost as historical sunk costs are irrelevant for achieving conditions of economic efficiency.

One can therefore suggest that unbundled interconnect costs should be calculated using forward looking long run costs. Prices could then be set to provide a margin over the forward looking long run costs such that across all services this margin is adequate for the TOs to remain financially viable. In competitive commercial organisations prices are not set based on cost alone but based on market forces. However, in considering costs the relevant costs are forward looking, but approximations of varying accuracy to the forward looking costs are often made employing historical cost information. Whilst not always the case this is because the cost of obtaining reliable forward looking cost information often outweighs the resulting benefits. In any case many pricing decisions do take account of historical costs to ensure that product and service prices recover the organisation's legitimate historical expenditure to achieve profitable reported results.

Competitive markets stimulate the development of new management tools for success in the competitive arena. As competition becomes more intense the costs of not understanding forward looking costs will outweigh the costs saved by using "rough historical approximations". It is only the forces of competition that will drive TO management to develop the myriad of management tools they need to survive, such as a more sophisticated understanding of their customers and the segment and service line contributions achieved. It is the requirement to have these tools that will drive organisations to understand and manage their costs in a way that gets closer to the economically efficient ideals. It is our belief that regulatory demands will never be able to deliver these responses in the way that a competitive marketplace can.

From the results of our field interviews summarised in section 5 it can be seen that it is in the more competitive market places, such as the UK, where the incumbent and new entrants are developing a much better understanding of their cost bases, and employing activity-based management techniques and incremental concepts of costs in pricing and management decisions. This can also be seen in the liberalised US market place. Even in relatively unliberalised environments many dominant

European TOs have seen the competition arriving and are acknowledging the need for different cost information systems to manage their business⁴².

It is interesting to examine why regulators invariably do not enforce interconnect charges based upon forward looking cost standards. Firstly most of the European TOs do not have cost systems that allow them to produce this information in a robust manner. As competition develops they will be forced to ascertain this information, but if it was purely a regulatory requirement their incentives to produce robust forward looking cost estimates without any distortion would be uncertain. The only remaining solution would be for the NRA to produce independent engineering cost studies of the forward looking cost of interconnect services. This would probably be impossible to achieve because of the asymmetry of information between the TO and the NRA, and would likely still result in a sub-optimal result. Further, even if forward looking costs were developed they would undoubtedly meet with criticisms from unconvinced competitors. The lack of transparency between the underlying costs and charges would make the regime difficult to defend. Further they are subjective and therefore incapable of audit. Obviously this would be different if incremental cost based interconnect charges were set before the introduction of the competitors - as was the case in Australia.

The conclusion that we can draw from the above is that in the interests of expediency interconnect charges in a practical setting should be set by the NRA based upon historical rather than forward looking costs. Whilst the latter undoubtedly have a sounder theoretical basis i.e. interconnect charges like all prices should be set based upon LRIC plus a margin, the use of historical costs has two advantages - they are available more easily than forward looking costs, and they can be reconciled to audited accounts which ensures the recovery of legitimate expenditure actually incurred. Whilst not theoretically pure in the short term this will allow interconnect terms to be set in advance in a transparent manner which will be an "enabler" for market entry and therefore competition. Following liberalisation, as the interconnect market becomes competitive interconnect charges will of commercial necessity be

⁴² Meeting the challenges of competitive market places requires more than simply acknowledging them. It requires alterations in business strategies, methods and management perspective. As European TOs restructure their business agendas away from government direction and regulatory commands towards the economic forces of supply and demand and creating real customer value, they will face a new business agenda. This new agenda requires new management tools.

driven to reflect the forward looking costs. However, safeguards are necessary. If the historical cost base includes costs that arise from inefficient operation these need to be carefully dealt with to ensure that the regime does not allow or facilitate their continuance (see below)⁴³.

9.5 Incremental Vs Fully Distributed Costs

Having discussed whether forward looking or historical costs should be used it is now necessary to determine whether an incremental or fully distributed cost approach should be taken.

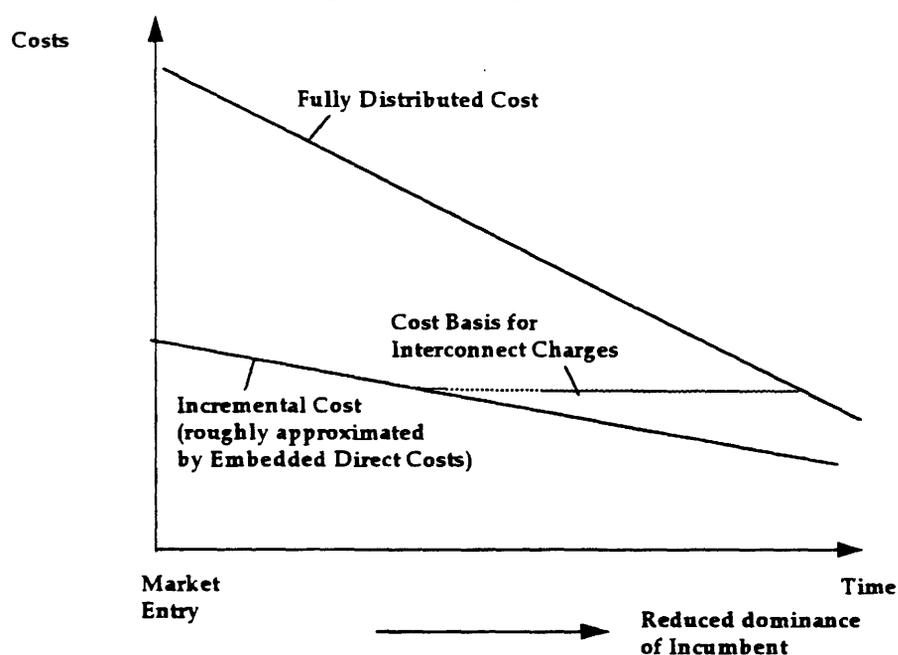
Whilst not an economically pure substitute for forward looking incremental costs an Embedded Direct Cost approach can be used as a rough approximation of incremental costs. Whilst this does not overcome criticisms relating to changing technologies and inefficient operations, the application of rigorous cost causal principles including Activity-Based Costing techniques for cost attribution can be adopted to get a workable substitute for incremental cost. This is often employed in incremental cost studies when the difficulties of gathering true forward looking cost information are prohibitive.

Efficient resource allocation is achieved if prices are based upon incremental cost. However, it is clear that in industries where economies of scope and scale are present incremental costs will always be below the fully distributed cost. Therefore prices need to be set above the incremental cost for an organisation to achieve a margin that makes a contribution to residual joint and common costs and hence allows the organisation to remain financially viable in the long term. For a regulator trying to set principles for the cost basis of interconnect charges this gives rise to a "a trade-off". If charges are set based upon incremental cost the incumbent will complain that this does not permit them to recover all their costs and encourages inefficient market entry based upon arbitrage opportunities. If charges are based upon fully distributed costs this may provide barriers to entry to competitors and not encourage efficient resource allocation.

⁴³ This is not to deny that in understanding the relative contributions which services and customers make to the organisation it is imperative for management to develop an understanding of forward looking costs.

From the arguments presented in section 8 it is clear that in the early stages of liberalisation the contribution to total revenue from interconnect services is likely to be small for the incumbent TO, but their cost to competitive new entrants is likely to be the single most important determinant to their viability. A workable compromise that encourages market entry and competition and also puts incentives on the incumbent to reduce costs through increased efficiency may be to set interconnect charges based on costs below fully distributed costs. Thus there is a theoretical basis for setting interconnect charges based upon incremental costs when first introducing competition and then migrating towards charges based on fully allocated costs as competition develops. Ultimately, in a competitive market the difference between the FDC and LRIC plus premium/margin will be small. A rough approximation to the incremental cost can be found using an embedded direct cost approach. Because this uses the historical information from the incumbent operators audited FDC costing system it will allow interconnect charges to be determined in advance and provide transparency in the relationship between costs and charges. Whilst not the most theoretically sound basis this will facilitate efficiency in the long term by permitting market entry and therefore put pressure on costs such that in the long term charges reflect the true underlying costs of service provision. Initial interconnection at below fully distributed cost will put pressure on incumbents to become more efficient and redress any structural imbalances in the interconnect regime such as unequal access etc.

Development of charges over time



Source: Ovum, Interconnect: the key to effective competition. October 1994

The margin above EDC to be applied in the early stages of liberalisation should be established through negotiation between the interconnecting parties. Where this does not give rise to agreement the NRA should determine the appropriate margin.

9.6 Formulation of Interconnect Charges

Having established the cost standards to be utilised it is now necessary to turn our attention to the formulation of interconnect charges. As mentioned in section 6.4 interconnect charges can be divided into four distinct elements. Two relating to the provision of interconnect services, the Connection Charge and the Conveyance Charge, and two that arise from the policy decision to use interconnect charges as the mechanism for compensating for regulatory imposed distortion in the retail market, the Local Access Loss Charge and the USO Charge. We discuss these further below. Another aspect which needs to be considered in the formulation of interconnect charges is the level of unbundling of network elements. As discussed in section 6.5, operators would like to be able to choose from a "menu" those elements of interconnection which are most suitable for their own business case.

9.6.1 *Connection Charge*

Of the four interconnect charge components this is perhaps the most straightforward to deal with. This is because they are likely to be the most easily identified and agreed costs by the interconnecting parties, and are primarily capital costs that can be easily identified in a causal manner to the act of interconnection. They are also perhaps the least significant costs.

The costs that should be recovered through the charge should reflect the directly attributable costs of connecting the two systems. Most of these are likely to be incremental in nature and thus have a sound economic justification for their use. Some element of the total cost claimed may however arise from an allocation of costs previously incurred by one of the existing operators e.g. costs of co-location space, and these should be attributed to the two operators in a manner which is equitable and agreed by negotiation. Particularly in relation to these historical costs one should ensure that they reflect efficient provision of service. The total connection costs should be shared between the interconnecting operators as the existence of the interconnect will by definition benefit both parties, with call traffic passing in both directions. It would seem equitable that the split is negotiated in a manner which

reflects the relative volumes of traffic passing in each direction through the point of interconnection.

The charges should be "one-off" reflecting the non traffic sensitive nature of the costs, although a mixture of up front payments and periodic fixed rentals may be agreed.

9.6.2 *Conveyance Charge*

Of the four components of interconnect charges the conveyance costs are likely to dominate almost exclusively. The costs should be calculated for unbundled network elements, because to do otherwise would not permit cost orientated charges for the reasons explained in 6.5 above. Conveyance costs cover:

- the use of the physical connection between the two networks to permit the transfer of calls from one network to another;
- the usage cost incurred where one operator utilises another operator's interconnected network to handle a call e.g. the provision of sufficient capacity for switching, transmission and other network components;
- the variable supplementary and ancillary costs, such as call set up, monitoring and recording network activity, billing etc;
- the overhead costs associated with the provision of interconnect services.

The costs and therefore the charges will have a number of elements reflecting a combination of fixed Non Traffic Sensitive (NTS) costs and variable Traffic Sensitive (TS) costs and also distance and non distance sensitive costs. The costs should be separately calculated for each unbundled network element, and should be split into those that are NTS and those that are TS.

9.6.3 *Local Access Loss Charge*

The local access loss arising from tariff imbalances is one component of the interconnect regime which has given rise to problems in all jurisdictions with wireline interconnection.

There is widespread agreement that for an economically efficient outcome and a less problematic interconnect regime the local access loss is best dealt with by removing any restrictions upon operators from rebalancing their tariffs provided USO goals are met by targeted subsidies (see section 9.6.4 below). Given the current stage of network development and that anticipated at the time of liberalisation in each Member State, NRAs should consider allowing operators to rebalance their tariffs to eliminate the local access loss.

It is understandable that with the potential threat that infrastructure competition in the local loop from cable TV companies and wireless based operators may pose, many incumbent TOs do not find it attractive to lobby NRAs to lift the restrictions on rebalancing. This would lead to price increases in markets where the threat of competition from lower priced providers is becoming a real possibility. Understandably they seek to fund below cost residential access prices through shared funding of the local access loss.

Accordingly, one could suggest that the "book" cost of the incumbent TO's investments in their local loops are stated above their economic value, and that therefore they should be written down to allow a reasonable return to be made on providing access without rebalancing^{44 45}.

Whilst either rebalancing or the write-down of local loop investments would allow cost orientated residential access prices in the local loop and therefore an efficient economic outcome, there is a risk that this will not be achieved in each Member State prior to liberalisation. If this is the case the incumbent operator will argue that they are at a cost disadvantage to new entrants, and will seek to share the local access loss with competitors, usually by adding an extra component to the interconnect charge. Such is the logic of the UK Access Deficit Charge regime and similar principles employed in Australia and the USA. We will examine the cost principles that should be followed in calculating these charges between operators designed to share the local access loss.

⁴⁴ Warburg S.G "From Pots to Pans" - The Experience of Real Competition in UK Telecoms. March 1994.

⁴⁵ US West and AT&T have both recently made significant write downs of their equipment as a result of outdated technology etc... This is also true in other privatised and liberalised US utility companies.

One of the most significant problems is agreeing the size of the local access loss. New entrants perceive a risk that the incumbent operator will claim more costs are incurred in the provision of local access than is in fact the case. It is therefore necessary for the NRA together with the industry to expose the incumbents calculation and quantification of the local access loss to scrutiny to establish its size. Incumbents presumably would be unable to object that this breaches commercial confidentiality if the problem only arises because these are monopoly assets. It should be calculated on the cost principles established above. New entrants should then contribute in a competitively neutral manner, but a number of principles could be followed:

- There should be only partial funding of the local access loss. This will incentivise the incumbent to improve efficiency in the provision of local access.
- There should be a fixed contribution for use of the local access network based on the principle of cost causality. Contributions based upon traffic destination result in higher contributions for long distance traffic which reduces competition in the long distance market and penalises certain subscriber groups unfairly.
- Unless local access loss charges are to be waived to encourage competitive market entry until access prices are brought into line with costs by either rebalancing or asset write downs, they should be introduced immediately. Suspending payments initially, as Oftel have done in the UK, makes transition arrangements more difficult particularly after any duopoly period and will stifle the development of competition in local access.

Recovery of local access losses should not be added onto any existing elements of interconnect charges as the relevant costs will not vary in proportion to interconnect call minutes or capacity. They would be better relegated to a separate item in the interconnect agreement, and recovered in a competitively neutral manner, perhaps a levy based on usage of the local access network.

9.6.4 *Universal Service Obligation Charge*

As explained in section 7 the most satisfactory result may be achieved if USOs are allocated to those organisations best placed to achieve them once voluntary or

competitive applications for the provision of such services have been taken into account. Only if a TO can then demonstrate that the avoidable cost is inequitable given its size should the NRA consider the TO's request to share its funding by way of a levy on other operators.

In the rare circumstance that funding is shared the costs should not, however, be added onto any existing element of interconnect charges as the relevant costs will not generally vary in proportion to any dimension of interconnect, be it either capacity or call minutes. Generally they may also be better relegated to a separate item in the interconnect agreement in their own right, and therefore become more akin to a USO levy on the industry.

9.7 The Isolation of Inefficiency

As noted in section 4.4 even where the arbitrariness of cost allocations and attributions are reduced with the rigorous employment of cost causal attribution and allocation methodologies such as Activity-Based Costing techniques there is still one unresolved potential problem with historical cost approaches such as FDC and EDC based prices. They are both historical approaches that attribute cost based upon the actual historical network engineering capacity together with the actual business processes of the organisation, and therefore the resulting costs reflect historical traffic patterns and performance of the organisation.

If there are inefficiencies reflected in the historical analysis there is a danger these will be encouraged to continue. For example, many of Europe TOs are descended from state controlled organisations and at the time of becoming independent their employees were given protected employment and pension rights in line with their former government employee colleagues. Now and in the future, this is likely to place a burden on the TOs as more costs are incurred to support a higher than optimal employee base, often at less than efficient costs. The same inefficiencies result if the TO employs more expensive, outdated technology in its network design.

A strict application of FDC principles would see these costs allocated to services, including interconnect services. Whilst the higher prices and charges resulting would be a recovery of legitimate past expenditure they clearly do not promote an efficient economic outcome.

Through the strict application of Activity-Based Costing such costs should become more readily highlighted and benchmarking between European TOs will greatly assist in their identification. For example, Activity-Based Costing will not therefore allocate them to services but they will remain as residual joint costs. Once identified and costed they should be grouped as part of the residual common costs. As with all other residual joint and common costs they will be recovered from the contribution each service makes above its EDC. If interconnect charges are initially set at below FDC, this will provide incentives for the TO together with the NRA to remove these inefficiencies, even if it includes amendment to employment contracts, the law, and reorganisation costs or the write-off of overvalued network plant as has been seen in the USA.

One thing is clear however, until work is done to highlight the costs of such inefficiencies, the incentive to reduce them will be negligible. Sensible network planning which has resulted in efficient surplus capacity to ensure the resilience of the network should not be confused with inefficiency. Only where it is felt appropriate by the NRA should the costs of inefficiencies be shared.

There are a number of other potential inefficiencies that arise from an historical approach but TOs will be incentivised to reduce them because of the competitive entry of other organisations.

9.8 Consistency and Comparability

The service costs arising from any FDC or EDC approach will obviously be affected by the accounting policies and their detailed application by Community operators. The results of the empirical research outlined in section 5 above suggests that despite the attempts at harmonisation of accounting policies within the Community, there is still significant cross-border difference between the accounting treatment and practices adopted across the Member States.

Each of these differences would therefore result in the determination of potentially very different service costs from the same original cost data. Accordingly, if prices are cost orientated the selection of accounting policies and practices could influence prices dramatically. This is relevant because different operators may compete on cost orientated prices that are very different despite the same, or very similar underlying costs.

Just as a Community wide solution to the range of possible outcomes that can result from differing cost attribution and allocation bases would be advisable, the same can be said of the need to limit variability arising from accounting policy selection and application.

9.9 Cost Allocation Methodologies

Cost allocation methodologies are most familiar in manufacturing organisations which need to fully allocate or "absorb" the costs of an organisation on a per unit basis for stock valuation and financial reporting. In a classical example an organisation will have a number of direct productive input costs, e.g. direct labour costs, direct material costs as well as joint and common costs, such as indirect labour, factory overhead costs etc.

Early attempts to allocate these overheads to production units sought to allocate the joint and common costs on a cost causative basis, and in the example above this may have been achieved on the basis of machine hours, direct labour costs, direct labour hours etc., depending upon what data was available and which measure was thought to be the main driver that gave rise to the consumption of these and other resources. This was acceptable at the time and was probably performed to a level of detail for which the benefits exceeded the costs of analysis. This does not mean that other, equally justifiable allocations could not have been made, each of which may have produced a materially different answer.

Unfortunately, not until the last 10-20 years has management accounting theory kept pace with the changing requirements of the more sophisticated production and service provisioning practices of today's organisations. This is particularly true of TOs. In manufacturing organisations the direct costs of production might be in excess of 80%, requiring less than 20% of costs to be allocated. In a TO however the position is reversed, with frequently less than 20% of costs being capable of direct identification with a service. The majority of a TOs costs are joint or common in nature, hence the issue of cost attribution and allocation for TOs in developing the cost of individual network elements and services is fundamental. This has started to be addressed with the introduction of Activity-Based Costing (ABC). This requires the accountant to better understand the processes that drive costs in an organisation, and the activities that "consume" such costs. This concept is explained more fully in section 9.10.

Many commentators, think of cost allocation as it relates to the "arbitrary" allocation of joint and residual common costs. However it is worth noting that while the majority of costs in a TO are common costs, many of these can be causally attributed to different services either directly or indirectly. Given the extent of these costs and the subjectivity that can be exercised in their "causal attribution" it is important to understand the range of different attribution or allocation methods that could be employed.

It is first beneficial to understand the process of calculating the cost of individual network elements and services before examining the methods of cost allocation utilised.

There are two main stages to this process, the first is the capture of cost data and collection into cost pools and the second the attribution and allocation of those costs into service costs. The following commentary demonstrates this two stage process of getting from cost categories through to service cost statements in an FDC based accounting system.

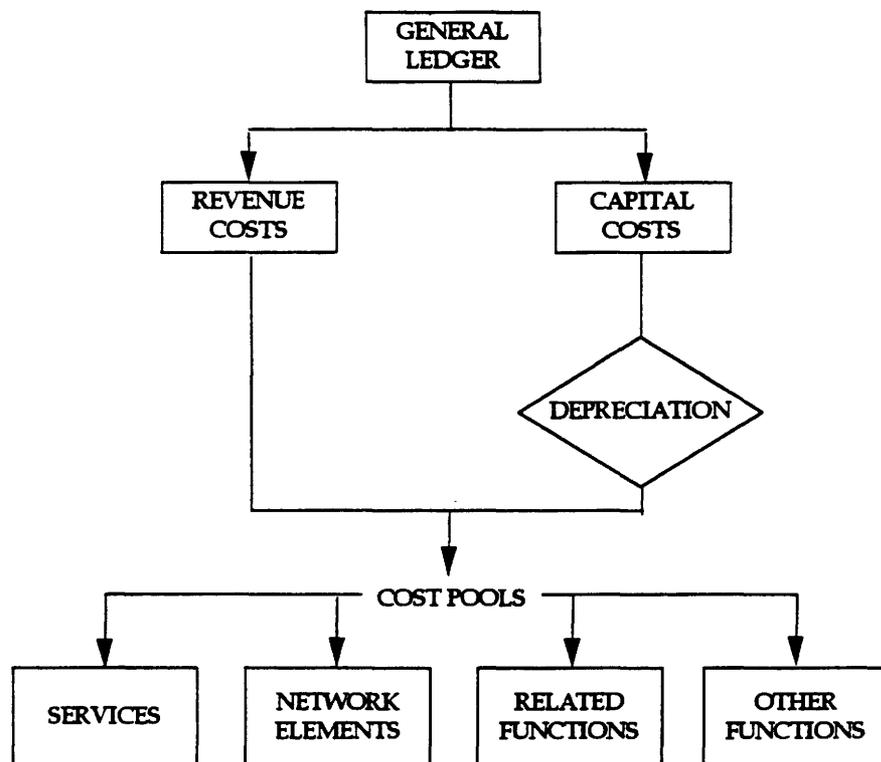
A similar process would apply to accounting systems based on other cost standards but the source of the cost information may not then be the general ledger, but could alternatively be derived from forward looking cost estimates.

Stage I

The first step in any costing system is to capture the cost data. In traditional financial reporting systems this will be via the general ledger. Other costing systems for financial planning may have other sources. However regardless of the source, a key factor which will influence the ultimate usefulness of the costing information is the level of detail at which costs are initially captured. If information is collected at a very high level, then the amount of cost which is subject to direct or indirect attribution or arbitrary allocation is likely to be significantly higher. For example, if the cost of network maintenance is collected as one amount, then it may be necessary to allocate it on some arbitrary basis such as the cost of the plant being maintained. However, if maintenance staff are required to complete timesheets detailing where their time has been spent, then their payroll cost can be directly allocated to the services or network elements on which their maintenance time was spent.

The costs collected in the chart of accounts or general ledger will then be identified as either revenue or capital costs. Revenue costs are those which relate solely to the period covered by the cost statement. Capital costs are those which pertain to network plant, other fixed asset categories and other costs for which the cost is spread over several years. The cost recorded in the service cost statement will be in respect of the depreciation charge. There are two key judgements with regard to capital costs. First is the judgement of what is a capital cost. Organisations differ in their capitalisation policy with regard to costs such as research and development, software and interest expense on construction. Second, depreciation is determined by the asset's estimated useful economic life. Since depreciation forms one of the largest items of annual cost, careful consideration should be given to the appropriateness of the depreciation lives used.

Once the revenue costs and depreciation and amortisation charges have been identified they will be grouped into one of the four cost pools shown:



Services - This pool contains costs which can be directly identified with a particular service, examples of services and directly assignable costs are:

Service	Direct Cost
Directory Enquiries	Wages of Directory Enquiries staff
Mobile Service	Cost of Cell Stations
International Service	Depreciation of International Gateway Switch

Network Elements - This pool contains the costs relating to the various components of transmission, switching and other network plant and systems. The costs will be in respect of network components which cannot be allocated directly to a particular service as they are utilised in the provision of a number of services.

Related Functions - This pool contains the costs of functions necessary for the provision of service to the customer such as billing, maintenance, customer service.

Other Functions - This pool contains the costs of functions which are not related to the provision of service but are an important part of the operations of the company. Such costs include planning, personnel and general finance.

The cost pools thus created are the starting point for Stage II which allocates the cost pools to services.

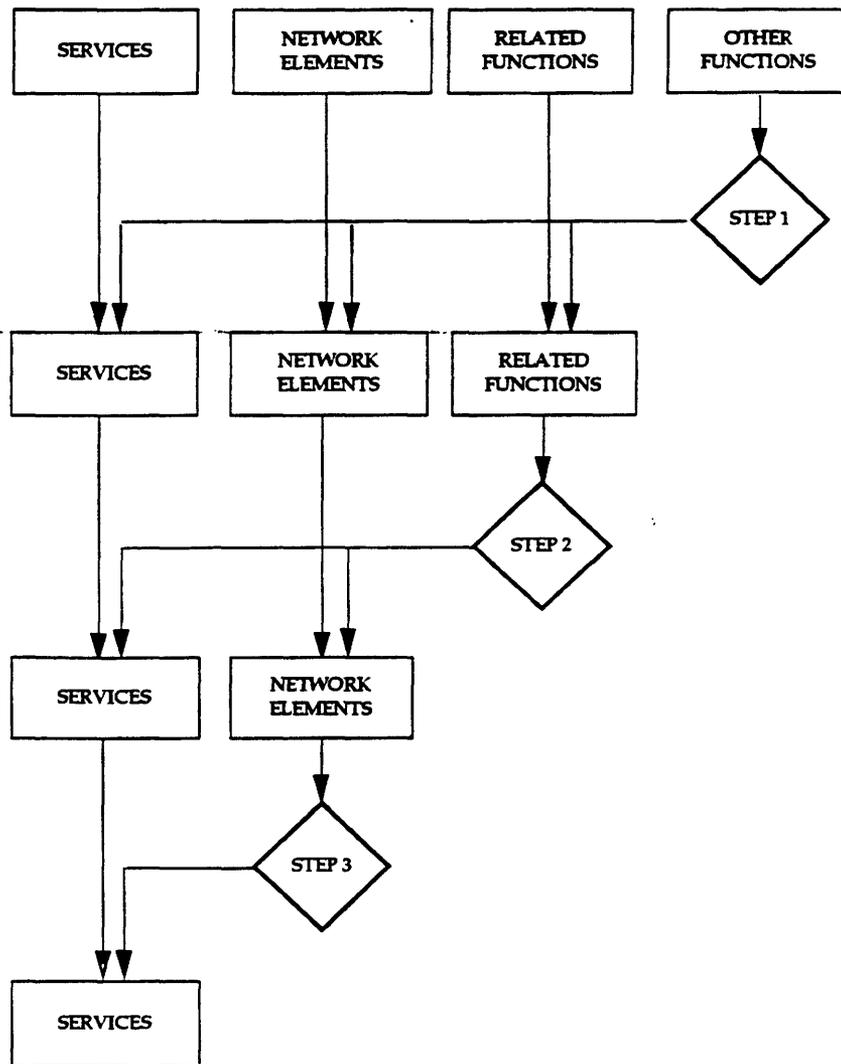
Stage II

General rules for the process of cost attribution and allocation can be established such as those contained in Article 10.2 of the Leased Line Directive⁴⁶.

⁴⁶ Council of the European Communities. Council Directive 92/44/EEC of 5 June 1992 on the application of open network provision to leased lines. Official Journal of the European Communities No. L165 p27-35.

- a. the costs of leased lines shall in particular include the direct costs incurred by the telecommunications organisations for setting up, operating and maintaining leased lines, and for marketing and billing of leased lines;
- b. common costs, that is costs which can neither be directly assigned to leased lines nor to other activities, are allocated as follows:
 - i. whenever possible, common cost categories shall be allocated based upon direct analysis of the origin of the costs themselves;
 - ii. when direct analysis is not possible, common cost categories shall be allocated based upon an indirect linkage to another cost category or group of cost categories for which a direct assignment or allocation is possible. The indirect linkage shall be based on comparable cost structures;
 - iii. when neither direct nor indirect measures of cost allocation can be found, the cost category shall be allocated based upon a general allocator computed by using the ratio of all expenses directly assigned or allocated to on the one hand, services which are provided under special or exclusive rights and, on the other hand, to other services.

Whilst these general rules are based on sound principles of causation, transparency and consistency of application, they only provide general rules and greater detail is required in breaking out the process of attribution and allocation, both to achieve greater consistency and potentially greater precision.



Many cost allocation models in other industries attempt to move directly from cost pools to a service cost report. However, a number of cost allocation models developed by TOs use a cascade or building block approach where costs are allocated in a series of steps rather than one. This is illustrated by the Stage II diagram. At Step 1, Other Function costs are allocated to either Services, Network Elements or Related Functions. At Step 2 the accumulated Related Functions costs are allocated to either Services or Network Elements. Finally in Step 3, the accumulated Network Element costs are allocated to Services to arrive at individual Service Costs.

This cascade approach to attributing and allocating costs means that rather than attempting to assign the cost of maintenance vehicles directly to services, which would probably only be possible by some arbitrary means, the cost can be indirectly assigned to the costs of network elements maintained (e.g. perhaps in relation to the

payroll cost of maintenance engineers that use the vehicles) and then the network elements are allocated to services. Each of the allocation steps illustrated above could involve a number of sub-steps. Where it is possible to perform an allocation via a number of direct or indirect attributions this is clearly preferable from a precision point of view to allocation through just one arbitrary step.

There is considerable flexibility in developing cost attribution and allocation principles. Having decided upon the principles there is considerable further flexibility in their detailed application. Accordingly it is possible to support a wide range of cost attributions and allocations, each of which will fall within the bounds of acceptable practice, which will clearly enable different conclusions to be drawn with regard to the calculation of service costs.

As a simple example consider a 2M Bit dedicated Broadband circuit carrying both voice and data. If costs are allocated based on call minutes the voice traffic would be allocated most of the costs. If instead costs are allocated on channel capacity utilisation, the data traffic might be allocated substantially all of the costs.

Appendix 7 contains information extracted from a US study that demonstrates the effects on service cost estimates of changes in attribution and allocation principles (e.g. treatment of spare capacity, peak hour Vs any time usage, etc.). Whilst this study provides estimates of incremental costs, as opposed to fully allocated or embedded direct costs it illustrates clearly the potential range of "right" answers depending upon the use to be made of the information.

More detailed information can also result in improved allocations. For example the total cost of provisioning a local switch 20 years ago may have been allocated to different call types based simply upon the call minutes of each call type passing through that switch. The main reasons for this is that only an approximate cost allocation was required due to no competitive commercial threat, and more importantly call minutes was information known and collected. In today's environment it is possible to break down the costs of the switch into a number of component costs based upon identified cost drivers.

A digital local exchange (DLE) performs the two functions of permitting customer access to the network and the handling of different types of calls. The cost drivers for the DLE expenditure are therefore those features responsible for the quantities of specific elements of equipment within the exchange, and are

- connection capacity
- traffic capacity
- call attempt capacity

The first stage of the cost attribution process could identify the division of total exchange costs between these cost driver factors and the second employs utilisation data for the apportionment of costs to services. This allows a causal attribution of costs to access and to call revenues.

Just as this more fundamental approach can be adopted with plant related costs so can it be applied to "overhead" costs. A more thorough understanding of the cost drivers connected with overhead costs and the activities exhausting these costs will lead to a more appropriate cost attribution.

The complexity of the process described above however should not be underestimated. Whilst greater detail and analysis is likely to give more 'accurate' results the effort required to produce it will be significant. The process will require agreement on the detail of the cost allocation methodology - i.e. agreeing at what level costs are to be captured, how frequently etc., determining cost drivers and line by line cost allocations. This will require detailed collection of costs, possibly requiring new procedures and reporting mechanisms for capturing data at a more detailed level - for example requiring new groups of employees to complete timesheets. TOs may need to perform engineering and other operational reports or studies to provide data on which to base cost attributions. Most importantly, there must be agreement on the unbundled services that require costing.

This process clearly generates a large database of information and significant processing requirements. If the system implemented to handle this process is to be valuable to a TO as it enters the competitive arena it will need to be capable of adapting to new and potentially more complex demands, for instance rather than just measuring the profitability of a service TOs may wish to assess the profitability of particular customer groups or geographical regions.

The problem for the organisation and for the regulator is to decide whether the environment warrants this more detailed understanding of the organisation's cost base. In a competitive market it will be a necessity, but it will occur only when the

competitive market drives it. For the liberalising monopolists the question of when to invest in this greater understanding is not so easily answered.

Given the broad range of acceptable apportionment and allocation methods achievable within the general rules, and acknowledging the potentially disparate views and agendas of the different TOs emerging in a liberalised market it is inappropriate for NRAs to leave the choice of methodology to the dominant operator. NRAs should be actively involved in the process of defining and documenting the detailed costing methodologies. Given their level of resources it is likely that this will be facilitated by wide industry debate on the identification of the relevant costs, the cost drivers and the attribution and allocation methodologies that should result from causality driven Activity-Based Costing. This is the process currently being followed by Oftel in the UK and has received widespread industry support. As such, we have provided an introduction to the concept of Activity-Based Costing and the principal steps required to set up an ABC process in section 9.10 below.

It is likely that this will be the only practical way to proceed, as simultaneously the industry will need to be involved in setting the list of interconnect services operators wish to purchase. If this process is not followed at a Community level a significant opportunity to avoid delays may well be lost. If the experience of the UK is repeated fully in each Member State the process of liberalisation will be obfuscated.

In this way it should be possible to achieve a situation where there are publicly available interconnect charges where interconnecting operators can understand the costs underlying the charges and the relationship between cost and charges. It is this level of transparency that is required for potential new entrants to make efficient business planning decisions.

9.10 Activity-Based Costing (ABC)

ABC is a philosophy that provides a more accurate picture of the cost of producing, marketing, and delivering products or services to identified market segments. It differs from traditional costing approaches in that it focuses primarily on the underlying activities required to produce products and services, rather than on the products and services themselves. While traditional costing approaches work reasonably well in meeting financial reporting requirements, they are generally not

capable of meeting (nor were they designed to meet) management's information needs for operating and strategic decisions.

ABC attributes costs to products and services based on an analysis of the causes of those costs (the so-called cost drivers). It accomplishes this by tracing and allocating costs through the activities performed to the products and services produced. In so doing, it establishes a clear cause-and-effect relationship between activities performed, their associated costs, and the resulting output from those activities. Furthermore, since ABC is not constrained by artificial functional or organisation boundaries, it accounts for all relevant costs associated with a business process, product or service regardless of where the activity which supports this business process, product or service is located within the organisation. As such, it improves the manager's understanding of the true cost of providing products and services to customers, which activities consume resources, and why costs are incurred. Activity-based management can then help to better manage, control, and understand the costs incurred in the conduct of activities and the underlying cost drivers.

The Decision Framework

Effective implementation of ABC requires a clear understanding of the products and services which are offered to customers in various market segments and the business processes and related activities which are required to provide those products and services. Once the business is understood in these terms, the key to successful application of ABC is to develop an adequate decision framework. This framework must be guided by the answers to the following questions:

- What kinds of decisions must the users make?
- What decision rules or decision tools are needed to make them?
- What kind of cost and other information is needed to support those decisions?

With such a framework guiding the effort, decisions can be made regarding whether to consider an ABC-type approach, what kind of ABC system to adopt, the level of activity detail to employ, and the kinds of cost information to track.

The Steps of the ABC Process

The step-by-step approach to ABC is relatively straightforward once the decision framework has been developed. The essential steps are as follows:

1. Identify the products and services of the company or business unit
2. Perform activity analysis to define the set of activities required to produce, market, and deliver the product or service.
3. Identify the cost drivers which determine the level of costs incurred for the level of activities performed.
4. Trace direct costs and allocate indirect costs to the activities performed based on the consumption of these cost drivers.
5. Link activities performed to products and services produced and trace resources consumed and associated costs through activities to products and services.
6. Manage and control the business process activities which are required to produce the products and services.

Step 1 involves defining the products and services produced by the company or business unit. Although the task appears straightforward, an understanding of the actual products and services produced and delivered to customers is sometimes missed in practice, particularly when thinking is limited to organisational functions and budgets.

Step 2 defines the set of activities required to produce the products or services defined in Step 1. In Step 2, activity analysis is used to define these linkages. Since the set of activities often crosses functional lines, this is a critical step which yields important insights into the flow of resources.

Step 3 identifies the determinants of cost, that is, the cost drivers. Whereas activity analysis helps explain what activities are performed and what resources are consumed, cost drivers explain why costs are incurred. They are the critical ingredient in the development of activity-based cost allocations.

In Step 4, costs are attributed to activities based upon their relationship to the relevant cost drivers. This provides the mechanism by which business unit managers can understand and thereby control their costs and manage the performance of the activities.

In steps 5 and 6, the link is made between activities and products and, based on this link, the activities and their underlying cost drivers are closely managed and controlled.

The result of applying the ABC approach is the ability to answer critical questions related to the costing of processes and activities and associated products and services.

In Member State TOs direct costs have declined as a fraction of the total costs while indirect costs and overheads have increased. The treatment of indirect and overhead costs remains a large issue in the telecommunications industry. ABC can help in this regard and assist telecommunications managers to understand the true cost of performing activities and providing products and services so that informed decisions can be made regarding which products and services to produce, and how best to produce them. A more rigorous costing will also facilitate a more informed interconnect charging decision.

9.11 Conclusions and Recommendations

In view of the challenging and complex issues involved in liberalisation across a diverse Community, the purpose of this study was to highlight the key issues and provide some broad guidelines and principles to form the basis for future development and progress. The views expressed in this report are clearly our own, and are based upon the interviews that we have performed with operators and regulators throughout Europe and the secondary research of the considerable literature which has been published on this subject.

There is currently a unique opportunity for the European Commission to ensure a harmonised approach to the cost accounting methods used in the establishment of costs on which to base interconnect charges. This will ensure that consistent and efficient charges are developed across the Community. With the onset of

competition in voice telephony in most European countries timetabled for 1998, this process will be increasingly difficult to implement if delayed.

Any guidance that the Commission develops on this subject should take into consideration the business requirements of the Telecommunications Operators (TOs) themselves, and as such should be practical, implementable and congruent with the business practices of these operators. The Commission's goal should be to develop a general framework for interconnect; establishing the broad principles which will form the basis for future development and progress, and hence enable a harmonised approach to interconnect.

Existing Cost Accounting Practices and Cost Allocation Methods of Community Operators

The cost accounting practices and cost allocation methods of Community operators generally meet the information needs of current users. However, the competitive market place will require the development of more rigorous approaches to cost accounting in many Member State TOs. Early development should be encouraged. In addition, the importance of a comprehensive and harmonised cost accounting approach to interconnect in the EU has been recognised.

To date, with few exceptions National Regulatory Authorities (NRAs) have generally not been required to have a detailed understanding of the cost accounting issues associated with interconnect. However, with the onset of a liberalised market NRAs will need to develop a more detailed understanding of costing issues to be able to provide effective regulatory oversight in developing cost orientated interconnect charges, and cost orientated tariffs.

Formulation of Interconnect Charges

The diversity of interconnect regimes around the world indicates that a number of factors influence the formulation and establishment of interconnect regimes. As such the Commission should suggest broad principles for interconnect to be agreed at an EU level. The responsibility for implementation should rest with the Member States.

The principles which we recommend the Commission endorse are as follows:-

- Interconnect Charges should be based on the underlying costs of an efficient operation, and in all cases contain two elements attributable to the interconnect services provided. These are:
 - The Connection Charge.
 - The Conveyance Charge.
- Separate charges within each element should be developed to reflect the traffic sensitive and non traffic sensitive costs and the distance and non distance related costs.
- Further Charge elements resulting from obligations and/or tariff constraints imposed by regulatory authorities do not relate directly to interconnect. As such they should be recovered separately from the costs of interconnect services, or, at a minimum as a separate part of the interconnect agreement. This incorporates the following elements:
 - The Tariff Imbalance or Local Access Loss Charge.
 - The Universal Service Obligation Charge.

Consideration of these elements are given in separate sections below.

- Interconnect Charges should be set to facilitate competition. In order to achieve this objective, NRAs in each Member State should ensure that the interconnect process is transparent giving rise to charges which are efficient and sustainable. Accounting separation under the review of the NRA is one way transparency may be achieved. In addition, NRAs should ensure that agreements are not unduly discriminatory and that confidence in the agreements is promoted through the availability of sufficient information.
- Interconnect charges should be based upon the cost of unbundled network elements. NRAs should liaise with TOs and potential operators to develop a list of the unbundled network elements which interconnecting operators wish to purchase. A co-ordinated European approach would be an efficient means by which this process could be achieved and would ensure cross-border consistency.

The Local Access Loss

The local access loss arises out of service cost and tariff imbalances. We believe that the local access loss should be eradicated, where justifiable, by ensuring that any constraints on the rebalancing of tariffs are removed.

We recommend that the Commission should:

- Encourage Member States to remove all barriers to tariff rebalancing. The speed of rebalancing and safeguards for vulnerable consumer groups should be determined by the NRA to take account of the national situation.
- Until such time as the service tariffs are rebalanced, consideration may be given by the NRA to sharing these "losses" amongst competing TOs. Such costs of the local access loss should be recovered over the use of the local access network in a competitively neutral manner.
- Recovery of the local access loss should only be partial, to encourage efficiency in the incumbent operator. Local access loss charge waivers may be considered by NRAs to encourage competitive market entry until full rebalancing has occurred, but such initial waivers, if of only limited duration, make transition arrangements more difficult and will stifle the development of competition in the local access market.

The Universal Service Obligation

The definition of the Universal Service Obligation (USO) evolves with the development of a country's telecommunications infrastructure. Such evolution will continue in the competitive market. We believe that competition will not endanger the provision of universal service, but that, with regulatory oversight to ensure price rebalancing is carried out at a reasonable rate and vulnerable subscriber groups receive targeted support, competition will improve the provision of universal service by:-

- improving efficiency and reducing prices
- fostering innovation
- generating market growth

- creating increased revenue with which to fund genuine universal service obligation costs
- encouraging operators to compete for the provision of social services

We recommend that:

- The NRAs in each Member State should be responsible for defining and identifying universal service obligation services and costing the universal service obligation.
- The following principles for sharing the provision and/or funding of universal service obligations should be used by the Member States:
 - the cost of universal service obligations should be calculated on an avoidable cost basis and incorporate the net current annual cost for all lines which, prior to connection, the TO would choose, or have chosen, not to connect.
 - the provision of universal service and/or the funding of the cost of universal service obligations should be encouraged to conform to the following framework:
 - i. TOs should be encouraged to provide "USO" services on a voluntary basis.
 - ii. Unfulfilled obligations should be offered for competitive tender by TOs.
 - iii. Residual obligations should be imposed by the NRAs upon those TOs best placed to meet them.
 - iv. Where an operator believes the unilateral imposition of universal service obligations upon it is unfair because the avoidable cost is incompatible with its status and competition policy objectives it could appeal to the NRA for shared funding.
 - v. After the NRA has vetted the avoidable cost calculated by the TOs they may agree to shared funding of the cost.
 - vi. Shared funding of universal service obligation costs should be by way of a levy on the industry in a competitively neutral manner and not included as part of the interconnect charge.

Promoting Efficiency

The most effective mechanism for improving efficiency is through liberalisation which will:

- encourage use of best practices and apply downward pressure to costs
- bring about rebalancing and hence improve allocative efficiency

For interconnect no one charging method will provide the ideal solution for promoting efficiency. Low charges may encourage efficiency of the incumbent but may also lead to inefficient market entry.

The promotion of efficiency, incorporating the principles agreed at a Community level, should be conducted by the NRAs who are best able to tailor the interconnect charge regime to the national situation.

In this respect we recommend the following principles:

- Interconnect charges should be set so as to facilitate competition which will then encourage efficiency.
- Where Incremental Cost concepts are used in interconnect pricing, charges should be set above the incremental cost to ensure a contribution to the residual joint and common costs of the interconnected operator.
- Where Fully Distributed Costing is used to set interconnect charges, downward pressure should be exerted on the interconnect charge to encourage TO efficiency. For example, through the application of a price-cap.
- Interconnect charges should be based upon the cost of unbundled network elements.
- The structural advantages enjoyed by the incumbent should be offset by abatement of interconnect charges. Abatements may then be reduced through time to reflect the increasing symmetry between the new entrant and the incumbent.

Our recommended principles continued.....

- The industry needs to investigate the practicality of implementing charges based on capacity.
- New entrants should then be offered the choice of either a capacity or a per-call minute cost related interconnect charge.

Cost Accounting Practices

There is currently a diversity of cost accounting practices across the Community which need to be harmonised for equity in interconnect.

Investment in more detailed and more rigorous cost allocation and attribution methodologies will arise through competition in time.

The Commission should take this opportunity to harmonise accounting policies and practices as far as is practicable. A framework for such harmonisation should incorporate the factors listed below. This is not intended to be a complete or definitive list, and indeed excludes elements previously directed for Community action elsewhere in our conclusions.

We recommend that:

- European TOs should be encouraged to adopt a uniform approach to cost attribution and allocation methods, and accounting principles to ensure cross-border consistency in cost measurement.
- Cost allocation and attribution methods employed by TOs should be based on cost causal principles. Such principles may require joint and common costs to be attributed and allocated in a more cost causal manner than currently employed. Such increases in the levels of attribution and allocation should be encouraged so long as the benefits of greater cost causality are not outweighed by excessive expense.

Our recommendations continued....

- Activity-Based Costing principles should be encouraged for use by TOs as a method for understanding the underlying costs and cost drivers where Fully Distributed Cost or Embedded Direct Cost standards are used. The industry should agree the cost drivers and cost allocation and attribution methodologies to be applied.
- TOs should be encouraged to develop long run incremental cost information for pricing decisions.
- Until such time as long run incremental costs are practicable, interconnect charges should be based on Embedded Direct Cost plus a margin to contribute to the joint and common costs of the interconnected operator.
- The size of the margin above the Embedded Direct Cost should be determined by negotiation between the parties to interconnect. Only when there is a dispute should the Member State NRA become involved.
- A process for eliminating inefficiencies should be agreed between the NRAs and incumbent operators. The costs of inefficiencies in incumbent operators should be calculated where a Fully Distributed Cost or Embedded Direct Cost approach is used for interconnect charges. Such calculations should either be scrutinised by the NRAs or carried out by them. The cost of such inefficiencies should not be passed on to interconnecting operators in the interconnect charge and should only be shared where this is felt appropriate by the NRA

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11. APPENDICES

1. Glossary of Terms
2. Country Backgrounds
3. The Death Spiral
4. Meaning of USO and Social Obligations in Developed Countries
5. Cost Data Regarding the USO
6. Effects of Differing Costing Methods on Service Cost Estimates
7. Depreciation Policies
8. Preliminary List of Unbundled Services: Extract from Oftel March Statement
9. Telephone Company Cost Statement Breakdown.

GLOSSARY OF TERMS USED IN ARTHUR ANDERSEN QUESTIONNAIRE

Activity Based Costing (ABC)

A process whereby costs are allocated based on the demand each product and/or service makes on all the company resources. Specific cost allocation is based upon studies of organisational cost drivers and activities.

Access charge

See *interconnect charge* below. The term "access charge" has at least two meanings (the usage implied in the *interconnect charge* definition below and the narrow meaning of the local access charge). This term has therefore been replaced with "interconnect charge" for clarity of meaning.

Access Deficit Charge

In the UK, BT seeks to make an Access Deficit Charge (ADC) to interconnecting operators. Where it is not waived the ADC is included as a component of the total *interconnect charge*. The ADC seeks to recover a share of the total *local access loss*, including an element (to date unquantified) relating to the *universal service obligation*.

Capacity based charging

An emergent system for interconnect charging where the purchaser rents "capacity" (e.g. switching or transmission capacity in discrete units) from an established operator. The purchaser pays a fixed price for access to the network regardless of the actual traffic utilisation, (up to a maximum of the capacity rented). There may be a separate variable charge for call set up, signalling etc. This contrasts with "cost per unit" charging where a user pays for actual calls conveyed, often on a "minute of use" basis.

Capacity Cost Approach (CCA)

An approach used in *incremental costing* to account for the costs of fixed assets expansion in discounted cash flow terms. The change in present value of projected capital expenditure as a consequence of fixed assets expansion is spread across the consequent additional capacity of the fixed assets (not across the units of capacity in use); thus the present value per unit of incremental capacity associated with the advancement or postponement of investment expenditure is derived.

Cost categories

Specific classes of costs differentiated according to their relationship with changes in output. Examples include fixed, variable, common and *sunk*.

Cost items

These are specific costs incurred by the firm and classified by management. Examples include, administrative expenses, maintenance, finance etc.

Cost orientation

This term is usually used in the context that tariffs and *interconnect charges* should be cost orientated. Cost orientation implies a relationship with underlying cost of service but without specifying what that relationship is.

Cost of service/service costs

The cost of providing a particular service, or family of services, to customers determined using an appropriate *cost standard*. The cost is distinguished from *interconnect charges* made to other operators for use of the network, and from *retail tariffs* to end users, both of which determine the revenue of the firm.

Cost standard

In EC legislation this term is synonymous with *cost accounting system*. For the purposes of this questionnaire, however, a cost standard is the principle by which the pool of costs are allocated to individual services to determine *service costs* as a basis for financial reporting, or regulatory or commercial decision making. Examples include *fully distributed costing (FDC)*, *marginal costing (MC)* and *long run incremental costing (LRIC)*.

Custom calling features

Value added voice services, e.g. call waiting, call forward, conference calling, etc.

Efficient Component Pricing (ECP)

A pricing proposal developed by Baumol and Willig which sets the *interconnect charge* as the incremental cost of production plus the *opportunity costs (OC)* associated with providing the service to competitors. OCs may be calculated by reference to:

- resources used in acquiring an asset
- alternative asset uses
- unavailable capacity or revenue foregone.

(Some commentators argue that this has recently been implemented to account for access deficits in the UK and New Zealand Telecommunications industries)

Embedded direct costs

A *cost standard* which attributes the historical costs of the existing network and organisation to individual services in a 'contribution' based analysis calculating the direct costs of that service. This is made possible by establishing a causal linkage between individual historical costs and the provision of a service. *Joint and common costs* are not allocated to services; rather they form part of the pool of costs which need to be recovered from tariffs along with the direct costs of service.

Engineering cost study

A cost study prepared using forward looking costs and an engineering approach to network expansion and modernisation.

Fully Distributed Costing (FDC)/Fully Allocated Costs (FAC)

A *cost standard* which allocates all of an organisation's costs to services. Fully allocated costs generally include the costs directly attributable to the service, plus a share of indirect costs and general overheads. The rules for determining the shares of the indirect costs and overheads are usually causally related but no entirely non-arbitrary set of rules exist.

Incremental Costing

A *cost standard* which measures the change in the total costs of the firm that arises from an increase or decrease in output by a discrete increment. In the particular case where the increment under consideration is a single unit, incremental costs and *marginal costs* will be the same. In the "short run", this is limited by the existing fixed assets capacity.

Long run incremental costing (LRIC) incorporates the capital costs associated with changes in fixed assets capacity, often using a *Capacity Cost Approach*.

Incumbent

This is the TO, or combination of regionally and functionally divided TOs, which evolved out of the historic state-owned organisation(s) holding the dominant position in telecommunications markets.

Interconnection

This is the term often used where one network operator (or service provider) connects its network, or equipment, to a second operators' network, to allow transfer of traffic between networks. The terms of interconnection would be expected to be covered by an "interconnect agreement" which sets out the commercial and technical terms of interconnection. Similar arrangements would be necessary to cover interconnection between a service provider and a TO.

Interconnect charge

This is the charge that one operator makes to another network operator for the conveyance of traffic over the first operator's network. Any such interconnect charge for the interconnection of two operators' networks should be considered to have two components:

- An initial connection charge - reflecting the up-front cost of physical connection of one network to another and any consequent costs arising.
- A conveyance charge - reflecting the transmission cost of traffic conveyed through one operators' network on behalf of another.

Two further charge elements, which do not relate directly to interconnect, are often incorporated into interconnect agreements:

- A tariff imbalance charge - to recover the subsidies of profit making services to loss making services where such profits and losses arise out of cost and tariff imbalances. Without this charge element competitors would select "overpriced" services without contributing to the "underpriced" services.
- A charge for the *USO* and *social obligations* required of the TO.

Joint and common costs

The strict economic definition for joint cost is where the incurrance of cost on a productive input by necessity produces more than one good or service (eg. the cost of producing mutton and wool). The economic definition for common cost is where the cost of a productive input is used to produce several different outputs but possibly in different proportions (e.g. the cost of purchasing a piece of land which can be used for growing various crops or grazing animals)

The definitions for joint and common costs as applied generally to telecommunications are more liberal than the true economic definitions. Joint costs arise where the incurrance of cost on a productive input is shared between a family of services (e.g. the cost of investment in a switching system). Common costs arise, where the cost of a productive input is shared across all services of the firm (e.g. executive salaries, fixed licence costs).

Liberalisation

The process by which the telecommunications industry is opened to competition.

Local access loss

In most countries, the costs attributed to the provision and maintenance of the local loop exceed the revenues earned from tariffs charged for local retail access. Conventionally, the revenues considered in this calculation include only the initial connection and line rental charges; they exclude revenues earned from calls conveyed. In this study, part of this loss relates to and can be included as part of the cost of universal service.

The local access loss arises for four reasons:

- inefficiencies
- tariff imbalances
- losses incurred by operators to serve uneconomic customers (because of the *USO*)
- losses incurred by operators to serve customers which they would serve without a *USO* because they are profitable once incoming and outgoing call revenues are included.

Marginal Costing (MC)

A cost standard which measures the cost of producing one more unit of output or the cost saved by producing one less unit of output holding constant the production levels of all other products and services of the firm.

Modern Equivalent Asset Value (MEAV)

A current costing methodology where values take account not only of general inflation but also specific price changes, e.g. rising fuel costs and the impact of technical progress in reducing real costs. The value is what it would be worth paying to bring replacement assets into use now in the normal course of business, taking account of practical constraints, e.g. on the rate at which the latest equipment could be introduced.

National Regulatory Authority (NRA)

The regulatory body responsible for controlling telecommunication regulation in a country.

Opportunity Cost

The cost when producing a product or service of contributions foregone from alternative applications of the resources applied to that production.

Penetration

This term has two commonly used definitions. The meaning applied in this questionnaire is the total number of residential and business lines per head of population. The alternative definition, not implied here, is that of household penetration the number of residential lines per household.

Rebalancing

The process by which some prices may rise relative to the average while others fall relative to the average so that all prices relate more closely to their respective costs of service. Rebalancing is normally accomplished within an overall constraint on the average movement of prices but may also occur when the overall price level is changed.

Retail tariff

The tariff charged to the subscriber for access to a telecommunications network. Normally it will consist of an initial connection charge and a recurrent (for example monthly) line rental charge (together forming the retail access charge) plus call charges based upon minutes of use, time of day and call distance.

Service element

See 'unbundling'. In this questionnaire the term "service element" describes each individual, separately defined, service feature offered to an interconnecting TO, either available separately or as part of a bundled *service offering*.

Service offering

A separately tariffed and separately available telecommunications service which may comprise one or more *service elements*.

Settlement rates

"International settlement rates" describe the payment made by one operator to another for the termination of an international telephone call, usually expressed as an amount per minute. Similar terminology could be adopted to describe the payment for delivery between domestic operators.

Social obligations

Obligations imposed upon the TO to provide such services as public telephones, provision of special equipment for disabled people, emergency service numbers, etc., that would not be provided under *strictly* commercial circumstances.

Stand alone cost

A *cost standard* which measures the cost of supplying a product or providing a service in isolation from the rest of the business.

Sunk costs

These are costs which an organisation is either committed to paying or has paid.

Switched telephone network

The ordinary telephone network (sometimes called the Public Switched Telephone Network (PSTN)). The main elements are exchange lines, switches and inter-switch links.

Telecommunications revenues

In this study the magnitude of telecommunications revenues relates to revenues from network operations and value added services; turnover of retail equipment suppliers, etc. is excluded.

Telecommunications Operator (TO)

A provider of licensed telecommunications services (e.g. voice telephony, payphones, mobile, paging etc.).

Unbundling

Interconnecting operators want access to particular parts of the network and want to be charged only for the network components which they use. Typically, the dominant TO wants to presume symmetry between its wholesale and *retail tariffs* and prefers to mirror its *retail tariff* structure in its *interconnection charges*. Competitive forces in the USA and the UK have led to pressure to "unbundle" the *interconnect* service offering into individual *service elements* demanded; (e.g. separate charges for local, junction or trunk switching or local, junction or long-distance transmission).

"Unbundling" is the process of disaggregation of network charges into separate charges to individual *service elements*.

Universal Service Obligation (USO)

The Council resolution of 7 December 1993 on the development of universal service in the telecommunications sector, defined a Universal Service Obligation as an obligation to provide a defined minimum service to all users at an affordable price. By definition, this would provide an obligation on the TO to provide voice telephony services at a "loss" or under conditions falling outside normal commercial conditions to some subscribers.

APPENDIX 2

COUNTRY BACKGROUNDS

Belgium

Denmark

France

Germany

Greece

Ireland

Italy

Luxembourg

Netherlands

Portugal

Spain

United Kingdom

UNITED KINGDOM

Background:

Population ('000s, 1992)	57660
Area - square miles (Times Atlas)	94,475
Density (population per sq mile)	610
Subscribers (1994 a/cs)	26,640,000 exchange-line connections
Country Turnover - 1991 US\$m (ITU 1992)	23598
Mainlines	25595
Penetration (AA Questionnaire 1994)	50 lines per 100 inhabitants

Historic PTT

Name	British Telecom
Corporatised	1969 (split from post in 1981)
Privatised	1984
Turnover 1990 US\$m (OECD, 1993)	23364
Turnover £UKm (1994 a/cs)	13675
Ownership	1% government 99% private
Employee numbers - thousands (1994 a/cs)	156

Fixed wire competitors:

Name	Mercury Communications Ltd	Kingston Communications Ltd
Turnover	£1.2 bn	
Ownership	C&W - 80%, Bell Canada - 20%	Private
		128,000 lines
	Licenced in 82 - expanded in '84	historic regional company
	400,000 public tel' customers	375k population capture

Mobile/PCN competitors:

Name	Cellnet	Vodafone
Ownership	60% - British Telecom 40% - Securicor	No major shareholders
	Licenced in 1985	licenced in 1985
Subscribers (1994 a/cs)	1019000 subscribers	1,174,000 subscribers
Date commenced operation	1985	1985
Name	Orange (PCN)	Mercury one-2-one (PCN)
Ownership	Hutchinson Microtel	50% - Mercury (C & W) 50% - US West
Date commenced operation	1994	1993

Cable (Telephony capability)

Yes

Service Providers

Yes

Leased Lines	domestic	Interconnection at both ends
Competition	international	Yes
(OECD, 1993)	3rd Party	Yes
	Capacity resale	Yes

Regulator:

Name	Department of Trade and Industry, Office of Telecommunications (OfTel)
Status	independent
Laws	Telecommunications Act 1984

DENMARK

Background:

Population ('000s, 1992)	5210
Area - square miles (Times Atlas)	16,625
Density (population per sq mile)	313
Ssubscribers - thousands (1993 a/cs)	3060
Country Turnover - 1991 US\$m (ITU 1992)	2379
Access lines (TeleDanmark, 1994)	3060
Penetration (93 a/cs)	58.7 subscribers per 100 inhabitants

Historic PTT

Name	Tele Danmark A/S - formed in 1991 by combining the regional companies Ktas, JT, FT & TS) and the international operator (Telecom A/S)	
Corporatised (OECD, 1993)	90	
Privatised (OECD, 1993)	92	
Turnover '90 US\$m (OECD, 1993)	2356	
Turnover DKm, 1993 (a/cs)	16293	
Ownership	94% Government owned (listed corporate body) due to be 51% owned shortly	
Employee numbers - thousands (1993 a/cs)	16.845	

Fixed wire competitors: None - Tele Danmark has an exclusive licence until 1-3-97

Mobile/PCN competitors:

Name	Tele Danmark Mobil A/S	DMT Dansk Mobil Telefon I/S "SONOFON"
Turnover	1300 DKm - 1993	Not available
Ownership	Tele Danmark	GN Store Nord - 51% Nordic PCN AB - 20% Bellsouth Corporation - 29%
Subscribers	323,000 subscribers (93 a/cs)	30,000 subscribers - 1993
Date commenced operation	1992	1992

Cable (Telephony capability) No voice telephony licence

Service Providers Leased lines available

Leased Lines	domestic	Interconnection at both ends
Competition	international	Yes
(OECD, 1993)	3rd Party	Yes - but only as VAS (Value added Service)
	Capacity resale	No

Regulator:

Name	National Telecom Agency (Telestyrelsen) under the P&T General Directorate of the Minister for Comm'
Status	Part of Government Department - Ministry of Communications
Laws	Telecommunications Act 1897 - amended in '90,'92,'94 mostly deals with empowerment rather than strict rules
Forms of Regulation	Licensing and sundry accounting and financial requirements

Interconnection:

Right to interconnect?	Mobile only until 1997
Laws governing interconnection	Regulation of Telecommunications Act - "Bekentgorelse af lov visse forhold pa telekommunikationsomredet" covers licencing and conditions for licencing

DENMARK

Interconnect charging	interconnect agreement was approved by the Minister of Communications. The agreement is not publically available
PTO cost accounting system	Fully Distributed Costing
Other	Cost based tariff structure achieved early through regionalised origins (WIK '94) Lowest call charges in Europe 90% of residential phones have sophisticated terminal features. Tariffs reflect costs - no rebalancing necessary From 1-1-95 a price cap of RPI-x% for domestic international and leased lines telephony About to issue 37m B shares

FRANCE

Background:

Population ('000s, 1992)	57460
Area - square miles (Times Atlas)	209,970
Density (population per sq mile)	274
Country Turnover - 1990 US\$m (ITU 1992)	20592
Mainlines - 1991 (ITU, 1992)	29100
Penetration (AA Questionnaire, 1994)	54 lines per 100 inhabitants

Historic PTT

Name	France Telecom
Corporatised	1990
Privatised	No
Turnover - OECD - '90 US\$m	18913
Ownership	Government administrative entity
Employee numbers - thousands, '90 (OECD, '93)	156.6

Fixed wire competitors:

None - no competition allowed yet
 Monopoly given to FT on infrastructure provision, voice telephony and telex
 However, 97 small "independent" networks are connected to the public network (1994)

Mobile/PCN competitors:

Name	Radiocom 2000 (93 - GSM)	SFR (ana + GSM from 93) Societe Francaise de Radiotelephonie
Ownership	France Telecom	45.3% - Generale des Eaux Vodafone & Bellsouth
Subscribers	300,000 (approx. - 1993)	100,000 (approx. - 1994)
Date commenced operation	1983	1987
	A third mobile licence has recently been awarded	

Cable (Telephony capability)

No

Service Providers

InDependent networks authorised for closed user groups
 Bearer services on leased lines or cable TV networks
 - Transpac: Sprint International: BT France: CGE

Leased Lines Competition (OECD, 1993)	domestic	Interconnection at both ends Yes Yes - but only as Value added Service Yes - but only as Value added Service
	international	
	3rd Party	
	Capacity resale	

Regulator:

Name	Direction Generale des Postes et Telecommunications (formerly DRG - Direction de la Reglementation Generale) under Ministry of Industry, Post, Telecommunication & foreign trade
Status	Directorate of the government ministry

Interconnection:

Right to interconnect?	Between licenced mobile networks and public network Between independent networks and the public network (restricted)
Laws governing interconnection	Law no 90-117 of 30/12/90 "Defining the new regulatory framework of the French telecommunication policy"

FRANCE

Interconnect charging

SFR- equivalent to large customer - higher subscription and lower usage price (no payment from FT to SFR)
GSM interconnect unpublished, but commercially agreed and subsequently vetted by the regulator

Universal Service/Social Obligations:

Here includes: contributions to research and education
leased lines for public safety agencies, vouchers to MPs,
non payment by ministries, holding public stocks, etc

PTO cost accounting system

Fully Distributed Costing

GERMANY

Background:

Population ('000s, 1992)	79750
Area - square miles (Times Atlas)	137,740
Density (population per sq mile)	579
Subscribers (1992 a/cs)	35.3m
Country Turnover - 1990 US\$m (ITU 1992)	25122
Mainlines - 1990 (ITU, 1992)	31887
Penetration (AA Questionnaire, 1994)	47 lines per 100 inhabitants

Historic PTT

Name	Deutsche Bundespost Telekom
Corporatised	1990
Privatised	Under discussion
Turnover - 1990 US\$m (OECD, 1993)	25117
Turnover - DMk (1992 a/cs)	53957282
Ownership	Separate company owned by the government
Employee numbers - thousands (1992 a/cs)	231

Fixed wire competitors: Second wireline operator is currently under consideration

Mobile/PCN competitors:

Name	De Te Mobil GmbH	Mannesmann Mobilfunk GmbH	E-Plus Mobilfunk GmbH
Ownership	DBP Telekom	Mannesmann AG - 51% Others - 49%	VEBA - 28% Thyssen - 28% Bellsouth - 21% Vodafone - 10%

Subscribers 771.9k sub (92 a/cs) information is unavailable (+80k on GSM service)

Date commenced operation 1986 1991 1994

Cable (Telephony capability) No voice telephony licence

Service Providers Yes

Leased Lines	domestic	Interconnection at both ends
Competition	international	Yes
(OECD, 1993)	3rd Party	Yes - except for 3rd party voice traffic
	Capacity resale	Yes - except for 3rd party voice traffic

Regulator:

Name	Federal Ministry of Post and Telecommunications
Status	Government Department

Interconnection:

Right to interconnect? Not until 2000

PTO cost accounting system Fully Distributed Costing

GREECE

Background:

Population ('000s, 1992)	10270
Area - square miles (Times Atlas)	50,945
Density (population per sq mile)	202
Country Turnover - 1991 US\$m (ITU 1992)	1308
Mainlines	4190
Penetration (1993 a/cs)	46 subscribers per 100 inhabitants

Historic PTT

Name	Hellenic Telecommunication Organisation (OTE)
Corporatised	1948
Privatised (WIK, 1994)	1949 (OTE incorporated as a Societe Anonyme (S.A.))
Turnover 1990 US\$m (OECD, 1993)	1293
Telecoms Turnover DRm ('93 a/cs)	365754
Ownership	Separate entity owned by the government
Subscribers (1993 a/cs)	4744016
Employee numbers - thousands (1993 a/cs)	26

Fixed wire competitors:

None - OTE granted monopoly: 10 years - fixed local telephony
10 years - fixed long distance
8 years - international services

Mobile/PCN competitors:

Name	Stet Hellas (GSM Mobile)	Panafone (GSM Mobile)
Ownership	Stet (Italy) - 75% Nynex - 20% Interamerican - 5% (covers 70% pop'n)	Vodafone France Telecom Intracom Data Bank
Date commenced operation	1993	1993

Cable (Telephony capability)

No

Leased Lines Competition (OECD)

None

Regulator:

Name	National Telecommunications Committee (NTC) Ministry of Transport and Communications
Status	Government Department
Forms of Regulation	TBA

Interconnection:

Right to interconnect?	Mobile - 8 year duopoly for Panafon and Stet
Laws governing interconnection	Both under re-evaluation - Telecommunication Act (1992) 2167/93 - Organisation of the public network operator Interconnect agreed on basis of arbitration/mediation in cases of non-agreement of interconnect terms
Interconnect charging	OTE can choose either 5% of revenue of traffic between OTE & the operator or 3.33% of mobile operator's service revenues (OTE-STET HELLAS interconnect - WIK - 1994) STET-Panafon: each co. 'keeps what he gets'= no IC charges

PTO cost accounting system

Fully Distributed Costing

Other

Greece is exempt from the EC deadline for voice telephony competition 2003

IRELAND

Background:

Population ('000s, 1992)	3520
Area - square miles (Times Atlas)	26,595
Density (population per sq mile)	132
Subscriber lines (1993 a/cs)	1113000 telephone lines
Country Turnover - 1990 US\$m (ITU 1992)	1250
Mainlines	1024
Penetration (1994 a/cs)	33 lines per 100 inhabitants

Historic PTT

Name	Telecom Eireann
Corporatised	1984
Privatised	No
Turnover 1990 US\$m (OECD, '93)	1293
Turnover IR£m (1994 a/cs)	871
Ownership	Corporatised and government owned
Employee numbers - thousands (1994 a/cs)	13

Fixed wire competitors:

TE given exclusive rights over:	
Mobile radiotelephony	Fixed infrastructure
Paging	Voice telephony
Satellite services	Telex services

Mobile/PCN competitors:

Name	Telecom Eireann (Eircell) -analogue
Ownership	Telecom Eireann

Sundry information

Covers 95% of population (1993 a/cs)
 Introduced GSM in 1992/1993
 44000 subs (1993 accounts)

Date commenced operation

1985

Cable (Telephony capability)

No voice telephony licences

Service Providers

Only outside of the confines of the TE granted monopolies
 On the same terms as ordinary customers
 Only a few at present

Leased Lines

domestic	No
international	No
(OECD, 1993) 3rd Party	Yes, but only as share added services
Capacity resale	No

Regulator:

Name	Department of Transport, Energy and Communication
Status	Government Department
Forms of Regulation	Price regulation
Laws governing interconnection	Postal and Telecommunications Services Act, 1983

PTO cost accounting system

Fully Distributed Costing

Key future events and other information

Ireland is exempt from EC deadline for competition until 2003
 Tariffs are undergoing partial rebalancing (1993 a/cs)
 2nd GSM licence to be given shortly

ITALY

Background:

Population ('000s, 1992)	57100
Area - square miles (Times Atlas)	116280
Density (population per sq mile)	491
Subscribers - thousands (1993 a/cs)	24167
Country Turnover - 1991 US\$m (ITU 1992)	15681
Mainlines (ITU, 1992)	23071
Penetration (1993 a/cs)	42 per 100 inhabitants

Historic PTT

Name	STET (Holding company - 64% state owned) Telecom Italia (56% - STET owned) - formed in 1994 from the merger of SIP, Italcable, Iritel, Telespazio and Sirm.
Corporatised	Yes (e.g. 1932 - SIP, 1933 - STET))
Privatised	Yes (e.g. 1936 - SIP and STET)
Turnover 1990 US\$m (OECD, 1993)	16666 (SIP)
Turnover- ILb (1993 a/cs)	27167 (STET), 26797 (proforma Telecom Italia)
Employee numbers - thousands (1993 a/cs)	88 (SIP), 101 (proforma Telecom Italia)

Fixed wire competitors: None

Mobile/PCN:

Name	Italpac (GSM)
Ownership	SIP
subscribers - thousands (1993 a/cs)	1207
Date commenced operation	1990

Cable (Telephony capability) No voice telephony licence

Leased Lines Competition (OECD) No

Regulator:

Name	Ministry of Post and Telecommunications
Forms of Regulation	Licence issue, tariffs (governed by law)

PTO cost accounting system Fully Distributed Costing

Other points

Merger of SIP with Iritel, Italcable, Societa Italiana Radio Maritima (SIRM) and Telespazio to form Telecom Italia

Pronto Italia - Omnitel (a consortium formed in 1994) have been awarded a licences to operate a mobile service. Operations are anticipated to commence in 1995.

LUXEMBOURG

Background:

Population ('000s, 1992)	390
Area - square miles (Times Atlas)	998
Density (population per sq mile)	391
Country Turnover - 1991 US\$m (ITU 1992)	203
Mainlines - 1991 (ITU, 1992)	192
Penetration (AA Questionnaire, 1994)	55 lines per 100 inhabitants

Historic PTT

Name	Entreprise des Postes et Telecommunications (P et T)
Corporatised	1992
Privatised	No
Turnover 1990 US\$m (OECD, 1993)	158
Telecommunications Turnover LUFm (1993 a/cs)	7792
Ownership	Separate company 100% government owned
Employee numbers - thousands (OECD - 1990)	0.7 (2.517 in post & telecoms (1993 a/cs))

Fixed wire competitors:

None - P et T granted monopoly till 1998

Mobile/PCN competitors:

Name	MOBILUX
Ownership	50% Millicom Int' Cellular S.A.
Date commenced operation	1985

Cable (Telephony capability)

No voice telephony licence

Leased Lines

None

Regulator:

Name	Government - Ministry of Communications
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Interconnection:

Right to interconnect?	No
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PTO cost accounting system

Fully Distributed Costing

Luxembourg has an extra two years (i.e. 2005) to comply with the EC liberalisation of voice telephony

NETHERLANDS

Background:

Population ('000s, 1992)	15130
Area - square miles (Times Atlas)	15,890
Density (population per sq mile)	952
Subscribers (WIK, 1994)	50.1 per 100 inhabitants
Country Turnover - 1991 US\$m (ITU 1992)	5193
Mainlines	7630
Penetration (1993 a/cs)	50 lines per 100 inhabitants

Historic PTT

Name	PTT Telecom B.V.
Corporatised	1989
Privatised	1994
Turnover '90 US\$m (OECD '93)	5480
Turnover - NLGm (1993 - KPN Jaarverslag)	11831
Ownership	KPN - government majority owned company (Koninklijke PTT Nederland NV)
Employee numbers - 1990 thousands (1993 a/cs)	31.9

Fixed wire competitors:

None till 1998
 PTT concession given in 1989 for following services:
 Public telephony services provision of leased lines
 Telex public infrastructure

Mobile/PCN competitors:

Name	PTT Telecom B.V. (including GSM)	RAM Mobile Data public packet switched mobile
Ownership	PTT Telecom Netherlands	
subscribers - thousands	Analogue - 216k (KPN Jaarverslag '93) Digital - 22.5k (KPN Jaarverslag '93)	
Date commenced operation	1989	

Cable (Telephony capability)

No voice telephony licence

Leased Lines	domestic	Interconnection at both ends
Competition	international	Yes
(OECD, 1993)	3rd Party	Yes, but only as Value Added Service
	Capacity resale	No

Regulator:

Name	Ministry of Transport and Public Works - Department for Telecoms and Post (HDTP)
Status	Government Department
Laws	Telecommunications Act 1988
Forms of Regulation	Tariff reasonableness, cross subsidisation policing (between regulated and non regulated units) Compliance with EC rules

Interconnection:

Right to interconnect?	Government currently deciding on when to offer licences
Interconnect charging	No special agreement with RAM - merely standard terms for utilisation of the network + provision of leased lines.

PTO cost accounting system

Fully Distributed Costing

NETHERLANDS

Key future events

30% of KPN shares to be floated in 1994

New TO to compete with PTT (except voice) from 1995

Voice telephony expected to be open to competition by 1998

Major rebalancing underway effectively 100% increase in costs of trunk calls and 5.8% increase in fixed charges within 1 year

Major fixed network competitors likely to come from electricity, railway and CATV sectors

2nd GSM licence to be tendered for shortly. Main contenders:
ING (dutch bank) and Vodafone (foreign network operator)
RABO (dutch bank) and Bellsouth (foreign network operator)
ABN-AMRO(dutch bank) & PacTel(foreign network operator)

PORTUGAL

Background:

Population ('000s, 1992)	10420
Area - square miles (Times Atlas)	35370
Density (population per sq mile)	295
Country Turnover - 1990 US\$m (ITU 1992)	1581
Mainlines 1991 (ITU, 1992)	2693
Penetration - 1990 (OECD, 1993)	24

Historic PTT

Name	Portugal Telecom - Cable & Wireline (public) CPRM - Companhia Portugue Sa Rádio Marconi, SA - submarine cable and satellite (public - government 51%) Telepac - Servicos de Telecomunicacoes, SA - wireline (100% - Telecom)	
Corporatised	Portugal Telecom, SA - June 1994 CPRM - 1925 Telepac - May 1992	
Privatised	Portugal Telecom, SA - 100% state owned CPRM - 51% state owned	
Turnover 1990 US\$m (OECD, 1993)	1480	
Telecom Turnover PTEm (1993 Consol' a/cs)	394552	

Fixed wire competitors:

None - until 1998
"Fundamental service monopoly" reserved

Mobile/PCN competitors:

Name	TMN - Telecomunicacoes	Telecel SA
	Móveis Nacionais, SA	
Ownership	66.6% - Telecom	Private
	33.3% - CPRM	
Date commenced operation	1989	1991

Cable (Telephony capability)

No voice telephony licence

Service Providers

Open to competition - several currently operating

Leased Lines Competition

No

Regulator:

Name	Ministerio dos Transportes e Comunicacoes Ministry for Public works, transport and Communications, Institute for Communications in Portugal (ICP)	
Status	Government Department	
Laws	Telecommunications Act: Law No. 88/89 Decree Law No. 283/89 established the ICP in 1989	
Forms of Regulation	Regulation and licencing of operators International communication affairs Spectrum management Postal service overseer Technical standard approval Broadcast overseer	

Interconnection:

Right to interconnect?	"Complimentary" & "VAS" services given right of access
Laws governing interconnection	Telecommunications Act: Law No. 88/89
Interconnect charging	Various

PORTUGAL

PTO cost accounting system

Fully Distributed Costing

Rudimentary in all TOs

Key future events

Government has announced plans to merge TP, TLP and Marconi and later to privatise the combined company ICP requiring new accounts from '95 from all TOs which detail the separate lines of business

Other points

Reserved numbering prefixes for cellular, telecel, TMN & paging Portugal is exempt from the EC deadline for voice telephony competition until 2003

SPAIN

Background:

Population ('000s, 1992)	39950
Area - square miles (Times Atlas)	194885
Density (population per sq mile)	205
Country Turnover - 1991 US\$m (ITU 1992)	10682
Mainlines - 1991 (ITU, 1992)	13264
Penetration (AA Questionnaire, 1994)	36 lines per 100 inhabitants

Historic PTT

Name	Telefónica de España, S.A
Corporatised (OECD, 1993)	1924
Privatised (OECD, 1993)	1924
Turnover 1990 US\$m (OECD, 1993)	8363
Turnover PTm(1993 a/cs)	1220084
Ownership	67% Public, 33% government (Madrid and NY SE)
Employee numbers - thousands '90 (OECD, 1993)	75.4

Fixed wire competitors: None

Mobile/PCN competitors:

Name	Telefónica	a new GSM licence is to be issued in
Date commenced operation	1984	November 1994. Telefónica will also
		operate a GSM licence

Cable (Telephony capability) No voice telephony licences

Leased Lines Competition No - The government plan to introduce competition in 1995

Regulator:

Name Directorate Generale de Telecomunicacions (DGTel)

PTO cost accounting system Fully Distributed Costing

Other Spain does not have to comply with the European Resolution for the liberalisation of voice telephony until 2003 due to a less developed network than the European average. However, the government are planning to liberalise voice telephony by 1998

UNITED KINGDOM

Background:

Population ('000s, 1992)	57660
Area - square miles (Times Atlas)	94,475
Density (population per sq mile)	610
Subscribers (1994 a/cs)	26,640,000 exchange-line connections
Country Turnover - 1991 US\$m (ITU 1992)	23598
Mainlines	25595
Penetration (AA Questionnaire 1994)	50 lines per 100 inhabitants

Historic PTT

Name	British Telecom
Corporatised	1969 (split from post in 1981)
Privatised	1984
Turnover 1990 US\$m (OECD, 1993)	23364
Turnover £UKm (1994 a/cs)	13675
Ownership	1% government 99% private
Employee numbers - thousands (1994 a/cs)	156

Fixed wire competitors:

Name	Mercury Communications Ltd	Kingston Communications Ltd
Turnover	£1.2 bn	
Ownership	C&W - 80%, Bell Canada - 20%	Private
		128,000 lines
	Licenced in 82 - expanded in '84	historic regional company
	400,000 public tel' customers	375k population capture

Mobile/PCN competitors:

Name	Cellnet	Vodafone
Ownership	60% - British Telecom 40% - Securicor	No major shareholders
	Licenced in 1985	licenced in 1985
Subscribers (1994 a/cs)	1019000 subscribers	1,174,000 subscribers
Date commenced operation	1985	1985
Name	Orange (PCN)	Mercury one-2-one (PCN)
Ownership	Hutchinson Microtel	50% - Mercury (C & W) 50% - US West
Date commenced operation	1994	1993

Cable (Telephony capability)

Yes

Service Providers

Yes

Leased Lines	domestic	Interconnection at both ends
Competition	international	Yes
(OECD, 1993)	3rd Party	Yes
	Capacity resale	Yes

Regulator:

Name	Department of Trade and Industry, Office of Telecommunications (OfTel)
Status	independent
Laws	Telecommunications Act 1984

UNITED KINGDOM

Interconnection:

Right to interconnect?

All PTOs have a right to interconnect with all other PTOs referred to in BT's licence sections 13,15,19 and 46
13 - duty of BT to interconnect with any other PTO

Laws governing interconnection

Interconnect charging

To cover BT's FAC of conveyance on historic cost basis including full contribution to overheads calculated from FRBS + the applicable rate of return to the capital employed + contribution to BT's Access Deficit (Waiver concessions) Regulator reviewed if not previously agreed by the parties (BT looking to standardise the interconnection agreements)

Universal Service/Social Obligations:

Borne by BT (price regulation on 64% of it's service - RPI-x)

PTO cost accounting system

FDC into cost codes published as the FRBS (Financial Results By Service)

Key future events

Cellnet and Vodafone shortly to be given freedom to build their own fixed links
Access Deficit waiver regime and price capping to cease in '97
Of tel intends to proceed with accounting separation of BT into BT-Retail, BT-Network and BT-Access

Other

Other TO's:

Energis Communications Ltd subsidiary of the national grid
Colt City network
MFS Communications Ltd City network - fibre optic
and many more licenced operators

Rebalancing restricted through RPI+2% on connection & line rental
low-user discounts obligation and RPI+5 limit on multi-line
business rentals

APPENDIX 3

THE DEATH SPIRAL

The term "Death Spiral" describes the catastrophic result of basing production decisions on simplistic FDC based profitability analysis.

This is best illustrated by way of a simple example:

A company sells four product lines. The company incurs several costs in providing these products:

- Direct costs which are only incurred with production of that specific product.
- Family costs which are costs incurred with production of that family of products. These costs are allocated to the specific products on the basis of revenue.
- Firm costs which are costs incurred with running the firm as a whole (e.g. Chairman's salary). These costs are also allocated to the specific products on the basis of revenue.

The profitability analysis of the four products of the firm are as follows (all figures have been rounded):

	Product family 1		Product family 2	
	A	B	C	D
Revenue	60	48	59	18
Direct costs	40	40	40	10
Allocated family costs (on basis of revenue)	11	9	15	5
Allocated firm costs (on basis of revenue)	3	3	3	1
Fully Allocated Cost	54	52	58	16
Product Profit	6	-4	1	2
Corporate profit			5	

From the above analysis it would appear that product B is not "profitable". Removing product B from production would then give rise to the following profitability analysis:

	Product family 1		Product family 2	
	A	B	C	D
Revenue	60	0	59	18
Direct costs	60	0	40	10
Allocated family costs (on basis of revenue)	0	0	15	5
Allocated firm costs (on basis of revenue)	5	0	4	1
Fully Allocated Cost	65	0	59	16
Product Profit	-5	0	0	2
Corporate profit		-3		

Now, Product A has borne the total of the allocated family costs (which are now therefore reclassified as direct costs). This has led to Product A also now appearing unprofitable.

Removing product A as well as B would now give rise to the following profitability analysis:-

	Product family 1		Product family 2	
	A	B	C	D
Revenue	0	0	59	18
Direct costs	0	0	40	10
Allocated family costs (on basis of revenue)	0	0	15	5
Allocated firm costs (on basis of revenue)	0	0	7	3
Fully Allocated Cost	0	0	62	18
Product Profit	0	0	-3	0
Corporate profit		-3		

Product Family 2 now bear the cost of all the firm's common costs. The allocation of these costs has resulted in the apparent unprofitability of product C. Removing product C, leaving just product D in production gives rise to the following profitability analysis:-

	Product family 1		Product family 2	
	A	B	C	D
Revenue	0	0	0	18
Direct costs	0	0	0	30
Allocated family costs (on basis of revenue)	0	0	0	0
Allocated firm costs (on basis of revenue)	0	0	0	10
Fully Allocated Cost	0	0	0	40
Product Profit	0	0	0	-22
Corporate profit		-22		

Product D now bears all the remaining firm costs and gives rise to a large loss.

By basing decisions on the FDC of the products the company has transformed from a profitable organisation to a heavy loss making one.

APPENDIX 4

MEANING OF USO AND SOCIAL OBLIGATIONS IN DEVELOPED COUNTRIES

"Universal Service Obligation" (USO) and "social obligations" are closely related terms, both poorly defined. We use them to cover the obligations placed on TOs to behave in a non-commercial way by providing outputs (i.e. products or services) on certain terms for vulnerable market segments. This is best illustrated by examples of the products and services which are included in the definition and those which are excluded:-

Included are:

- relay services for profoundly deaf people (with users paying only "normal" call charges)
- special telephones for people with various disabilities
- payphones with very low takings (e.g. in isolated areas)
- reduced rentals for pensioners

Excluded because they are not outputs (although undoubtedly of public concern) are:

- employment (e.g. requirement to maintain a certain size of workforce in the TOs)
- training given to TO workforce
- R&D
- sourcing (e.g. requirements to place supply contracts by open competitive tender)
- environmental controls e.g. on placing of radio masts
- overall price control, e.g. by broad price caps - these are designed to improve efficiency rather than benefit particular customer groups

Excluded because the market segment is not vulnerable are:

- constraints on speed of rebalancing (normally non-traffic sensitive (NTS) versus traffic sensitive (TS), local vs long-distance)
- emergency callout service (cost is proper to the emergency services and small in relation to their total costs)
- providing adequate network capacity for overflows from competition ("network of last resort")
- defence requirements

A controversial area not included in the examples above is the provision of service to remote rural areas at nationally uniform (or near-uniform) prices. This is discussed in more detail in section 7. In summary we take the view that in developed countries it is the exception rather than the rule that such activities would fall within our definition, because:

- the cost differential attributed to rural operations is often overestimated
- the revenues resulting from rural operations are very worthwhile, especially long-term and taking accounting of incoming as well as outgoing traffic.

From limited evidence available for the UK, we believe that low levels of telephone connection are more likely to prevail in areas of deprived inner-city/suburban housing than in rural areas. The challenges of achieving universal service are more likely to be associated with urban poverty and multiple deprivation than with the supposed high cost of rural provision. These observations seem to be confirmed by the Swiss Bakom report.

APPENDIX 5

COST DATA REGARDING THE USO

A number of studies have been performed around the world that have attempted to quantify the cost of the Universal Service Obligation and various social obligations. Whilst this is not the place to reproduce these in full a number of such studies are worthy of further review. These are as follows:

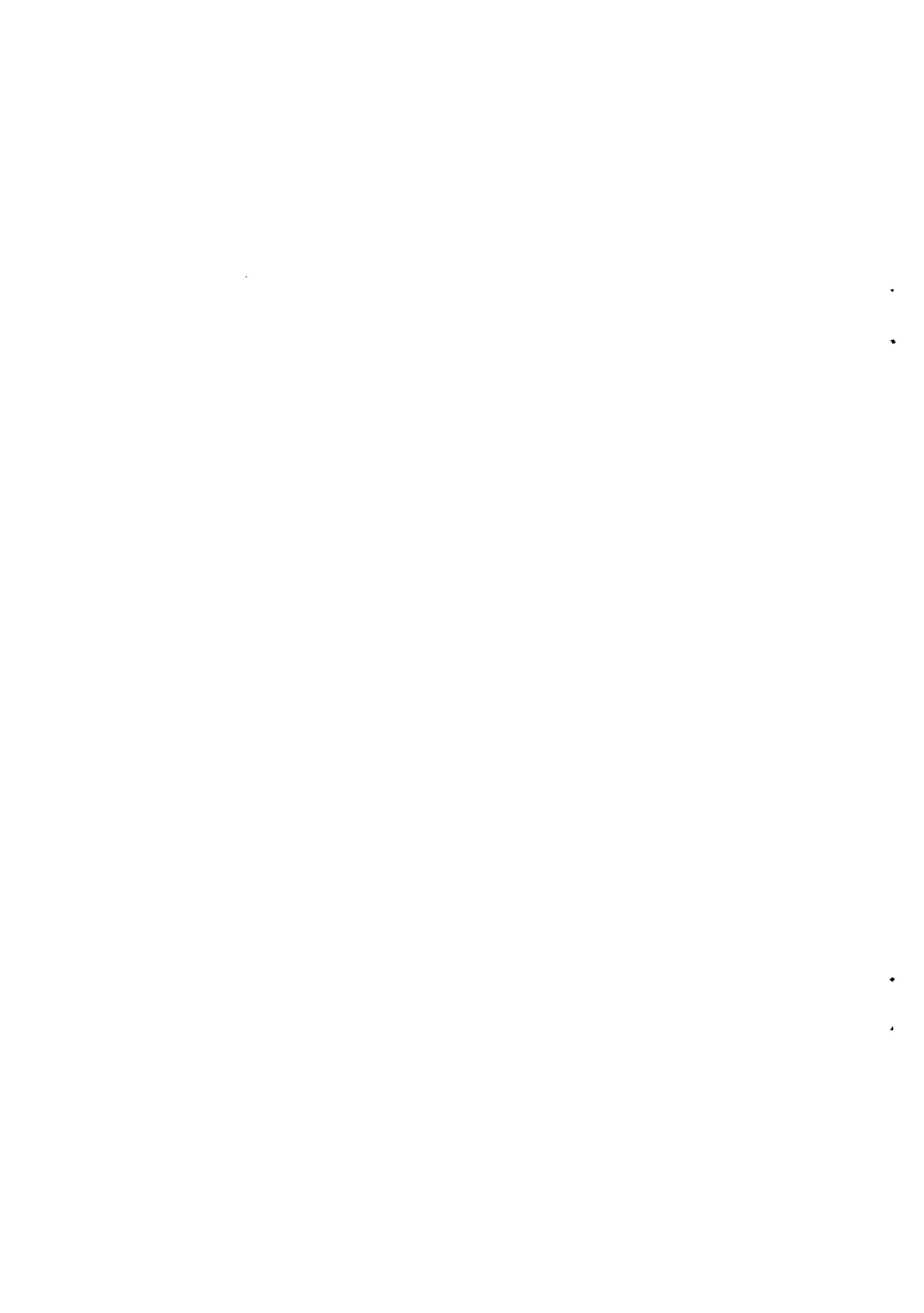
Analysys. Provision of Quantitative Data as Background Material for the Bangemann Group. Final Report, 18 May 1994.

INFRAS. Unterstudie Grundversorgung - Schlussbericht. INFRAS report for BAKOM. Zurich, March 1994.

Bureau of Transport and Communications Economics. The Cost of Telecom's Community Service Obligations. BTCE Report 64, Canberra 1989. ISSN 0814 - 9097.

Commission of the European Communities: Federal Telecommunication Subsidies in the USA. Report prepared for C&C DGXIII, November 1991.

Borrows, John D, Phyllis A. Berntt and Raymond W. Lawton. Universal Service in the United States: Discussions of the Debate. Wissenschaftliches Institut Für Kommunikationsdienste (WIK) publication No. 124, Bad Honnef, March 1994.



APPENDIX 6

EFFECTS OF DIFFERING COSTING METHODS ON SERVICE COST ESTIMATES

In Section 7.4 above, we commented that a wide range of cost allocation bases are available which can result in very different allocation of costs between services. In this appendix, we demonstrate the marked difference in estimates of service costs resulting from "reasonable" methodological alternatives.

The cost of local service consists of three parts - access from the customer's premises to a serving end office (switching system), the end office usage and interoffice transport (transmission). Interoffice transport consists of the outside plant (metallic or fibre cables) and circuit equipment (digital cross connects, multiplexers and lightwave equipment) shared by local and long distance traffic, as well as private lines. The amount of interoffice plant and its costs are driven by the *amount of bandwidth* required at the *busy hour (BH)* of use¹.

A 1990 study by the Rand Corporation computed the costs of local telephone service in California². The study provided estimates of the costs of access and local usage. Rand's study assumed that changes in local calling would cause additional investment in only portions of the interoffice facilities, primarily the multiplexing equipment. Other facilities, such as fibre lines and digital cross connects, were considered one-time, fixed costs. The resulting average capital costs per line were:

\$0.80 - \$1.20 per year

These represent the average annual depreciation, cost of money and income taxes per local telephone line assuming average usage of 2.0 BH CCS per line.

Allocation of Fixed Costs

When the fixed or non-volume sensitive costs associated with the fibre, digital cross connects and lightwave equipment are included in the incremental costs, the average capital costs per line increase by a factor of four:

¹ The unit of capacity for bandwidth is bits of data. A voicegrade channel requires 64Kbits. When transmission is over digital fibre, a voicegrade channel is called a DSO channel. Twenty-four channels combine to form a DSI circuit with 1.566 megabits of capacity.

² Mitchell; "Incremental Cost of Telephone Access and Local Use", Rand Corporation, June, 1990.

\$3.24 - \$4.24 per year

This calculation implicitly assumes that growth in the number of local service customers cause additional investment and capital costs in fibre, cross connects, etc. in spite of the fact that facilities initially placed between switching systems may be adequate to handle growth in demand.

Investment Loading

Telephone company service cost analyses often add additional investment loading to cable, switching and circuit investment for structures (poles and conduit), land, buildings and other secondary, support plant. The argument is that support plant is required to house or otherwise support primary plant and should, therefore, be attributed to services. Others will argue that for most practical situations, the investment in land, buildings and structures would be the same whether a service is added or not.

Investment loading factors for central office equipment may range from 15-50%. When the loadings are added to the previous estimates, the annual costs for interoffice transport increase even further:

\$3.73 - \$6.36 per year

Other Methodological Differences

These are just three examples of differences in costing methods and the significant impact they have upon service cost estimates. There still are others:

- Embedded versus Forward-Looking Costs - The previous estimates were based upon incremental costing, thus they reflected the current or future costs of plant which would have to be added with increased demand for local telephone service. Often cost studies are performed to determine the costs of existing telephone plant attributable to services. These are *embedded costs*.
- Since the cost per unit of capacity of some types of telephone equipment are dropping due to lower material prices or higher vendor discounts, embedded material prices may be higher than incremental material prices. This difference in method would further increase service cost estimates.

- Peak versus Off-Peak Costing - Studies are often based on usage anytime - anyday. This implicitly assumes that all service usage contributes to plant costs. If, however, a service utilises plant during off peak periods, it does not contribute to additional capacity requirements or plant investment. This tends to lower service costs.
- Other Cost Drivers - In our previous example, local telephone service utilises interoffice trunks (a DSO equivalent) for a period of time (BH CCS). Some services, such a private lines, have a dedicated interoffice channel. In this case, the driver is a DSO, DSI or higher bandwidth circuit. Expressing costs on this basis produces a very different figure. For example, using the data from the Rand study, the interoffice plant capital costs for a DSO would be:

\$10.35 - \$13.34 per year (without fixed costs)

\$33.50 - \$191.75 per year (with fixed costs)

Conclusion

There is considerable flexibility in developing cost allocation principles. Having decided upon the principles there is considerable further flexibility in their detailed bases of application. Accordingly, it is possible to support a wide range of cost allocations, each of which will fall within the bounds of acceptable practice, which will clearly enable different conclusions to be drawn with regard to the calculation of service costs.

APPENDIX 7

DEPRECIATION POLICIES

The following tables report the depreciation policies applied by the incumbent operators in each member state. In all cases, unless otherwise indicated, the depreciation policy is straight-line over the useful economic life of the asset and expressed in years.

This serves to illustrate how the incumbent operators in each member state not only categorise their fixed assets into different groupings but also depreciate those similar fixed assets at different rates.

For example, buildings are depreciated over 60 years by Telecom Eireann, 25-33 years by SIP, 20 years by Tele Danmark and up to 10 years by PTT Telecom BV.

Thus, given identical networks, each incumbent operator would derive a different depreciation charge and hence a different "cost" to the business of utilising those fixed assets.

Belgium

<u>Fixed asset category</u>	<u>Useful life</u>
Land	not depreciated
Built-up land	33
Construction equipment in operation	22
Other real rights on buildings	33
Plant, machinery and equipment	3-25
Furniture and office equipment	10
Computers and accessories	3
Vehicles	5
Refurbishment work on rented buildings	5
Non-built up land used by third parties	not depreciated
Buildings used by third parties	33
Building equipment used by third parties	22
Accommodation	33
Equipment in accommodation	22
Disused buildings	not depreciated
Disused building equipment	not depreciated
Tangible fixed assets under construction and advance payments	depreciated in the same way as the fixed assets to which they relate

Source: Belgacom annual report 1993

Denmark

<u>Fixed asset category</u>	<u>Useful life</u>
Buildings, etc.	20
Cable installations	10-14
Telephone exchange installations, etc.	10
Equipment on customers' premises	5
Fixtures and fittings, motor vehicles, etc.	3-5

Source: Tele Danmark annual report 1993

France

France Telecom does not publicly disclose information concerning depreciation practices.

Germany

<u>Fixed asset category</u>	<u>Useful life*</u>
Intangible assets	4
Buildings	10-60
Telephone equipment and terminal equipment	5-10
Data transmission equipment, telephone network and ISDN switching equipment, transmission equipment, radio equipment, and equipment for broadband distribution networks	10
Broadband distribution networks, line networks and cable conduit lines	20
Telecommunications equipment, supplies, etc.	3-12
Other plant and machinery	15
Other fixtures and fittings, tools and machinery	4-15

* Depreciation rates in Germany are determined to a large extent by the tax authority tables

Source: Deutsche Bundespost Telekom annual financial statements 1992

Greece

<u>Fixed asset category</u>	<u>Useful life</u>
Land	not depreciated
Buildings	20
Telephone exchanges	12.5
Telegraph exchanges	10
Radio relay stations	8
Local airline network	12.5
Network piping	25
Underground network	25
Underwater network	20
Connection	10
Secondary installation	8
Tools and equipment	5.5
Printing Machinery	8.3
Tools and equipment at 3rd parties	5
Others	5-8

Source: Hellenic Telecommunications Organization S.A.

Ireland

<u>Fixed asset category</u>	<u>Useful life</u>
Buildings	60
Transmission equipment - duct	40
Transmission equipment - cable	10-20
Radio and repeater equipment	11-35
Exchanges	10-20

Source: Telecom Eireann annual report and accounts 31 March 1994

Italy

<u>Fixed asset category</u>	<u>Useful life</u>
Non-industrial buildings	33
Industrial buildings	25
Plant and machinery	5-20
Other tangible fixed assets	3-15

Source: SIP annual report 1992

Luxembourg

<u>Fixed asset category</u>	<u>Useful life</u>
Land	not depreciated
Buildings	25-50
Transmission cable	10-25
Transmission ducts	15
Fire safety equipment	10
Security equipment	10
Replacement transformers containing PCB	5
Special equipment	10
Underground network (including junctions)	20
Overground network	10
Technical installations and machines	5-10

Source: Enterprise des Postes et Télécommunications annual report 1993

Netherlands

<u>Fixed asset category</u>	<u>Useful life</u>
Land and buildings	0-10
Plant and equipment	4-33
Other property, plant and equipment	7-25
Property, plant and equipment in progress	not depreciated

Source: KPN annual report 1993 (includes postal service)

Portugal

<u>Fixed asset category</u>	<u>Useful life</u>
Buildings and improvements	8-50
Plant, machinery and equipment	3-20
Vehicles, transport and equipment	4-7
Tools	4-10
Office furniture and equipment	3-10
Other fixed assets	3-10

Source: Comunicacoes Nacionais consolidated annual report 1993 (consolidated financial statements of Portuguese TOs)

Spain

<u>Fixed asset category</u>	<u>Useful life</u>
Buildings/ structures	40
Power equipment	13-18
Switching equipment	10-20
Transmission equipment	5-15
Urban and inter-urban networks	8-25
Subscriber equipment and other installations	4-8
Mobile, office equipment and others	5-10

Source: Telefonica annual report, 1993

United Kingdom

<u>Fixed asset category</u>	<u>Useful life</u>
Freehold buildings	40
Leasehold land and buildings	unexpired portion of lease or 40 years, whichever is the shorter
Transmission duct	25
Transmission cable	10-37
Radio and repeater equipment	4-25
Digital telephone exchange equipment	11-13
Computers and office equipment	3-7
Payphones, other network equipment, motor vehicles and cables	3-40

Source: British Telecom annual report 1994

APPENDIX 8

PRELIMINARY LIST OF UNBUNDLED SERVICES: EXTRACT FROM OFTEL STATEMENT ISSUED BY THE DIRECTOR GENERAL OF TELECOMMUNICATIONS. INTERCONNECTION AND ACCOUNTING SEPARATION: THE NEXT STEPS OFTEL, MARCH 1994:

ANNEX H

STANDARD LIST OF INTERCONNECTION SERVICES (BROKEN DOWN BY COMPONENTS)

1 The Tables that follow provide a list of interconnection services technically capable of being provided by any operator. OFTEL has divided these into 3.

List A containing interconnection services that OFTEL believes BT should provide from January 1995 although not all the pricing arrangements are yet determined.

List B contains those services OFTEL believes need to be considered during 1994 so that they can be provided, if agreed or determined, by January 1995.

List C contains those services or issues which OFTEL believes may need more extensive debate on a longer time scale.

2 This annex sets out the contents of the three lists.

A glossary of terms used in the Tables is attached to the back of the Tables. The numbers referred to are the numbers in the Tables.

List A

Services with a conveyance element

- 1.1 DLE interconnect
- 1.2 DMSU-DLE (single tandem)
- 1.3 DMSU-DMSU-DLE (double tandem)
- 1.4 Outgoing International Direct dialling interconnect at DMSU
- 1.5 Outgoing International Direct Dialling interconnect at ISC
- 1.6 Indirect access ingress interconnect at DMSU
- 1.7 Indirect access ingress interconnect at DLE
- 1.14 Transit DMSU-DMSU
- 1.15 Transit DMSU
- 1.16 Access to operator's PRS
- 1.17 Access to operator's freephone service
- 1.18 Access to operator's local call fee services
- 1.19 Access via INMARSAT
- 1.20 Access via Skyphone
- 1.21 Transit access to another operator's PRS
- 1.22 Transit access to another operator's freephone service
- 1.23 Transit access to another operator's local call fee services
- 1.24 DLE interconnect of ISDN
- 1.25 DMSU-DLE interconnect of ISDN
- 1.26 DMSU-DMSU-DLE interconnect of ISDN
- 1.27 Outgoing ISDN IDD at DMSU
- 1.28 Outgoing ISDN IDD at ISC
- 1.29 Transit DMSU-DMSU interconnect of ISDN
- 1.30 Transit DMSU interconnect of ISDN
- 1.31 Access to operator's emergency services
- 1.32 Access to operator's operator assistance
- 1.33 Access to operator's operator assistance + onward successful call
- 1.34 Access to operator's directory assistance
- 1.35 Access to operator's blind and disabled directory assistance
- 1.36 Access to operator's international directory assistance
- 1.38 Access to BT international operator assistance
- 1.39 Access to operator's international operator assistance + onward successful call
- 1.40 Inland transfer charge calls to another operator's customer
- 1.41 Incoming international transfer charge calls

Glossary of Terms

AFN all figure number (eg nnn in 071nnn 9876)
C7 CCITT No. 7 signalling system

D or DE digits digit in number string (eg DE in 0987 DE4321)

DAS Directory Assistance System

DDSN Digital Derived Services Network

DJSU Digital Junction Switching Unit

DLE Digital Local Exchange

DMSU Digital Main Switching Unit

indirect access system to enable BT users to route calls via an OLO system by dialling a particular access code

intra-building link the link between interfaces on multiplexors and the switches at either end of an Interconnect link

ingress from BT to Operator's network

INMARSAT International Maritime Satellite Organisation

ISC International Switching Centre

ISDN Integrated Services Digital Network

i/x interconnect

KDT Keyboard display terminal

Mb megabits per second

NIS Number Information System

NNG national number group (eg xxx in Oxxx 987654)

o/g outgoing (from UK)

OLO Other Licensed Operator

PDH plesiochronous digital hierarchy

PRS Premium Rate Services

RCU Remote Concentrator Unit

SDH synchronous digital hierarchy

transit call from Operator A to Operator B via BT's network

3 The tables show the services and the components that make up those services. It is proposed that it is the services that would be bought, not the components.

4 For ease of understanding, the components and services are described in relation to the BT network structure and its elements.

5 Some services are provided for interconnect now or technically capable of being provided now, others may require some technical development and still others may require fundamental technical development.

Table 1 Services with a conveyance element

Each service (each row in the table) comprises one or more of thirteen components. These components are labelled A to M. They are:

- A **international network:** the network from BT's International Switching Centre to halfway to the foreign admin
- B **ISC:** switching at the International Switching Centre
- C **trunk transmission:** transmission between DMSUs and between DMSU and ISC
- D **trunk switching:** switching in the DMSU layer of BT's network.
- E **junction transmission (I):** transmission between the trunk switching layer and digital local exchange (DLE) or digital junction switching unit (DJSU) or between DJSU and DLE
- F **local switching setup:** setup of switched calls at the BT DLE. This includes any switching at analogue exchanges parented on BT's DLEs. In London this also includes BT's DJSUs.
Table 2B Number Information Systems
- G **local switching March 3, 1994 termination:** termination of switched calls at the BT DLE. This includes any switching at analogue exchanges parented on BT's DLEs. In London this also includes BT's DJSUs.

H **junction transmission (II):** transmission between the DLE and a remote concentrator unit.

I **concentrator unit:** may be colocated or remote (RCU). This component covers the traffic-sensitive costs of the unit.

J **DDSN:** BT's Digital Derived Services Network, including termination of the call.

K **Operator Centres:** BT has centres for Directory Assistance, International Directory Assistance, Operator Assistance, International Operator Assistance and Emergency Services. This component in the table also includes the conveyance from BT's DLEs to Operator Handling Centres.

L **Payphone Access:** Levy on free-to-caller calls made from BT public payphones .

M **Outpayments:** Some services have a price component that includes a payment to an originating or terminating Operator (or foreign Admin) or to a Service Provider (e.g. transit, access to BT Freephone 0800, outgoing international).

In addition to these components, contributions to Access Deficit (ADCs) will be payable, subject to Oftel waiver, on all OLO-billed calls billed that use BT's exchange lines.

Note that services that offer access to an Operator's operators could be by an OLO's customer or by that OLO's operators.

Table 2A Data Management Amendments

The creation or amendment of number ranges. In addition to these services, BT may reserve the right to charge for specific network management intervention, for example, call gapping.

Table 2B Number Information Systems

Entry of Operators' customer number information on to BT's Number Information System (NIS) or into BT's phone books. Also,

access to customer number information, either using BT's Directory Assistance System (DAS) or through supply of BT Phonebooks. Although not shown in the tables, BT would also provide, and charge for, service development, data amendment work and operator training for OLOs to setup Operator Centres.

Table 3 Infrastructure Services

Tables 3A, 3B and 3C cover the interconnection services proposed by BT.

Table 3D shows the price structure of dedicated point-to-point transport.

Table 4 Network Features

Features in addition to basic services identified in Tables 1-3. The table quotes examples of such services and is not intended to be exhaustive

A glossary of terms follows the tables.

LIST OF REQUESTED SERVICES TECHNICALLY CAPABLE OF BEING PROVIDED BY ANY OPERATOR
TABLE 1
SERVICES WITH A CONVEYANCE ELEMENT

Network components used in providing service		A	B	C	D	E	F	G	H	I	J	K	L	M
		int'l nwk	ISC	trunk xmn	trunk switch	jctn xmn (I)	local switch setup	local switch tmntn	jctn xmn (II)	CU	DDSN	Oprtr Cntns	Pyphn Accss	Out- paymt
1.1	DLE i/x						X	X	X	X				
1.2	DMSU-DLE (single tandem)			X		X	X	X	X	X				
1.3	DMSU-DMSU-DLE (double tandem)			X	X	X	X	X	X	X				
1.4	o/g IDD i/x at DMSU	X	X	X	X									X
1.5	o/g IDD i/x at ISC	X	X											X
1.6	indirect access ingress i/x at DMSU			X	X	X	X		X	X				
1.7	indirect access ingress i/x at DLE						X		X	X				
1.8	indirect access from Public Payphone			X	X	X	X		X	X			X	
1.9	line side i/x own DLE calls						X	X	X	X				
1.10	line side i/x single tandem calls				X	X	X	X	X	X				
1.11	line side i/x double tandem calls			X	X	X	X	X	X	X				

SERVICE	int'l nwk	ISC	trunk xmn	trunk switch	jnctn xmn (I)	local switch setup	local switch trmntn	jnctn xmn (II)	CU	DDSN	Optr Cntrs	Pyphn Access	Out- paymt
1.12 line side i/x o/g IDD calls	X	X	X	X	X	X		X	X				
1.13 line side i/x i/c IDD calls	X	X	X	X	X		X	X	X				
1.14 transit DMSU-DMSU			X	X									X
1.15 transit DMSU				X									X
1.16 access to Operators Services			X	X						X			X
1.17 access to Operator's Freefone Services			X	X						X			X
1.18 access to Operator's Local Call Free Services			X	X						X			X
1.19 access via INMARSAT	X	X	X	X									X
1.20 access to Skyphone	X	X	X	X									X
1.21 transit access to another Operator's PRS			X	X									X
1.22 transit access to another Operator's Freefone services			X	X			X	X					X
1.23 transit access to another Operator's Local Call Fee services			X	X				X					X
1.24 DLE i/x ISDN					X	X	X	X	X				
1.25 DMSU-DLE i/x of ISDN					X	X	X	X	X				

SERVICE	int'l	ISC	trunk	trunk	trunk	local	local	local	local	CU	DDSN	Opntr	Pyph	Out-
	nwk		xmn	switch	xmn (I)	switch	switch	switch	switch	CU	DDSN	Cntrs	n	paymt
1.26			X	X	X	X	X	X	X	X				
1.27	X	X	X	X										X
1.28	X	X												X
1.29			X	X										X
1.30			X	X										X
1.31			X	X	X	X	X	X	X			X		
1.32			X	X	X	X	X	X	X			X		
1.33			X	X	X	X	X	X	X			X		
1.34			X	X							X	X		
1.35			X	X							X	X		
1.36			X	X								X		
1.38			X	X								X		

SERVICE	int'l nwk	ISC	trunk xmn	trunk swtch	jnctn xmn (I)	local swtch setup	local swtch tmntn	jnctn xmn (II)	CU	DDSN	Oprr Cntrs	Pyphn Access	Out-paymt
1.39 Access to Operator's International Operator Assistance + onward scssful call	X	X	X	X							X		X
1.40 Inland transfer charge calls to another Operator's customer			X	X	X	X	X	X	X		X		
1.41 Incoming international transfer charge calls	X	X	X	X							X		X
1.42 Virtual private network i/x													
1.43 Intelligent network i/x													

DETAILS TO BE DEFINED AT A LATER DATE

LIST OF REQUESTED SERVICES TECHNICALLY CAPABLE OF BEING PROVIDED BY ANY OPERATOR
TABLE 2
OTHER ANCILLARY SERVICES

TABLE 2A--DATA MANAGEMENT AMENDMENTS

SERVICE	fixed set-up	per zone set-up	per local exchnng set-up
2A.1 new AFN	X	X	X
2A.2 new NNG	X	X	X
2A.3 new NNG discrim down to single D digit	X	X	X
2A.4 new NNG discrim down to no. of D digits	X	X	X
2A.5 new NNG DE combntn	X	X	X
2A.6 new indirect access code	X	X	X
2A.7 changes to existing NNG numbr ranges	X	X	X
2A 8 change to AFN	X	X	X
2A 9 change to NNG discrim down to single D digit	X	X	X
2A 10 change to NNG discrim down to no. of D digits	X	X	X
2A 11 changeto NNG DE combntn	X	X	X
2A. 12 change to indirect access code	X	X	X
2A 13 new Operatr chargeband	X	X	X

TABLE 2B--NUMBER INFORMATION

SERVICE	add	amend	delete	hold	bold	super-bold
2B 1 data on to NIS via hardcopy	X	X	X	X		
2B 2 data on to NIS via disk	X	X	X	X		
2B 3 entry in Operator's Phone book	X				X	X

The following have costs that are driven per unit of the service:

2B.4 hardback Operator Phonebooks

2B.5 paperback Operator Phonebooks

2B.6 KDT terminals for DAS access

2B.7 access to DAS (per terminal)

LIST OF REQUESTED SERVICES TECHNICALLY CAPABLE OF BEING PROVIDED BY ANY OPERATOR

TABLE 3
INFRASTRUCTURE SERVICES

TABLE 3A--IN-SPAN CONNECTION

SERVICE	new duct instlltn	site trnspt mtce	PDH mux instlltn per 2Mb	PDH mux mtce per 2Mb	SDH mux instlltn system (by size)	SDH mux mtce per system (by size)	intra-bldg signllg links cnnctn (see Table 3C)	intra-bldg signllg links rental (see Table 3C)	intra-bldg capcty links cnnctn (see Table 3C)	intra-bldg capcty links rental (see Table 3C)
3A. 1 In-span connection via PDH	X	X	X	X			X	X	X	X
3A. 2 In-span connection via SDH	X	X			X	X	X	X	X	X

TABLE 3B--INTERCONNECT EXTENSION CIRCUITS

SERVICE	instlltn per 2Mb	mtce + per depn per 2Mb	mtce depn per 2Mb per km
3B.1 Interconnect extension circuits	X	X	X

TABLE 3C--INTRA-BUILDING LINKS (Signalling and capacity)

SERVICE	signalling link set with one route (instltn per 2x2Mb set)	signalling link set with one route (mnce + depn per 2x2Mb set)	signalling link set per addtnl route (instltn per set)	signalling link set per sbsqpt ordered route (instltn per set)	cpcty links (instltn per 2Mb)	cpcty links (mnce + depn per 2Mb)	modifi- cation per 2Mb
3C.1 provisions	X	X	X	X	X	X	
3C.2 route type change							X
3C.3 OLO switch change	X		X		X		
3C.4 Operator switch change at OLO request	X		X		X		
3C.5 time slot 16 to C7 upgrade							X
3C.6 Operator switch modfctn due to OLO bearer change							X

TABLE 3D--POINT-TO-POINT TRANSPORT

SERVICE	trunk		jnctn		jnctn		jnctn		trunk		jnctn		jnctn		local			
	xmn	instn	xmn(I)	instn	xmn (II)	instn	xmn (I)	mtce+	depn	xmn	mtce+	depn	xmn (II)	mtce+	depn	loop	mtce+	depn
3D 1 Operator to Operator's end-customer	X		X		X		X		X			X				X		
3D 2 within Operator's nwk	X		X		X		X		X			X						
3D 3 system link (Operator to OLO or vice-versa)	As Table 3A (in-span connection), but without intra-building signalling and capacity links																	
3D 4 OLO(A) to OLO(A) or OLO(B) via Operator	Built from 2xservice 3D 3 and 1 x3D.2																	

Note that the above services are required at 64Kb and the following multiples of 2Mb: 2, 8, 34, 140, 155, 622.

Note also that the services may not use all the components. For example, the transport might only run from a local exchange building to an end-customer.

LIST OF SERVICES TECHNICALLY CAPABLE OF BEING PROVIDED BY ANY OPERATOR
TABLE 4
NETWORK FEATURES

NB Cost components to be identified.

SERVICE

- 4.1 change of number announcemt
- 4.2 call diversion
- 4.3 geographic portability within same NNG
- 4.4 non-geographic number blocks
- 4.5 inter-Oprtr portability of non-geog numbers

APPENDIX 9

TELEPHONE COMPANY COST STATEMENT BREAKDOWN

To achieve a meaningful understanding of service costs and revenues requires detailed financial information. This is illustrated below based upon hierarchical analysis of an operator's reported performed. We have used as an example an analysis prepared in the USA where the practice of service costing is currently more widely applied. These analyses highlight the conflict between maintaining the confidentiality of an operator's commercial information and providing the level of detail which an interconnecting operator might consider necessary.

Illustrative analyses are as follows:

- Total Company Results Report
- Segment Report
- Consumer Segment Report
- Residence Line Contribution Report
- Network Transfer Charges
- Network Transfer Prices Segment Report
- Central Office Line Terminating Equipment

1. Total Company Results Report

Income Statement	\$	\$
Total Operating Turnover		78,385,530
Operating Expenses		
Plant Specific	(17,281,942)	
Plant Non-Specific	(7,258,829)	
Depreciation	(14,201,025)	
Customer	(17,678,105)	
Corporate	(11,542,503)	
	<hr/>	
Total		(67,962,404)
Other Operating Income & Expenses		(3,077,237)
Interest & Related Items		(8,730,377)
		<hr/>
Net Loss		(1,384,488)
		<hr/>
Net Asset Statement		
Telephone Plant in Service		274,410,698
Less: Accumulated depreciation		(88,064,862)
Material & Supplies		3,052,166
Telephone Plant Under Construction		4,904,082
Less: Customer deposits		(893,206)
		<hr/>
Total Assets		193,408,878
		<hr/>
Debt Ratio		63%
Equity Capital (\$)		71,967,444
Return on Equity		-2%
Return on Turnover		-2%
Asset Turnover		0.41
Leverage		2.69

Comment

For most European companies, this information is publicly available.

2. Segment Report

	<u>Total Company</u> (\$)	<u>Consumer</u> (\$)	<u>Small Business</u> (\$)	<u>Large Business & Government</u> (\$)	<u>Inter- exchange Carrier</u> (\$)	<u>Public</u> (\$)	<u>Directory Advertising & Other</u> (\$)	<u>Network</u> (\$)
Turnover and Transfer Charges	78,385,530	11,867,545	8,292,393	6,492,415	35,531,740	1,682,411	14,519,026	0
Transfer Charges	50,000,000	0	0	0	0	0	0	50,000,000
Total (A)	128,385,530	11,867,545	8,292,393	6,492,415	35,531,740	1,682,411	14,519,026	50,000,000
Direct Costs								
Volume-Sensitive Costs	99,490,077	17,960,099	8,343,331	3,842,195	7,828,729	1,707,121	6,174,422	53,634,180
Fixed Costs	7,492,735	54,102	14,292	1,035,136	239,144	0	15,224	6,134,837
Total (B)	106,982,812	18,014,201	8,357,623	4,877,331	8,067,873	1,707,121	6,189,646	59,769,017
Segment Contribution (A-B)	21,402,718	(6,146,656)	(65,230)	1,615,084	27,463,867	(24,710)	8,329,380	(9,769,017)
Common Costs	22,787,206							
Net Loss	(1,384,488)							

Comment

This is similar to what member state NRAs may consider for reporting the revenues and costs of the incumbent operator's retail segments, the network, and charges to other operators and service providers. This alone would not provide the visibility required for costs underlying transfer charges to the retail segments and other operators.

3. Consumer Segment Report

	<u>Consumer Segment</u> (\$)	<u>Residence Line</u> (\$)	<u>Service Connection Charges</u> (\$)	<u>Directory Assistance</u> (\$)	<u>Directory Listing</u> (\$)	<u>Custom Calling</u> (\$)
Turnover and Transfer Charges						
Turnover	11,867,545	7,153,013	1,647,936	607,040	439,794	2,019,762
Transfer Charges	0	0	0	0	0	0
Total (A)	11,867,545	7,153,013	1,647,936	607,040	439,794	2,019,762
Direct Costs						
Volume-Sensitive Costs	17,960,099	10,963,383	5,764,467	616,282	180,146	435,821
Fixed Costs	54,102	41,186	0	7,178	0	5,738
Total (B)	18,014,201	11,004,569	5,764,467	623,460	180,146	441,559
Service Contribution (A-B)	(6,146,656)	(3,851,556)	(4,116,531)	(16,420)	259,648	1,578,203
Common Costs	0					
Segment Contribution	(6,146,656)					

Comment

Using the Consumer Segment as an example, this report provides a bit more detail, but probably would not satisfy new entrants of the NRAs since it does not disclose the underlying costs, their utilisation and unit transfer prices.

4. Residence Line Contribution Report

	<u>Actual</u> (\$)	<u>Monthly</u> <u>Amount Per</u> <u>Residence Line</u> (\$)	<u>Percentage of</u> <u>Turnover and</u> <u>Transfer</u> <u>Charges</u> (\$)
Turnover and Transfer Charges			
Turnover	7,153,013	7.44	100%
Transfer changes	0	0.00	0
Total (A)	<u>7,153,013</u>	<u>7.44</u>	<u>100%</u>
Direct Costs			
Volume Sensitive Costs			
<u>Network Transfer Charges</u>			
Local Loop	5,704,613	5.93	80%
Central Office	3,505,313	3.64	49%
Interoffice Transport	0	0.00	0%
Other	0	0.00	0%
Total (B)	<u>9,209,926</u>	<u>9.57</u>	<u>129%</u>
Business Process Costs			
Sales	0	0.00	0%
Service Establishment	0	0.00	0%
Service Maintenance	1,138,125	1.18	16%
Invoicing & Collection	615,332	0.64	9%
Other	0	0.00	0%
Total (C)	<u>1,753,457</u>	<u>1.82</u>	<u>25%</u>
Total Volume Sensitive Costs (B+C)	10,963,383	11.40	153%
Fixed Costs	41,186	0.04	1%
Total Direct Costs (D)	11,004,569	11.44	154%
Service Contribution (D-A)	(3,851,556)	(4.00)	(54%)

Comment

Gaining further detailed analysis of the Residence Line contribution, we begin to get some idea of what types of costs underlie retail segment results and operator charges, but there is no information on *utilisation* and *unit transfer prices*.

5. Network Transfer Charges

Facilities provided to: Consumer Segment - Residence Line

<u>Quantity</u>	<u>Description</u>	<u>Monthly Price</u> (\$)	<u>Total Annual</u> <u>Charges</u> (\$)
80,166	Local loops	5.93	5,704,613
80,166	Central office line terminations	2.93	2,818,637
82,161	Local originating interoffice busy hour minutes of use	0.10	101,854
80,166	Local originating busy hour minutes of use	0.61	584,822
	Subtotal - Central Office		<u>3,505,313</u>
	Total		<u>9,209,926</u>

Comment

These are the kinds of data we believe NRAs will need to make a determination and the cost allocation information an operator would find acceptable. We, of course, are not into proprietary information from a telephone company's point of view.

6 Network Transfer Prices Segment Report

Network Component: Central Office Line Terminating Equipment
Type: Residence Line

<u>Equipment Component</u>	<u>Average Installed Cost Per Unit of Capacity (\$)</u>	<u>Percent Occurrence</u>	<u>Depreciation Rate</u>	<u>Interest Charge</u>	<u>Maintenance Rate</u>	<u>Operating Taxes</u>	<u>Other</u>	<u>Total Carrying Cost</u>	<u>Monthly Costs (\$)</u>
Type A Line Card	159.71	50%	6%	4%	5%	1%	0%	15%	1.00
Type B Line Card	199.98	50%	6%	4%	5%	1%	0%	15%	1.25
Line Drawer	30.41	100%	6%	4%	5%	1%	0%	15%	0.38
Main Frame Connector	8.51	100%	6%	4%	5%	1%	0%	15%	0.10
Jumper Wire	4.92	100%	6%	4%	5%	1%	0%	15%	0.06
Arrestor Module	3.15	100%	6%	4%	5%	1%	0%	15%	0.04
Rotating Terminal Block	0.76	100%	6%	4%	5%	1%	0%	15%	0.01
Protector	6.95	100%	6%	4%	5%	1%	0%	15%	0.09
Total									<u>2.93</u>

Comment

This gets at the question of how transfer charges would be developed. This is information an operator and NRA would need in a determination.

7 Central Office Line Terminating Equipment

<u>Equipment Component</u>	<u>Quantity in Service</u>	<u>Installed Cost (\$)</u>	<u>Average Unit Cost (\$)</u>	<u>Line Capacity Per Unit</u>	<u>Physical Line Capacity</u>	<u>Percent Usable Capacity</u>	<u>Usable Capacity</u>	<u>Average Installed Cost Per Unit of Capacity (\$)</u>	<u>Units in Service</u>	<u>Percent Utilization</u>	<u>Spare Capacity Investment (\$)</u>
Type A Line Card	104,402	16,674,013	159.71	1	104,402	100%	104,402	159.71	94,000	90%	1,661,300
Type B Line Card	34,187	6,836,616	199.98	1	34,187	100%	34,187	199.98	31,861	93%	465,147
Type C Line Card	3,225	859,836	266.62	1	3,225	100%	3,225	266.62	600	19%	699,867
Type D Line Card	519	139,883	269.52	1	519	100%	519	269.52	0	0%	139,883
Line Drawer	5,001	4,865,955	973.00	32	160,032	100%	160,032	30.41	126,432	79%	1,020,764
Main Frame Connector	1,667	921,955	553.06	100	166,700	65%	108,355	8.51	95,000	88%	113,633
Jumper Wire	3,000,000	376,006	0.13	0.03	90,000	90%	81,000	4.92	73,000	95%	17,203
Arrestor Module	111,500	351,120	3.15	1	111,500	100%	111,500	3.15	103,000	92%	26,767
Rotating Terminal Block	3,434	225,496	65.67	96	329,664	90%	296,698	0.76	126,461	43%	129,383
Protector	96	60,069	625.72	100	9,600	90%	8,640	6.95	8,000	93%	4,450
Total		31,310,949									4,278,397

Comment

Finally, this would be an actual property record of telecom line terminating equipment used to develop one transfer charge between the telecom Network and Retail. A capacity costing approach is used here. One might also show values using an average costing approach. In addition, these are embedded costs. An alternative is to use incremental costs.

This would require two changes. First, one would ask whether the telecom company is likely to exhaust any equipment component. (This company is not likely to run out of rotating terminal blocks). For equipment which is not expected to exhaust, no cost would be included in the transfer price. Secondly, for equipment which is expected to exhaust, current (rather than embedded) costs would be used.