

**Study on the Cost Allocation for Number
Portability, Carrier Selection and
Carrier Pre-Selection**

Final Report for

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by

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The views and recommendations expressed in this study are those of the consultants and do not necessarily reflect the view of the European Commission

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EXECUTIVE SUMMARY

A STUDY ON THE COST ALLOCATION FOR NUMBER PORTABILITY, CARRIER SELECTION, AND CARRIER PRE-SELECTION

This is the executive summary of the two volume study, the primary purpose of which is to develop guidelines which may assist National Regulatory Authorities (NRAs) in the assessment and allocation of the costs of number portability, carrier selection, and carrier pre-selection (“the services”).

POLICY BACKGROUND AND TERMS OF REFERENCE

EU Directives require the following services to be available:

- **Call-by-call carrier selection (CS)** should have been offered by all fixed local access providers with significant market power (SMP) since 1 January 1998 in all Member States where full liberalisation was due by that date. In Member States where additional transition periods have been agreed, carrier selection should be in place by the end of that additional period.¹
- By 1 January 2000, **carrier pre-selection (CPS)**, with the default carrier to be determined by the subscriber and with call-by-call override to be available to the user, should be offered by all fixed local access providers with SMP in all Member States.² In Member States where additional periods were agreed for full liberalisation, carrier pre-selection should be in place two years after the date of liberalisation at the latest.
- Also by 1 January 2000, **operator number portability (NP)** should be offered by all fixed local access providers. In the case of geographic numbers, portability should be offered at a specific location and in the case of other than geographic numbers at any location.³ In Member States where additional periods were agreed for full liberalisation, number portability should be in place two years after the date of liberalisation at the latest.

The European Commission has referred to the services which are the subject of this study as “key facilitators of consumer choice and effective competition in a liberalised telecommunications environment”. Other public authorities have also seen the development of these services as an important part of an efficient and competitive telecommunications market. Our impression is that this view has been accepted by major operators.

EU Directives do not prescribe in any detail either how Member States should introduce these services, or how the costs should be shared between operators. Thus within the context of the overall principles of the Interconnection Directive, as amended, and other relevant EU legislation,

¹ Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on Interconnection in Telecommunications with regard to ensuring universal service and inter-operability through application of the principles of open network provision (ONP).

² Directive 98/61/EC of the European Parliament and of the Council of 24 September 1998 amending Directive 97/33/EC (the Interconnection Directive) with regard to operator number portability and carrier pre-selection. Official Journal of the European Communities L268/37. Note also that Section 24 of Directive 97/33/EC provides that the “functioning of this Directive should be reviewed by 31 December 1999, in particular to examine the scope of universal service and the timetable for number portability”.

National Regulatory Authorities (NRAs) may make their own arrangements adapted to specific national market situations.

EU Directives do, however, impose duties on NRAs concerning costs, charges, and other matters relevant to the study. These duties (emphasis has been added) require NRAs to:

- ensure that charges are to be cost oriented (Article 1(3) of the Directive amending the Interconnection Directive);
- ensure that charges for number portability are to be reasonable (Article 15 of the ONP Voice Telephony Directive);
- ensure that direct charges to customers for carrier pre-selection should not act as a disincentive for the use of the facility (Article 1(3) of the Directive amending the Interconnection Directive);
- exercise their responsibilities regarding interconnection in a way that provides maximum economic efficiency and gives the maximum benefit to end-users. Relevant considerations include the need to ensure satisfactory end-to-end communications for users, the need to stimulate a competitive market, and the need to ensure the fair and proper development of a harmonised European telecommunication market (Article 9 of the Interconnection Directive); and
- ensure effective competition and/or interoperability of services (Article 9 of the Interconnection Directive).

One particular issue which regulators will want to address in some detail is that of assessing and sharing the costs for the introduction and operation of number portability, carrier selection, and carrier pre-selection between the operators involved. In some Member States where these new facilities have already been introduced the NRAs have intervened in order to ensure pro-competitive arrangements for cost allocation. Others are considering the issue.

The practical application of the policies has been marked by controversies including a current court case between Deutsche Telecom and its regulatory authority and an earlier dispute between BT and OFTEL.⁴ Both of these disputes arose from disagreements about how the costs of the new services should be met.

Against this background, the terms of reference are that the present study should:

“...provide a clear basis for the assessment and allocation of costs for number portability and carrier pre-selection. It should also make concrete proposals for guidelines which may help the NRAs in drafting the necessary arrangements. ... The study should suggest a model for cost allocation which is in line with existing EU regulatory principles and which could provide guidance for NRAs in all EU Member States.”

3 *ibid.*

4 Although this case preceded the Directives, it turned on many of the same issues that are central to the present study.

As part of this work, a review was conducted of relevant experience in six Member States where the facilities have already been introduced, including experience with charging modalities. The six Member States were chosen so as to represent different circumstances and approaches.

EXPERIENCE IN SIX MEMBER STATES

The Member States reviewed as part of this study were France, Finland, Germany, the Netherlands, Sweden and the UK. Their experience and the possible lessons for other NRAs have been summarised in Table 1 below.⁵

The major lessons from these country studies can be summarised under the following three headings:

- the implementation of the services;
- the cost allocation arrangements; and
- the level of regulatory involvement.

The Implementation of the Services

Number portability has been introduced in a variety of different ways in the Member States that we reviewed, and NRAs have generally been content to allow operators to arrive at the most appropriate technical solution. In some Member States (such as Finland, Sweden, and initially the UK) an interim solution was introduced prior to the introduction of a more efficient longer-term solution which is usually, but not always, an IN-based solution. In those instances where a migration to a more efficient technical solution is planned, it is important that barriers are not introduced to prevent such a migration occurring.

There is greater scope for Member States to implement carrier selection and carrier pre-selection in different ways. Although the Directive requires only that operators with significant market power (SMP operators) provide carrier selection and carrier pre-selection, some Member States have extended the requirement to offer carrier pre-selection to all local fixed network operators.

The Cost Allocation Arrangements

The most significant lesson from the review of Member States' experience has been that the cost allocation arrangements for the additional conveyance costs could affect the take-up of number portability. This has become apparent in Finland and France where on-switch solutions involving significant additional conveyance costs were implemented and the costs passed on to recipient network operators. It may, therefore, be appropriate for the cost allocation arrangements to contain the appropriate incentives to migrate to a suitable long-term solution.

Concerning carrier selection and carrier pre-selection, one of the lessons to emerge has been that the way that the obligations have been imposed appears to influence the way that the costs are allocated. In general the system set-up costs have been borne by each operator where the obligations were symmetric. Where obligations have only been imposed on operators with SMP, some of these operators (eg in the Netherlands for carrier selection and in Finland for carrier pre-

⁵ Full details are provided in Chapter 5 of Volume I and Appendix 1 of Volume II of this study.

selection) have been permitted to pass on at least some of their system set-up costs to indirect access providers.

Where inter-operator charges have been permitted for carrier selection and carrier pre-selection, these do not to date appear to have impeded the development of competition.

The Level of Regulatory Involvement

The review of Member States' experience has identified the need for more guidance on the question of how the costs of number portability, carrier selection, and carrier pre-selection should be allocated. Commercial negotiation, in some instances, has resulted in high charges or has placed a charge on what may well be an inappropriate party.

A clearly preferable method for ensuring cost-orientation has not yet emerged. However, the use of cost-accounting systems, where in line with Commission guidance on accounting separation and cost accounting, could be a suitable basis for assessing whether charges are cost oriented.

Table 1
Summary of and lessons from the experience of six EU Member States

Issue	Summary of experience in Member States	Lessons from Member State experience
<i>Implementation of NP</i>	<ul style="list-style-type: none"> • Long term solutions do not necessarily have to be IN based solutions. In the UK the long-term solution involves call drop-back. • A mix of technical solutions has been used to implement NP: <ul style="list-style-type: none"> – Three Member States (Finland, Sweden and the UK) plan to introduce or have already introduced an interim solution prior to the introduction of a longer-term technical solution. – The migration path to the longer-term solution can be either pre-planned (eg to call drop-back in the UK) or left open (eg to an IN solution in Finland). – Two Member States moved straight to their long-term solution: France with onward routeing and the Netherlands with an IN solution. A number of technical solutions are working in parallel in Germany. 	<ul style="list-style-type: none"> • Some on-switch solutions involving high additional conveyance costs can affect the take-up of NP, and therefore NRAs should ensure that obstacles to migration to a more efficient solution do not exist (ie. they should try to avoid locking in a technical solution that involves additional conveyance costs). Incentives to migrate to a suitable long-term solution should be contained in the cost allocation arrangements.
<i>Implementation of CS/CPS</i>	<ul style="list-style-type: none"> • NRAs have imposed the obligation regarding CS and CPS differently in different Member States: <ul style="list-style-type: none"> – Two Member States (Sweden and Germany) have imposed the obligation on all fixed local loop operators. – Three Member States (France, the Netherlands and the UK) have imposed the obligation only on operators with SMP. – One Member State (Finland) originally imposed the obligation on all fixed local loop operators but subsequently narrowed it. 	<ul style="list-style-type: none"> • The scope of the obligation has tended to influence the way that NRAs allocate costs. The common themes were: <ul style="list-style-type: none"> – where obligations are symmetric, operators have borne their own establishment costs. – where they are not symmetric there have been divergences but some operators have been allowed to pass on some of their establishment costs to other operators (eg. France and the Netherlands with CS).

Table 1 (Cont'd)
Summary of and lessons from the experience of six EU Member States

Issue	Summary of experience in Member States	Lessons from Member State experience
<i>Cost allocation arrangements</i>	<ul style="list-style-type: none"> Operators have generally had to bear their own system set-up costs for NP but have been allowed to pass on their per-line costs for NP (except in Germany). The additional conveyance costs of NP have generally been subject to commercial negotiation. In some countries where CS and CPS have been imposed only on SMP operators the system set-up costs have been recoverable through inter-operator charges (for example in Finland for CPS and the Netherlands for CS). 	<ul style="list-style-type: none"> Inter-operator charges to recover the additional conveyance costs associated with NP could deter the take-up of the service when imposed on the recipient network operator. Donor network operators may find it difficult to levy an “exit” charge on customers leaving their network. Inter-operator charges for CS and CPS do not appear to deter the development of effective competition.
<i>Regulatory Involvement</i>	<ul style="list-style-type: none"> Two NRAs (Finland and Sweden) provided only high level guidance and left the details to operators to agree through commercial negotiations. The others have been more closely involved in some way in regulating the charges levied by SMP operators. NRAs in all six Member States emphasised the principle of cost orientation when providing guidance on charges. A number of different approaches have been used by NRAs to arrive at cost oriented charges including the use of cost accounting systems and international benchmarking. The latter has been used by one NRA (Germany) to arrive at a cost oriented charge for the per-line administration costs of CPS. 	<ul style="list-style-type: none"> Guidance is often required on the type of costs that should be passed on to other operators. The absence of such guidance can lead to high inter-operator charges. NRAs may need to take a more pro-active role when assessing whether changes are cost oriented. It is too early to assess which of these approaches are best. The use of cost based accounting systems for interconnection, however, is consistent with the existing EU regulatory framework.

TECHNICAL SOLUTIONS

The technical solution to implement the services has sometimes been identified following discussions in a working group comprising operators, the NRA, and often manufacturers.

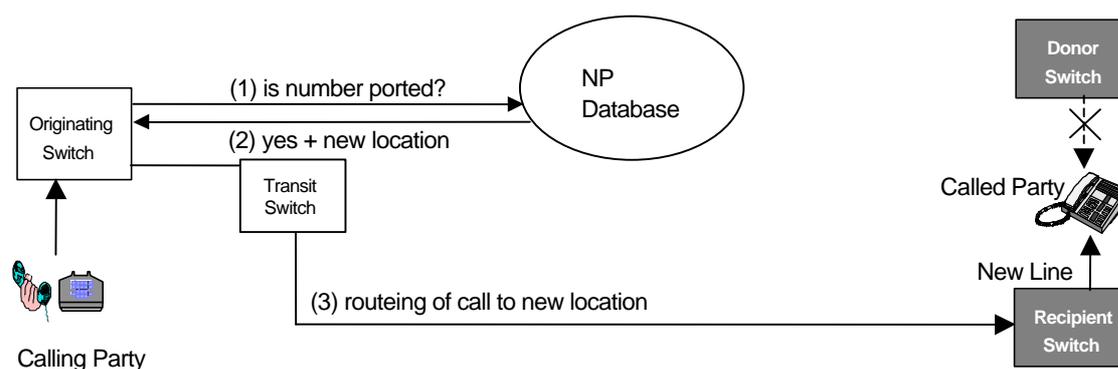
Technical choices themselves are beyond the scope of the study except to the extent that they may influence, or be influenced by, cost allocation arrangements. However, the technical options and solutions form an essential background to questions of cost assessment and recovery.⁶

Number Portability

The technical solutions used to introduce number portability can be classified into off-switch and on-switch solutions. Off-switch solutions transfer the portability information into one or several external databases that can be accessed by all network switches for query, perhaps using Intelligent Network (IN) techniques. Off-switch solutions allow for the best routing of the call towards the final destination. On-switch solutions rely on information in the donor local exchange (i.e. the exchange where the subscriber was initially located). On-switch solutions involve call forwarding or “tromboning” at least in the signalling phase if not for the duration of the call.

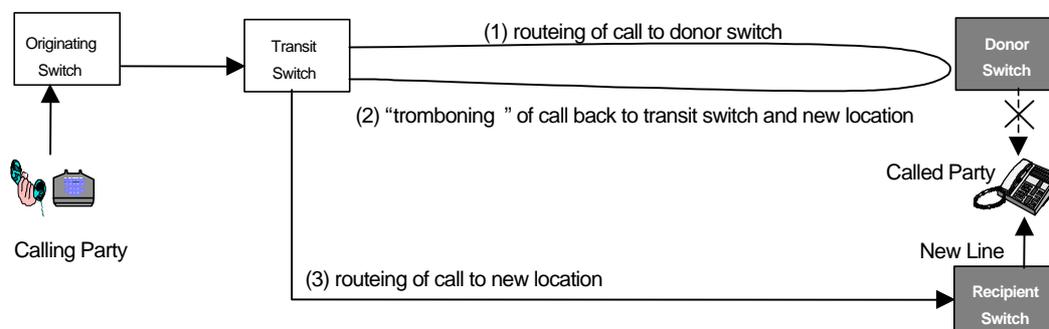
This difference is illustrated in the diagrams below, which show that the routing to a new number is more direct under an off-switch solution. There are, of course, a number of technical solutions within each class of solutions although we have only presented one of each below.

Figure 1
Example of Off-Switch Solution with Query by Default for an Originating Switch



⁶ Full details are provided in Chapter 4 of Volume I and in Volume II.

Figure 2
Example of On-Switch Solution with “Tromboning”



The choice of technical solution will have cost implications which will affect the cost burden of different operators and the balance between the establishment and consumption costs that each operator will face. For instance, off-switch solutions are more expensive to establish than on-switch solutions because of higher system set-up costs. There may also be a cost to create a national ported numbers database. The additional conveyance costs, however, will be very low, as a call to a ported number does not need to involve the donor network operator.

The six EU Member States that we reviewed have introduced number portability in different ways:

- France and the UK have selected an on-switch solution as the longer term solution;
- the Netherlands have introduced a long-term IN solution without an interim solution;
- Sweden and Finland have introduced an interim on-switch solution but hope to migrate to a long-term IN solution; and
- Germany (and Sweden initially) has a number of technical solutions working in parallel.

In theory, an operator — particularly an incumbent operator — would prefer to introduce number portability using an on-switch solution. This will usually be the most cost effective solution for them as they will incur relative low system set-up costs but high on-going additional conveyance costs. As the volume of porting customers increases and the additional conveyance costs rise, an IN solution or call drop-back will become more cost effective and the incumbent should choose to migrate to the longer-term solution.⁷

The way that costs are allocated could affect the incentives inherent in the technical solutions. In Finland, for example, the incumbent operator has been permitted to pass on the additional conveyance costs to other operators, thus removing the incentive to move to the more efficient technical solution.

The cost allocation arrangements need to provide the incentive for operators to switch from a short-term on-switch solution to a more efficient solution. This switch would be determined by

⁷ If, of course, an IN or call drop-back solution could be cost effectively introduced in the foreseeable future, it may not be sensible to introduce an interim on-switch solution that would only operate for a few months.

operators but would occur once the take-up of number portability is such that the establishment costs of more efficient solutions outweigh the high consumption costs of on-switch solutions.

This study does not propose a particular technical solution for Member States. Instead, it provides a consistent framework for allocating the costs in a way that will encourage operators to migrate to a more efficient solution when appropriate to do so.

Carrier Selection/Pre-selection

There are fewer alternative technical solutions available to introduce carrier selection and carrier pre-selection. In most EU Member States, carrier selection has been implemented by assigning prefixes to carriers that are used to programme routing tables subject to the necessary interconnection agreements.

The most common approach to introducing carrier pre-selection involves storing and memorising the subscriber's pre-selection options in the line context of the subscriber's local exchange.⁸ This is usually achieved by specific software development that allows 'pre-selected' calls to be carried by default. The size of the establishment costs incurred for carrier pre-selection may well depend on the types of calls that can be pre-selected, with an 'all calls' option likely to require additional investment.

Through their involvement in technical discussions, NRAs will need to ensure that the relevant data are available and that procedures for data flows and billing systems are in place. Their involvement in technical discussions will also enable NRAs to ensure that the solutions selected provide "maximum benefit to end-users".

Recommendation 1 (*Recommendation 8.1 in Volume I*)

National Regulatory Authorities in most countries may wish to avoid being drawn too closely into decisions about the technical solutions. However, the National Regulatory Authority will need to be satisfied that the arrangements for cost assessment and recovery are workable for all concerned, provide the right incentives for operators to migrate to more efficient solutions, and do not distort competition.

⁸ This refers to the information stored in the local exchange which specifically relates to the characteristics applicable to a particular customer line such as carrier pre-selection.

COST ASSESSMENT

Cost Typology

Costs involved in all three services are most usefully be categorised as either “establishment costs”, being the costs incurred in making the services available, or “consumption costs” which are the additional costs incurred when customers make use of the services.⁹

Establishment costs may be further categorised as a) “system establishment costs”, and b) “per-operator establishment costs”. System establishment costs would be incurred if, for example, a national database were to be set up as part of an Intelligent Network (IN) solution to the technical problems of providing number portability. Per-operator establishment costs are expenses such as those incurred when operators modify their accounting and billing systems, or set up means of access to an IN database.

Consumption costs consist of administrative costs involved in transferring a customer and his number, referred to here as “per-line administration costs” and “additional call conveyance costs”. Per-line administration costs result from the need to modify subscriber information held in the donor network. Additional call conveyance costs result, for example, from a longer route being taken by a telephone call to a customer who has moved from one operator to another while keeping the same number (referred to as a “ported customer”).

More detail of each type of cost for the different services is provided in Tables 2 and 3 below. This shows, *inter alia*:

- that off-switch solutions for number portability will result in higher establishment costs than on-switch solutions;
- within each family of number portability solutions, the magnitude of costs will vary as will the relative size of the consumption costs; and
- the establishment costs for carrier pre-selection are lower than for carrier selection (assuming that carrier selection is offered prior to the implementation of carrier pre-selection).

It should also be noted that there are no consumption costs for carrier selection and that the additional conveyance costs for carrier pre-selection are negligible.

Assessing the Reasonableness of Costs

NRAs will generally be required to approve charges (either to customers or to other operators) imposed by operators designated as having significant market power (SMP) and possibly by other operators. In order to determine whether those charges are appropriate and reasonable, NRAs will require an assessment of the type and magnitude of the costs involved. Volume II of this study provides such guidance in the following areas:

- the type of operator which initially incurs the costs;

⁹ Full details are provided in Chapter 4 of Volume I and in Volume II.

- the nature of the work involved; and
- other factors that might affect the costs.

These costs will vary from Member State to Member State and even from operator to operator. The factors that matter include:

- the operator's network characteristics (size, structure and architecture, equipment and supplier diversity);
- the operator's technical and administrative organisation (centralised or decentralised entities, level of automation of tools and procedures);
- the competitive environment (number of competitors, position of the operator in the market, regulatory and technical obligations of each operator towards Number Portability); and
- the structure of interconnection (interconnection at local / transit level, number of points of interconnection, services at the interconnection).

Volume II of the report provides detailed assessment tables that give guidance to the likely magnitudes and how they vary as a result of the factors affecting costs identified above. It also contains a technical description of each of the categories of costs identified in the following tables and, where appropriate, ball-park estimates of each of these costs.

Tables 2 and 3 categorise the types of costs incurred under each service, noting the significance of these costs and the impact on different operators.

Table 2 – Costs Incurred in Provision of Number Portability

	System set-up cost	Per-operator set-up	Per-line set-up	Additional conveyance	Other administration
Number Portability					
On-switch solutions					
<i>Costs involved</i>	<ul style="list-style-type: none"> • Software evolutions in switches • Adaptation of information systems • Creation of inter-operator service management tools and procedures • Adaptation of maintenance and customer support procedures 	<ul style="list-style-type: none"> • Initial programming of switches (except for 2nd number solution) 	<ul style="list-style-type: none"> • Modification of subscriber data 	<ul style="list-style-type: none"> • Tromboning and non-optimal routing of calls 	<ul style="list-style-type: none"> • Allocation of non-geographic numbers
<i>Significance of costs</i>	High proportion of total cost	Small proportion of total costs	Very small	Varies depending on technical solution: but can be quite high	Negligible
<i>Main party incurring cost</i>	The bulk of the costs will fall on the incumbent or donor network operator, although new entrants will also incur some costs	Low impact on the incumbent operator as well as other originating and transiting operators	Medium for the incumbent and low for other operators	High impact on the donor network operator and medium for others	Very low impact on the NRA
Off-switch solutions					
<i>Costs involved</i>	<ul style="list-style-type: none"> • Set-up of Intelligent Network • Adaptation of information systems • Creation of inter-operator service management tools and procedures • Adaptation of maintenance and customer support procedures 	<ul style="list-style-type: none"> • Initial programming of switches • Access to national NP database 	<ul style="list-style-type: none"> • Modification of subscriber data 	<ul style="list-style-type: none"> • Additional conveyance of IN query 	<ul style="list-style-type: none"> • Management of a national ported numbers database • Allocation of non-geographic numbers
<i>Significance of costs</i>	Significant proportion of total cost (higher than on-switch solutions)	Higher proportion of total costs than for on-switch solutions	Very small	Negligible	Very small
<i>Main party incurring cost</i>	High impact on all operators, but low on other operators	Medium impact on all operators	Medium impact on the incumbent and low on other operators	Very low impact on all call-originating operators	Very low impact on the NRA

Table 3 – Costs Incurred in Provision of Carrier selection and pre-selection

	System set-up cost	Per-operator set-up	Per-line administration	Additional conveyance	Cost incurred by NRA
Carrier selection					
<i>Costs involved</i>	<ul style="list-style-type: none"> Expansion of digit capacity of switches Programming of switches to statistically distribute non CS traffic Adaptation of customer care and billing systems Adaptation of inter-operator billing systems Adaptation of maintenance and customer support procedures 	<ul style="list-style-type: none"> Initial programming of routeing tables 	None	None	<ul style="list-style-type: none"> Allocation of routeing prefixes
<i>Significance of costs</i>	High proportion of total costs	Very small proportion of total costs	None	None	Negligible
<i>Main party incurring cost</i>	Medium impact on the dominant local loop operator, low impact on indirect access providers	Low impact on the dominant local loop operator			Very low level of costs incurred by NRA
Carrier pre-selection					
<i>Costs involved</i>	<ul style="list-style-type: none"> Modification of subscriber context Adaptation of customer care and billing systems Adaptation of maintenance and customer support procedures 		<ul style="list-style-type: none"> Modification of subscriber information 	<ul style="list-style-type: none"> Additional call processing 	<ul style="list-style-type: none"> Allocation of pre-selection codes
<i>Significance of costs</i>	High proportion of total costs	None	Very small	Negligible	Negligible
<i>Main party incurring cost</i>	High impact on the dominant local loop operator, medium impact on indirect access providers		Medium impact on the dominant local loop operator, very low impact on indirect access providers	Very low impact on the dominant local loop operator	Very low level of costs incurred by NRA

COST ALLOCATION

Basic Principles

The Amending Interconnection Directive, along with other Directives such as the ONP Voice Telephony Directive and the Interconnection Directive, require charges for number portability, carrier selection, and carrier pre-selection to be cost oriented and consistent with EU regulatory principles. In the Member States that we reviewed, cost orientation has been viewed as a critical legislative requirement, and as an important condition for efficiency. A cost oriented charge can help to ensure that operators make decisions that reflect the underlying costs incurred.

Classifying costs as either establishment costs or consumption costs recognises that different types of costs in Member States have generally been reflected in tariffs in different ways. Such a classification also reflects sound economic principles.

- Establishment costs are incurred essentially in order to meet the requirements of the Directives and of national legislation. Costs which are incurred as a result of legislation intended to ensure effective competition in a liberalised market should generally be recovered in broadly based charges (ie charges paid by the generality of customers).
- Consumption costs, on the other hand, result from the decisions of individual end-user customers to make use of the services. These should be represented in user charges, which broadly reflect the additional costs incurred. This too accords with economic efficiency, and with the principle of cost oriented charges.

A further basic consideration is that the costs involved in introducing the services are reasonable and efficient. This could be achieved by ensuring that a significant part of the costs fall on the operators that incur them, rather than being passed on to other operators. Any regulatory constraints on how these costs may be reflected in prices should provide incentives to ensure that the costs are at the efficient level.

These considerations point towards the main costs of establishing the services being recovered by each operator from their own customers through broadly based charges. This would also be consistent with the principle of competitive neutrality in that operators under similar obligations will be treated in a similar way. In the case of number portability and carrier selection/pre-selection services, for example, all access providers under similar obligations will be treated in an equal manner.

This will have different implications for operators with SMP and for other operators. For instance:

- operators with SMP will be able to incorporate the establishment costs they incur into their network costs and pass these on to their customers, subject to any price controls they face. These price controls may allow operators with SMP to pass on all of their costs as incurred or (more realistically) an allowance to reflect some measure of efficient costs; while
- operators without SMP should be able to recover their establishment costs from their own customers, subject only to the normal constraints imposed by a competitive market.

In cases where the obligation under the Directives to offer the service has been limited to operators with SMP, the operator with SMP may reasonably be allowed to pass on at least a proportion of the establishment costs that they incur to other operators, provided that such charges do not offend other EU regulatory principles (such as impeding the development of effective competition).¹⁰

Establishment costs

Number portability

In the case of number portability, all fixed access providers are required to offer the service. This means that even those customers that are directly connected to new entrants could choose to switch to the SMP operator and retain their number. Movements in such a direction (new entrants to incumbent SMP operator) would be relatively small during the early years of competition, but would be expected to grow over time. The fact that the obligation applies symmetrically to all operators has been used by NRAs to recommend that all fixed line operators should bear their own establishment costs, as is our recommendation.

SMP operators may argue that in practice they will incur by far the largest part of the costs; and that they should be allowed to recover part of the costs from other operators, which are likely to gain market share and profits from the new policies. However, SMP operators should be able to recover the costs from their existing customers unless prevented by the regulator from doing so, and if all operators are treated in the same way there is unlikely to be any distortion to competition.

The recommendation holds regardless of whether an on-switch or off-switch solution is to be implemented, or even if both will be introduced over the long-run. The establishment costs associated with an off-switch solution will be relatively higher than those for an on-switch solution.¹¹

Where establishment costs are incurred by an agency on behalf of the industry as a whole, in order to introduce a master database for some IN solutions, these costs should be recovered in the same way as other establishment costs. That is, each operator should contribute to these establishment costs either through an equal annual charge or through a charge that relates to their market share.

Carrier selection and pre-selection

As indicated above, the recommendations regarding the recovery of the establishment costs associated with carrier selection and carrier pre-selection will differ depending on whether the obligation to introduce the service is imposed on the operator with SMP or on all operators. Practice has varied between Member States on whether the obligation has been imposed on other operators.

¹⁰ A fuller discussion of these basic principles is contained in Chapter 6 of Volume I.

¹¹ The issues associated with a migration from an interim solution to a long-term solution are discussed in Section 8.1.

If, on the one hand, the obligation is imposed on all operators, as has been the case in Germany and Sweden, then all operators would be liable for their own establishment costs which they could recover from all of their existing customers through broadly based charges, subject to price control where appropriate. This situation would be analogous to the symmetrical requirement for number portability discussed above. The difference, however, would be that indirect access providers who do not offer local access would avoid an inter-operator charge. Such an outcome arises because the obligation effectively becomes a condition on access providers. Indirect access providers, by virtue of not operating an access network, would avoid the establishment costs. This treats all access providers equally and, at the same time, avoids any distortion in the market for call services.

If, on the other hand, the obligation is imposed only on the operator with SMP, that operator could recover its establishment costs from other operators who use but do not provide the facility, whether those operators are indirect access providers or local access providers acting as indirect access providers, provided that such charges are consistent with other regulatory objectives (for example, they do not impede the development of effective competition).

In these circumstances, inter-operator charges could have the following advantages:

- they would be seen as a fair outcome as the operator with SMP is introducing a facility that will benefit other operators;
- they could promote efficiency as indirect access providers could decide whether to offer their own access facilities, rather than face the CPS charge; and
- they could, by setting the charge at a level that recovers the reasonable costs of an efficient operator, promote cost minimisation.

A special case can be identified where the obligation has been limited to SMP operators but where particular non-SMP operators choose to offer these services on a bilateral basis with the SMP operator or on a multilateral basis. Assuming that the NRA could be satisfied that a genuine offering was being made by the non-SMP operator, that operator would bear their own establishment costs and not be obliged to make a contribution to the SMP operator's establishment costs.

Our review of Member States' experience (as for example in the Netherlands) suggests that such charges have tended not to harm the development of competition when they were imposed for carrier selection. There is less experience in the area of carrier pre-selection and only in Finland are operators passing on their establishment costs for carrier pre-selection through inter-operator charges, although it seems likely that such an approach may also be adopted in France and the Netherlands.

It will fall to NRAs to assess when an inter-operator charge to recover the establishment costs is inconsistent with other EU regulatory principles. The factors they will need to consider include benefits to all customers and effective competition. The extent to which these factors can be quantified is difficult, but Volume I provides a discussion of the factors that ought to guide NRAs when determining whether all or some part of the establishment costs incurred by operators with SMP could be passed on.

Recommendation 2 (*Recommendation 6.1 in Volume I*)Establishment costs

Where all operators are under equivalent obligations, each operator should bear the establishment costs it incurs when introducing these services rather than passing them on in inter-operator charges. Operators without significant market power and not subject to price controls will be able to seek to recover these expenses from customers in any way they choose. Operators with significant market power will usually be subject to controls limiting the extent to which costs can be recovered from their own customers.

When obligations are not made symmetric, ie where they are imposed on operators with significant market power but not on other operators, it would be reasonable for operators obliged to offer the service to be able to pass on at least a proportion of these costs to those operators who use the facility.

Consumption Costs

Three main types of consumption costs have been distinguished: per-line administration costs, additional conveyance costs, and some administration costs incurred by NRAs.

Consumption costs are distinguished from establishment costs in that there is a closer alignment between the party that causes the costs to be incurred and the party that benefits. In order to encourage efficient use, charges should reflect costs and the consumption costs associated with number portability and carrier pre-selection should generally be passed on through inter-operator charges.¹²

The major differences between the treatment of consumption costs arising from number portability and those arising from carrier pre-selection are discussed below. In essence, the differences arise because of the additional conveyance costs, which can be significant under some of the on-switch solutions for number portability.

Number portability

There are two types of consumption costs incurred during number portability: per-line administration costs and additional conveyance costs. We deal firstly with the per-line administration costs.

The principle of cost oriented charging indicates that *per-line administration costs* of number portability should be passed on from the donor network operator to the recipient network operator. The charge should be at a level that reasonably reflects the likely level of costs for an efficient operator.

¹² There are no significant consumption costs associated with CS.

The recipient network operator could then make a commercial decision whether to seek to recover the costs from end-users, although in practice they have tended not to do so. These operators have an interest in promoting the services and would not want to deter customers from joining their networks. Operators — even those with SMP — who gain customers through number portability or carrier pre-selection would, by virtue of competitive pressure, be unlikely to impose charges on customers joining their network.

Nevertheless, NRAs do have a duty to ensure that that direct charges to customers should not act as a disincentive for the use of the facility and may wish to monitor charges to ensure that the recipient network operators do not set charges which act as a disincentive. Whether or not new entrants pass on these costs to their customers is, ultimately, a commercial decision for operators; we see no strong general case for preventing them from doing so.

Our review of Member States' experience has shown that it is the *additional conveyance costs* that have led to most of the problems with number portability. In the UK, the treatment of the additional conveyance costs was one of the major reasons behind the Monopolies and Mergers Commission (MMC) inquiry. The current arrangements regarding the additional conveyance costs in Finland and France, have shown that charges for the additional conveyance costs, even if cost oriented, could substantially limit the take-up of number portability.

There are two parties who typically have borne the additional conveyance costs associated with some on-switch solutions — the donor network operator (DNO) which has lost the customer and the recipient network operator (RNO) which has gained the customer. The impact of charging either of those two is considered below.

Recovering the additional conveyance costs from the recipient network operator

A charge on the recipient network operator has been justified in the past on the basis that this operator gains the customer and the associated revenue stream. This benefit, it has been argued, would offset the ongoing costs that would be incurred every time a call is made to the ported customer.

A charge on the called party would be inconsistent with the way that telephone calls are normally charged. Classically, the calling party is the party deciding to make a call and therefore the party responsible for paying the costs of that call. The originating operator, in the particular sense of the party primarily responsible for routing a call, is responsible for paying for the chosen route.¹³

If the additional conveyance costs of number portability were to be passed on to the called or porting customer by the recipient network operator, the called customer would be in the unusual situation of paying a fee every time they received a call. This could not only deter people from porting, but it would also effectively impose a charge on customers to use what they may consider to be their own telephone number.

¹³ This, however, is changing with the advent of call forwarding away from geographic numbers, termination away from the primary geographic translation of a non-geographic number and cellular roaming away from the home country which have introduced the concept of the termination of such calls being paid for by the recipient party through the recipient operator or through special billing procedures.

Imposing the additional conveyance costs on the recipient network operator would not be appropriate mainly because it would not contain the right incentives. The recipient network operator is not able to control calls to its network and is not in a position to minimise the associated costs. Further, the exposure to an uncertain level of ongoing charges may make the portability service unattractive to new operators effectively limiting the availability of the service to consumers.

Recovering the additional conveyance costs from the donor network operator

It could be argued that a charge on the donor network operator is appropriate in order to provide it with incentives to minimise the costs in its own network. However, this could be seen as unfair by effectively penalising the donor network operator twice — once for losing the customer and the associated revenue stream and again for having to bear a cost arising principally out of their position as the customer's former operator.

A stronger argument would be that the responsibility for routeing a call should lie with the operator which originated the call, and it is in this capacity that the donor network operator should bear responsibility for the additional conveyance costs. Initially at least, it will be the donor network operator which originates most of the calls to ported numbers, and as the originating operator, they would face the incentive to minimise those costs.

Recovering the additional conveyance costs from the originating operator

The traditional role and responsibility of the originating operator¹⁴ in terms of routeing calls and the incentive effects that this implies suggests that the originating operator may be the most appropriate party to bear the additional conveyance costs. Such a charge is likely to lead to the most efficient outcome as the originating operator is generally in the best position to control the additional conveyance costs. This is so even though the main additional conveyance costs may be incurred in the donor's network.

Operators with SMP, and the incumbent donor network operator in particular, will be worse off under such a charge largely because they will originate the majority of calls in the short-run. Levying a charge for the additional conveyance costs on the originating operator will then mean that the principal donor operator bears its own additional conveyance costs.

The donor network operator, faced with the majority of the additional conveyance costs, would then face a strong incentive to migrate to a more efficient on-switch solution (for example, call drop-back) or migrate to an IN solution. This decision will benefit other originating operators who, by themselves, would not be able to expedite the introduction of more efficient number portability arrangements. In other words, the cost burden imposed on the donor network operators, through their position as the most significant originating operator, would help to ensure that a more efficient technical solution emerges to the benefit of all operators.

¹⁴ The originating operator in our discussion and in our recommendations is the first operator who has options in relation to routeing through the national network. In the case of a call coming from outside the Member State, the originating operator is likely to be the importing operator.

NRAs may then face arguments, based on the grounds of fairness, to allow the donor network operator to recover some of the additional conveyance costs from the recipient network operator. Such a charge would however run the danger of an inefficient technical solution as the call-originating operator would no longer face such a strong incentive to introduce a more efficient technical solution.

Operators without SMP ought to benefit from such an arrangement. As recipient network operators, these operators will no longer be subject to an uncertain level of ongoing charges for calls to their customers. This will enable them to promote number portability aggressively — something that operators in some Member States (such as Finland and France) have so far been reluctant to do. As originating operators, they will be worse off as they would be liable to a charge when their customers originate a call to a ported number.

During the initial stages of liberalisation, the proportion of calls originating from the networks of operators without SMP would be small, and the additional conveyance costs they would face would also therefore be small. In the longer term, and in a multi-operator environment, third party operators will increasingly originate calls that terminate in another network via the incumbent's network. In these cases it would seem fair and efficient for the third party operator, which is originating the call and receiving revenue from the calling customer, to pay the donor network operator an amount for the additional conveyance costs incurred in the donor's network.

The call originating operator without SMP will be faced with the choice of paying the charge or investing in a technical solution that minimises the additional conveyance costs, and/or negotiating with others in a position to contribute to the efficient solution. In practice, however, a third party originating operator may not, on their own, be able to implement a more efficient solution. A charge on them, however, may force them to exert pressure on the NRA and other operators to migrate over time to a more efficient technical solution. In the meantime, the revenue they receive from their subscriber making a call will to a large extent offset the charge for the additional conveyance costs that they are facing.

There is a real issue concerning how the additional conveyance costs could be recovered by originating operators. We do not, of course, envisage that the calling customer pays an additional charge for calls to a ported number.¹⁵ In most cases, calling customers would be unaware that the party they are calling has ported and they should not, therefore, be subjected to additional charges. Rather, the additional conveyance costs should be borne by the originating operator who could recover them in the following manner:

- Originating operators without SMP would recover the charges from their own customers through broadly based charges.
- Originating operators with SMP would recover the additional conveyance costs imposed on them through broadly based charges on all customers, normally subject to price control. In order to encourage a move towards a more efficient technical solution, the price control would presumably allow for the recovery of an allowance for the additional conveyance costs that represents the costs of an efficient technical solution (such as call drop-back).

¹⁵ An exception may conceivably be considered if a warning about the cost implications could be provided to the calling customers.

Recommendation 3 (*Recommendations 6.2 and 6.4 in Volume I*)Consumption costs

The per-line administration costs associated with number portability should be reflected in a charge from the donor network operator to the recipient network operator.

Where additional conveyance costs are significant, they should be recovered by the donor operator through an inter-operator charge to the call originating operator. We take it as axiomatic that a customer calling a ported number would not face a charge additional to the expected tariff for a call to a non-ported number in that block of numbers.

National Regulatory Authorities should generally resist proposals for charges between the donor network operator and recipient network operator to recover additional conveyance costs arising from number portability. If such charges are permitted, this should be only for a short period of time (to avoid locking in an inefficient solution).

Carrier pre-selection

The only significant consumption costs arising from carrier pre-selection are the per-line administration costs.

As with number portability, the principle of cost oriented charging indicates that *per line administration costs* of carrier pre-selection should be reflected in a charge from the access operator to the pre-selected operator. The charge would be at a level that reasonably reflects the likely level of costs for an efficient operator. The pre-selected operator will then make a commercial decision whether to seek to recover the costs from end-users (see section 5.3.1).

Recommendation 4 (*Recommendation 6.3 in Volume I*)

The per-line administration costs associated with carrier pre-selection should be reflected in a charge from the local loop operator to the indirect access provider.

Consumption costs incurred by NRAs or a central agency

There are two categories of consumption costs that fall to an NRA and to a central agency from the introduction of number portability, carrier selection, and carrier pre-selection.

Costs that arise from the implementation of IN solutions for number portability

If an off-switch solution is implemented, it requires a central agency to manage the database of “ported” numbers.¹⁶ This agency (which could be an independent body acting under the authority of the NRA or the industry as a whole) will incur set-up costs and possibly some on-going costs.

The bulk of these costs (system set-up and maintenance) will be establishment costs and as number portability is a symmetric service, all operators should contribute to these costs, which can be amortised over a period of years. Such a charge could be determined by reference to the market share of operators measured in a volumetric way, or simply be based on an equal annual “membership charge”.¹⁷

The on-going costs, to the extent that any could be identified, should be recovered from the parties that cause them. This may well be the recipient operator, who notifies the database of a ported number. Levying a charge on the recipient could deter operators from offering the service, but the on-going costs are likely to be small. It may be more practical to roll the on-going costs into the annualised establishment costs and treat them both in the same way.

Additional administrative costs for NRAs

For number portability, the additional administrative costs include the management of the allocation of non-geographic numbers. Numbering allocation is typically the responsibility of the regulatory authority and costs associated with the management of the allocation of non-geographic numbers will probably be treated in the same way as the costs associated with the management of geographic numbers.

For carrier selection and carrier pre-selection, the additional administrative costs include the management of allocation of carrier (pre) selection codes to operators. The administrative costs associated with carrier (pre) selection are likely to be very low as the task of allocating carrier (pre) selection codes is generally performed as part of the instruction of applications for long distance operators. Hence, NRAs are likely to be able to support such costs as part of their general regulatory responsibilities.

For both number portability and carrier selection/pre-selection, there may also be costs for facilitating processes that need to be put in place between operators.

¹⁶ Operators could then download information on all porting activity (if a distributed database solution is implemented) or all operators could have copies of the national database for real-time interrogation, which are synchronised daily (if a centralised database solution is chosen).

¹⁷ These options are explored briefly in Section 8.5 of Volume I.

DETERMINING THE APPROPRIATE LEVEL OF CHARGES

In considering cost allocation and charging issues, NRAs will be focusing mainly on SMP operators although the inter-operator charges levied by other operators may also require monitoring or regulatory approval.

A first step towards assessing what charges would be cost reflective might be to consider how costs are allocated in the relevant operators' accounting systems. These cost accounting systems could be used by operators with SMP in order to calculate interconnection charges and should also be consistent with the Commission guidance on accounting separation and cost accounting.¹⁸

To the extent that cost accounting systems to the level of detail and relevance recommended by the Commission are in place in Member States, these could assist NRAs to determine:

- that any costs that operators seek to pass on to their customers through charges are cost oriented. This will mean that the establishment costs incurred for number portability, for example, could be recovered through charges on its existing customers, but only if those costs have been calculated using current costs and reflect the costs incurred by an efficient operator employing modern technology; and
- that any costs that could be passed on to other operators are sufficiently unbundled, reasonable (by reflecting the costs incurred by an efficient operator employing modern technology), and include a reasonable amount of common or shared costs.¹⁹

Where cost accounting systems of the appropriate type are not yet in place, NRAs may consider undertaking studies based on other cost studies and/or engineering studies to determine whether the charges proposed by operators are reasonable and cost oriented.

Another method which could be used to advise on whether charges are cost oriented, and which may provide a useful check on estimates arising from cost accounting systems, is international benchmarking. This approach has been adopted in Germany in order to estimate the per-line administrative costs of carrier pre-selection, although the parties are in dispute about the level of charges.

¹⁸ Commission Recommendation of 8 April 1998 on interconnection in a liberalised telecommunications market: Part 2 — Accounting separation and cost accounting.

¹⁹ The Commission suggests that a well defined cost-allocation system will enable at least 90 per cent of the costs to be allocated on the basis of direct or indirect cost-causation.

Recommendation 5 (*Recommendation 8.2 in Volume I*)

There are two approaches to assess the costs of operators with significant market power:

- Use of cost accounting systems recommended by the European Commission in Commission Recommendation of 8 April 1998 on interconnection in a liberalised telecommunications market.
- In the absence of such detailed cost accounting systems, the use of cost studies similar to those used to derive interconnection charges, perhaps supplemented by engineering studies.

Useful confirmation may sometimes be derived from international benchmarking comparisons.

CROSS BORDER EFFECTS

Within the overall framework of telecommunications' liberalisation laid down for the European Union, differences in national situations, policies, and applications of the principles are to be expected. Nevertheless, divergences in cost allocation arrangements could, in certain circumstances, present internal market concerns.

The EU telecommunications market is served by companies many of which are powerful SMP operators in their home country, and at the same time entrant (or potential) competitors in other Member States. It is important that the terms on which these companies compete in the EU as a whole are reasonably even-handed, and not distorted by differences in national regulation.

Number Portability

Within the framework of existing EU Directives, there is as we have explained scope for NRAs across EU Member States to allocate the costs of number portability differently. This generally has not happened to date in the six Member States that we reviewed with regard to establishment costs; in all cases, for example, operators have been required to bear their own system set-up costs.

There has, however, been divergence across the six Member States in the way that the consumption costs, and in particular, the additional conveyance costs have been allocated. Whilst some Member States have allowed operators to pass on the additional conveyance costs, others have not. Moreover, in two Member States, it is the recipient operator that must pay such costs.

The major costs of introducing number portability are the establishment costs. It would be theoretically possible within the terms of the Interconnection Directive, as amended, for Member State A to impose a significant proportion of these costs (eg the cost of national IN master database) on its dominant SMP operator(s) while Member State B imposed the corresponding costs on all operators active in its market. The upshot might be that the SMP operator(s) in A paid most of the establishment cost in A and a share of the corresponding costs in B; whilst the competitor(s) based in B would pay only a share of the relevant establishment costs in B and nothing towards the costs in A.

This could amount to a significant imbalance in the terms of competition within the EU market. Our recommendations would prevent this, by having each operator meet its own establishment costs, and encouraging NRAs to recover costs of an IN master database from all operators an even-handed basis.

With regard to the consumption costs of number portability, similar issues could arise. Member State A might in theory require the incumbent operator to bear these costs, while Member State B allowed them to be reflected in inter-operator charges, with the result that they fell disproportionately on the SMP operator(s) in A.

It is not clear to what extent charging arrangements for the conveyance costs in the six Member States surveyed has affected the competitive position of new entrant operators in those Member

States. Number portability — although a key facilitator of competition — is only one variable that will affect the profitability of new entrants. It is also possible that it is simply too early to determine the impact of divergent cost allocation arrangements on cross border trade.

Our recommendations, however, if implemented would lead to greater consistency in the way that the costs of number portability are allocated and would eliminate some of the factors that might otherwise give rise to adverse cross-border effects. If, as recommended here, each Member State requires donor operators to recover the additional conveyance costs from the call-originating operators²⁰, this would help to produce an equitable and efficient basis for international competition.

Carrier Selection and Pre-selection

The scope for cross-border problems is greater for these services, since the Directives leave it open to Member States to limit the basic requirement to provide the services to the SMP operators and some Member States have done so.

In terms of cost allocation, different approaches have been taken although these follow some common themes. Those NRAs that have imposed the obligation on all fixed access providers, have required operators to bear their own costs. On the other hand, those that have imposed the obligation on operators with SMP only have taken different approaches with some at least likely to allow the SMP operator to pass on some or all of their establishment costs to other operators. Other approaches are to be expected as more EU Member States implement the Directive.

These differences in the scope of the obligation in the Directive may have cross border impacts. A requirement to oblige all fixed line operators to offer carrier selection and carrier pre-selection may have an impact on the investment decisions of new entrants. If a new entrant is required to offer carrier pre-selection services, the prospects of entering a market where its future market share is under threat may affect the entry decision. In addition, if a new entrant is already in the market, and then a requirement to offer carrier pre-selection services is introduced, this may affect the business plan of the company as it may expect to have lower growth in its market share.

Our recommendations here would not prevent divergences from emerging. In fact, some such differences may well be appropriate since the market structure in Member States differs. The potential for adverse cross-border effects would however be reduced by the recommendation that if NRAs can foresee an extension to the obligation they should consider:

- an early decision on whether all operators will have to bear their own system set-up costs: this would prevent the SMP operator from passing on some of its establishment costs to other operators who would then be subject to their own costs;
- a transitional arrangement during which the SMP operator could pass on its costs; and
- a reciprocal arrangement whereby those carrier pre-selection operators who were willing to offer carrier pre-selection could avoid the charge from the SMP operator. This could have the

²⁰ In the case of a call coming from outside the Member State, the originating operator is likely to be the importing operator.

added advantage of facilitating the widespread introduction of the carrier pre-selection service.

For the three services as whole, therefore, our recommendations would avoid some potentially significant distortions to the terms of competition and thus contribute to the fair and proper development of a harmonised telecommunications market in the EU.

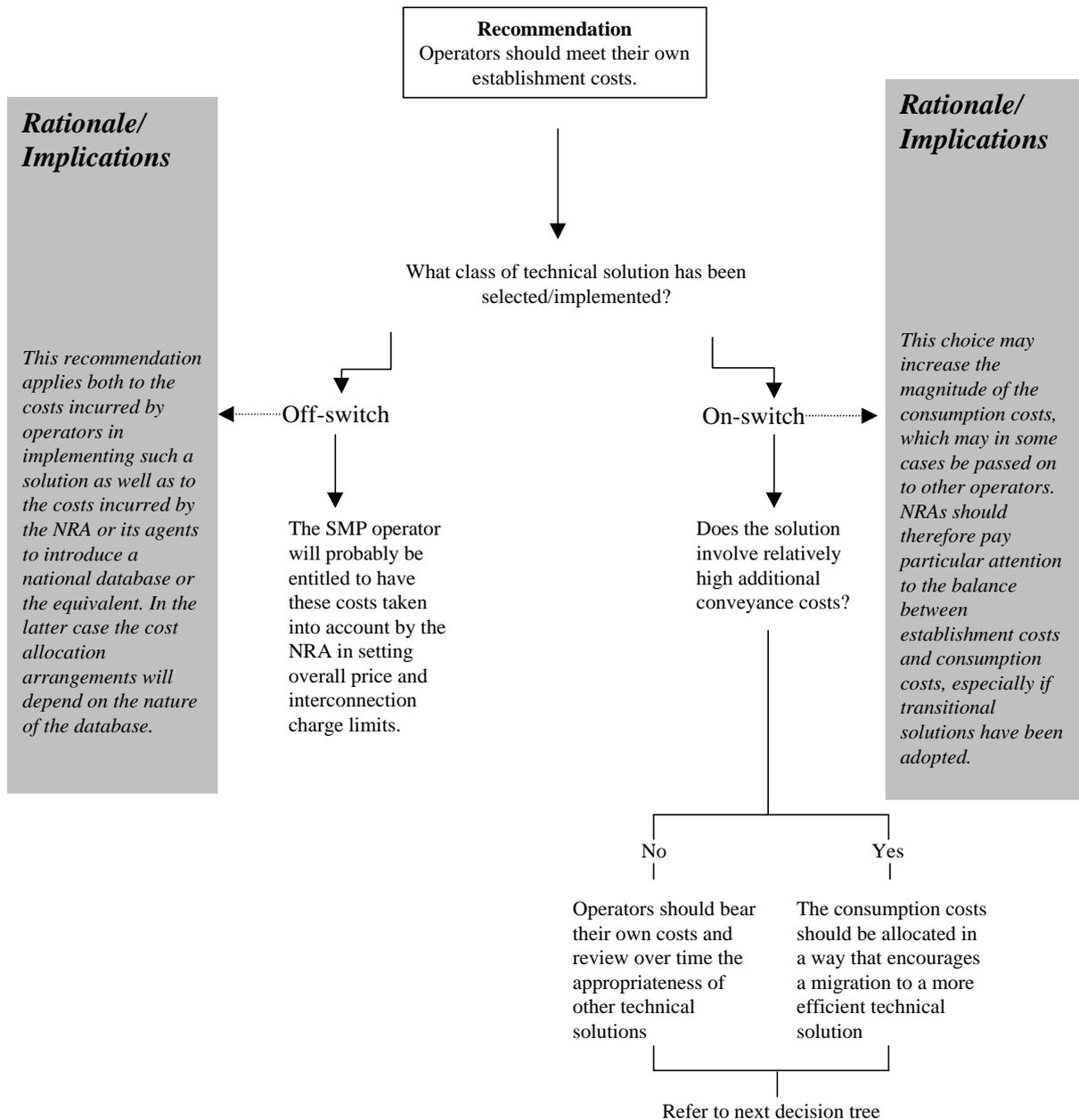
CONCLUSIONS

This study has presented a consistent framework for allocating costs of number portability and carrier selection/pre-selection and, if the model suggested here for cost assessment, and the reflection of appropriate costs in charges is followed, this should ensure that the service of number portability, carrier selection, and carrier pre-selection develop as an effective part of the competitive EU telecommunications market.

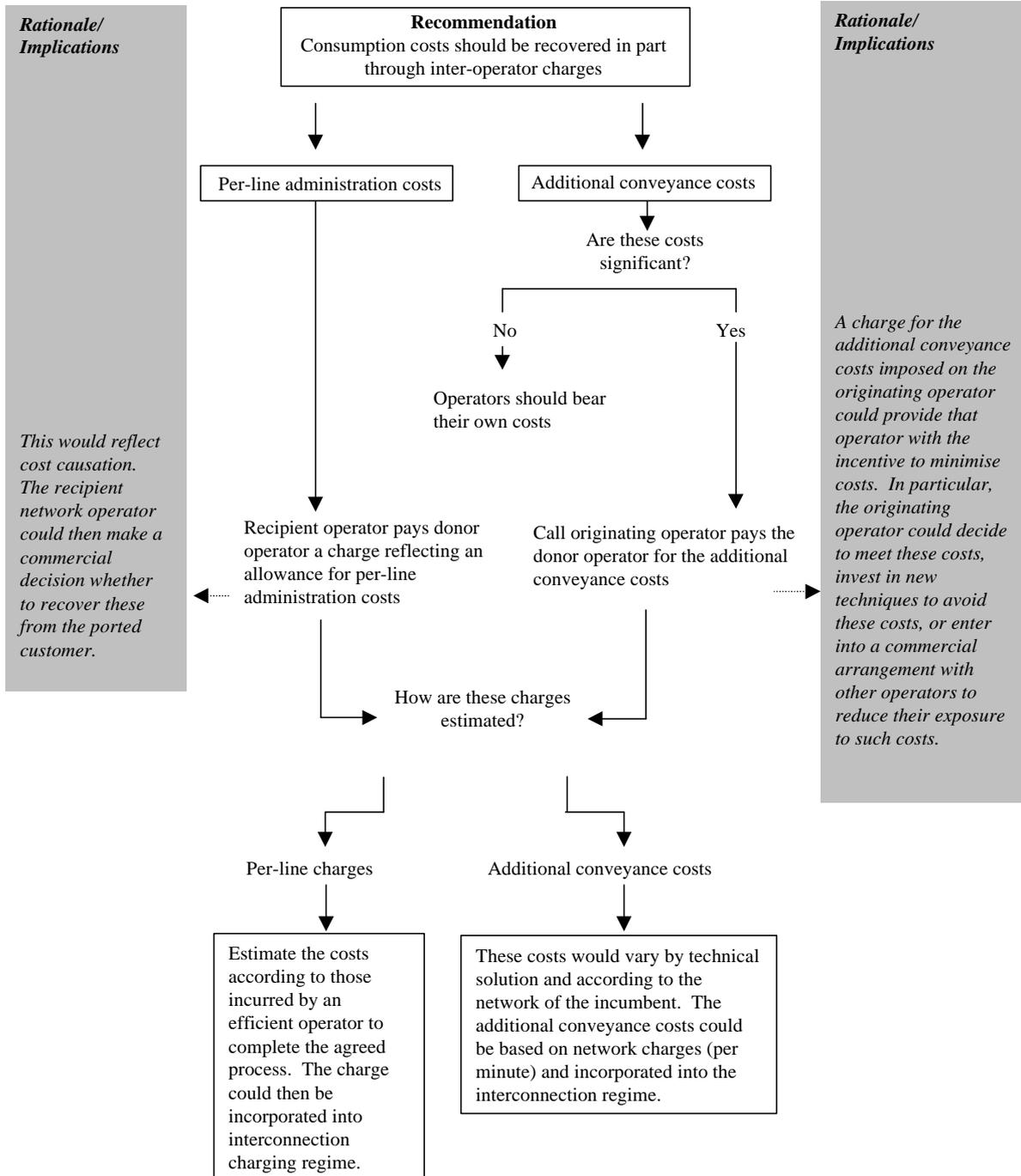
Decision Trees

The following decision trees illustrate recommendations made above.

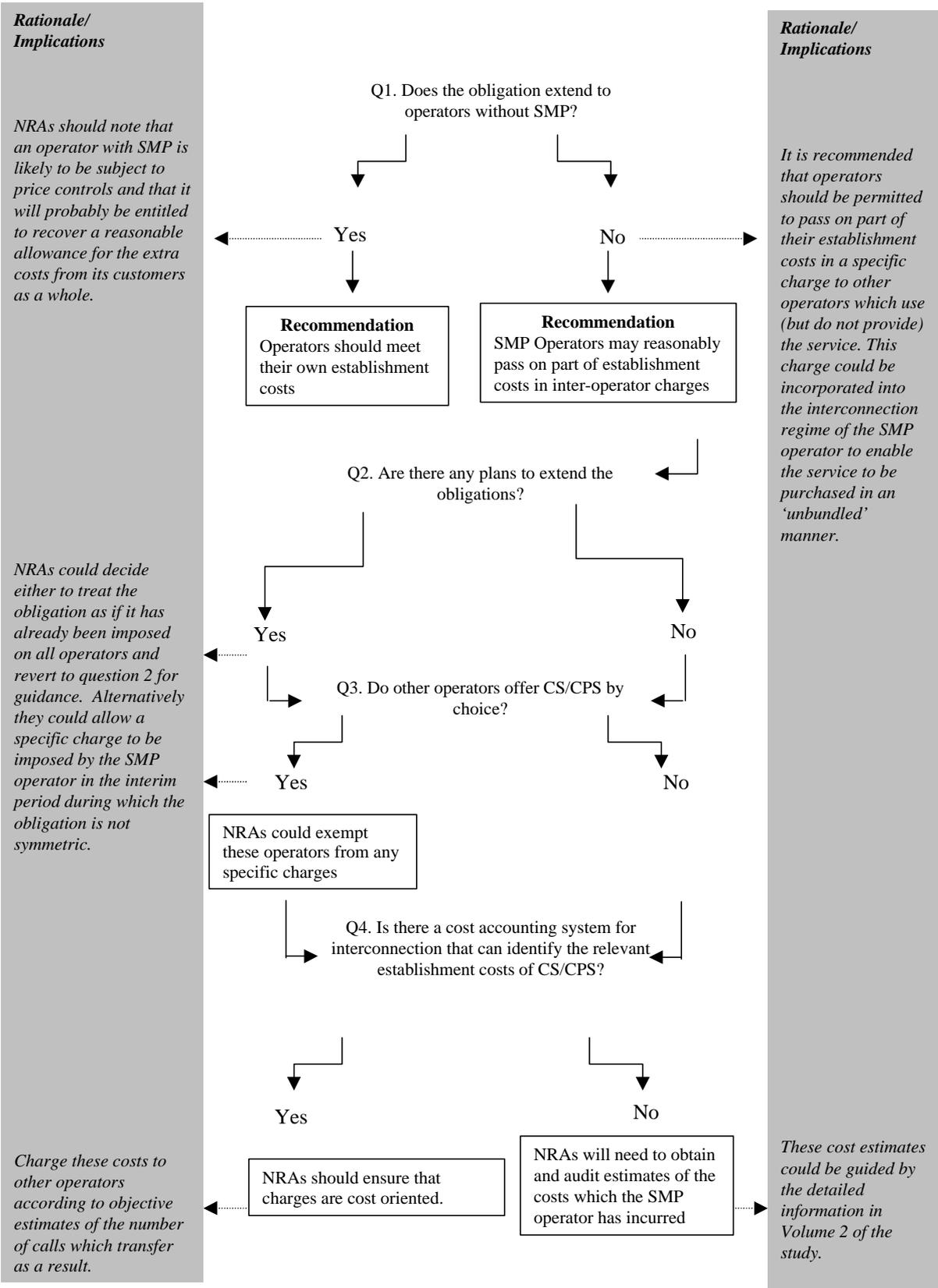
Establishment costs for NP



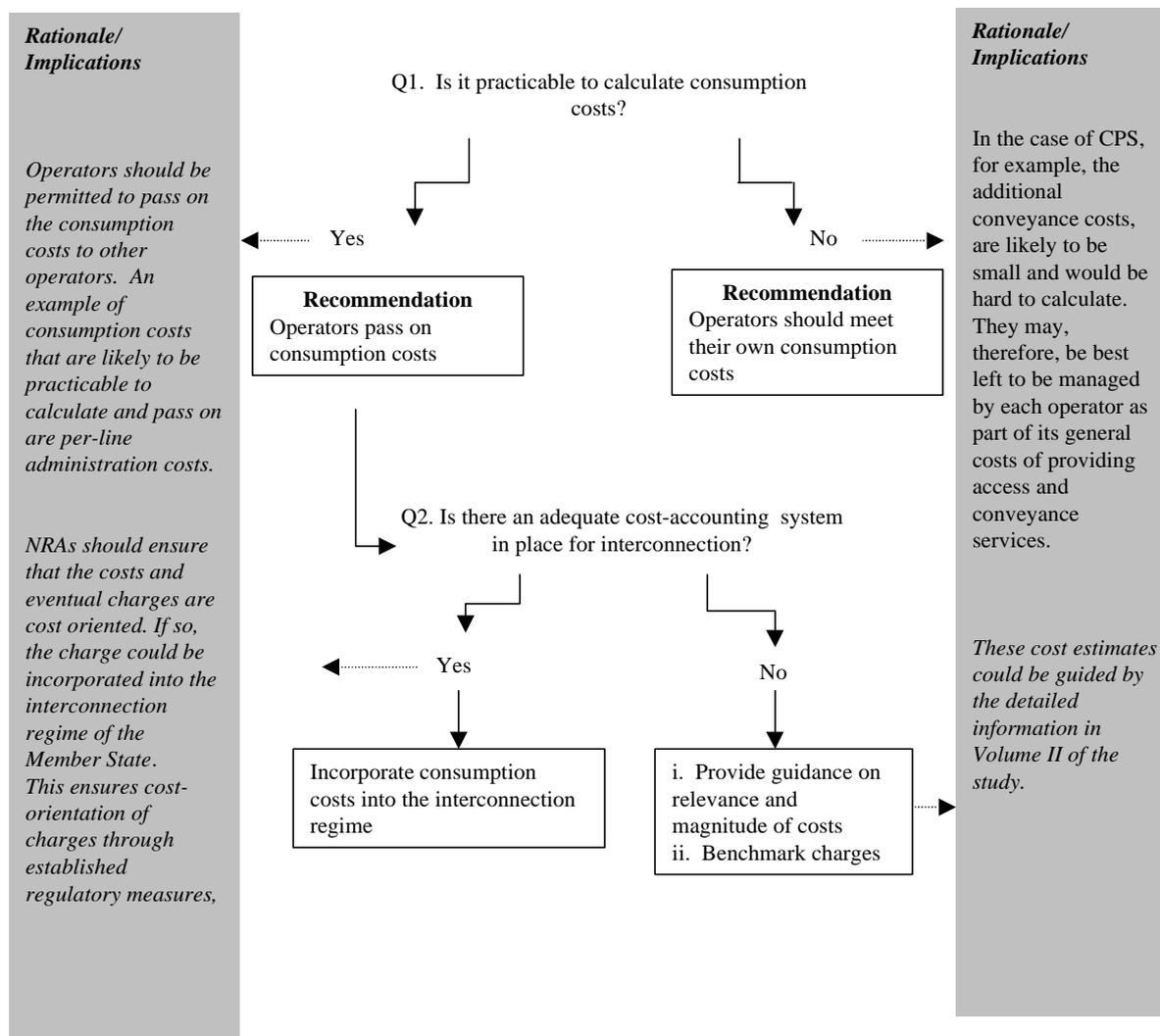
Consumption costs for NP



Establishment costs for CS/CPS



Consumption costs for CS/CPS



Model for Cost Allocation

The recommendations regarding cost allocation are presented in the following box.

BOX 1
RECOMMENDED MODEL FOR COST ALLOCATION

<u>Number Portability</u>	
Establishment costs	
Recommendation:	<ul style="list-style-type: none"> All operators should bear their own costs.
<i>Implication:</i>	<i>SMP operators should recover an allowance for their costs from broadly based charges subject to price controls.</i>
Consumption costs	
Recommendation:	<ul style="list-style-type: none"> When practicable to do so, <u>additional conveyance costs</u> should be charged by donor network operator to call originating operator.
<i>Implication:</i>	<i>Charges for additional conveyance costs will fall mainly on the incumbent operator. Such charges would provide an incentive to introduce more efficient technical solutions.</i>
Recommendation	<ul style="list-style-type: none"> <u>Per-line administration costs</u> should be passed on by the donor network operator to the recipient network operator.
<i>Implication:</i>	<i>A cost oriented inter-operator charge for the per-line administration costs should not impede the development of competition.</i>
<u>Carrier Selection and Carrier Pre-Selection</u>	
Establishment costs	
Recommendation:	<ul style="list-style-type: none"> If all operators are obliged to introduce the service, they should bear their own establishment costs.
<i>Implication:</i>	<i>When operators bear their own costs, the SMP operator can presumably recover an allowance for their costs from broadly based charges subject to price controls.</i>
Recommendation:	<ul style="list-style-type: none"> If only the SMP operators are obliged to offer the service, part of their costs could be recovered in inter-operator charges, possibly as part of the interconnection regime to other operators who use (but do not provide) the service.
<i>Implication:</i>	<i>NRAs will need to ensure that any inter-operator charges are cost oriented and do not impede effective competition nor deter the take-up of the service.</i>
Consumption costs	
Recommendation:	<ul style="list-style-type: none"> An allowance for the <u>per-line administration costs</u> can be recovered by the local loop operator from the pre-selected operator. <u>Other consumption costs</u> should not be significant and should be borne by the operators that incur them.
<i>Implication:</i>	<i>A cost oriented inter-operator charge for the per-line administration costs should not impede the development of competition.</i>

MAIN REPORT: VOLUME I

1 INTRODUCTION

This Report has been prepared by European Economic Research Limited (Europe Economics) and Arcome SA for DG XIII of the European Commission. The purpose of the study is to provide a clear basis for the assessment and allocation of costs for number portability and call-by-call carrier selection and carrier pre-selection. The study also makes proposals for guidelines which may help National Regulatory Authorities (NRAs) in drafting the necessary arrangements.

1.1 Terms of Reference

The Terms of Reference require that the study should examine:

- Which categories of costs result from the introduction and operation of (a) number portability (NP) and (b) call-by-call selection (CS)/ carrier pre-selection (CPS);
- How these costs can be assessed objectively;
- Effects of different ways of charging (to operators, end users or both);
- Relevant experience in countries where the facilities have already been introduced, including experience with charging modalities;
- Which guiding principles may be applied in order to ensure that the facilities will have the desired pro-competitive effect;
- What role the NRA should play; and
- Any cross-border effects of possibly diverging national cost allocation arrangements.

The Terms of Reference also state that:

- The study should suggest a model for cost allocation which is in line with existing EU regulatory principles and which could provide guidance for NRAs in all EU Member States.
- The study should build on existing studies regarding number portability and carrier selection in general and on relevant documents published by NRAs, in particular on cost allocation.
- The consultants should liaise with NRAs where appropriate through CEPT/ ECTRA/ ETO from the outset of the study to facilitate an input of up-to-date information and to ensure that the recommendations of the study will be of practical relevance for NRAs in all EU Member States.

1.2 Our Approach

Our approach to this study can be summarised as follows:

1.2.1 Technical solutions and cost information

In order to determine the categories of costs that result from the introduction of NP, CS, and CPS, and in order to assess these costs objectively we:

- drew on previous studies and our experience to present the most common technical solutions for the implementation of each of the services;
- presented a commonly used framework that allows the various costs that arise when implementing a new service in a telecommunications' network to be identified and classified; and
- developed guidelines for NRAs in assessing whether the cost estimates provided by the operators are relevant and realistic. These guidelines identify the factors that determine each cost element and discuss correction factors which should be applied to the costs.

1.2.2 Cost allocation

In order to provide guidance on how the costs of these services should best be allocated, we:

- reviewed the experience in six EU Member States²¹ with respect to the introduction of the services and the recommendations on cost allocation. As part of that, we reviewed existing policy documents and consultation papers, issued a questionnaire and conducted telephone or face-to-face interviews with NRAs. We also conducted interviews with some operators (incumbents and new entrants) in each of the six Member States;
- assessed the cross-border impact of diverging cost allocation arrangements; and
- developed a framework of principles to offer guidance to NRAs on how to allocate the costs of the services. This framework was based on international experience and a review of relevant regulatory principles in Member States, and on Community Directives and Recommendations.

1.3 The Structure of this Report

The results of the study are presented in two volumes.

²¹ The six EU Member States chosen by agreement between the project team and DG XIII were Finland, France, Germany, the Netherlands, Sweden, and the UK.

Volume I

Volume I is the main report of the study and addresses all but one of the terms of reference; the exception being the assessment of the costs for each technical solution which, given its technical nature, is covered in Volume II. Volume I presents the major guidelines and recommendations for NRAs to assist them when allocating the costs of number portability, carrier selection, and carrier pre-selection. The structure of Volume I is as follows:

- Chapter 2 sets out the obligations in the Directives and provides the context for this study;
- Chapter 3 describes the essential features of NP, CS, and CPS;
- Chapter 4 identifies the most common technical solutions used to implement NP, CS, and CPS. This chapter also describes the costs involved in introducing the services and classifies them in a manner that assists in providing guidance on their allocation;
- Chapter 5 summarises the experience of six EU Member States with respect to the implementation of the services, and the principles used to recover costs;
- Chapter 6 presents a framework of guiding principles that could be used by NRAs to recover the costs and discusses some of the issues of divergences in the way the framework is applied;
- Chapter 7 discusses the cross-border effect of diverging cost allocation arrangements;
- Chapter 8 discusses the role of NRAs based on EU regulatory principles and the experience in the Member States that we reviewed.

Volume II

Volume II provides the operational detail that may be useful to NRAs, including technical details of costs and guidelines for assessing the likely level of costs. The structure of Volume II is as follows:

- Chapter 1 provides in detail costs for each technical solution for NP and guidance for assessing costs;
- Chapter 2 provides in detail costs for each technical solution for CS/CPS and guidance for assessing costs.

In addition, there are two appendices:

- Appendix 1 presents a detailed review of the experience in six EU Member States;
- Appendix 2 provides a more detailed description of some of the NP technical solutions, of non-geographic number portability and mobile number portability.

2 LEGAL FRAMEWORK

2.1 Obligation to Implement the Services

The obligations on Member States to introduce NP, CS, and CPS are contained in the Interconnection Directive (97/33/EC)²² and the amending Interconnection Directive (98/61/EC).²³ Together, these Directives require the following:

- **Call-by-call carrier selection (CS)** should have been offered by all fixed local access providers with significant market power (SMP) since 1 January 1998 in all Member States where full liberalisation was due by that date. In Member States where additional transition periods have been agreed, carrier selection should be in place by the end of that additional period.²⁴
- By 1 January 2000, **carrier pre-selection (CPS)**, with the default carrier to be determined by the subscriber and with call-by-call override to be available to the user, should be offered by all fixed local access providers with SMP in all Member States.²⁵ In Member States where additional periods were agreed for full liberalisation, carrier pre-selection should be in place two years after the date of liberalisation at the latest.
- Also by 1 January 2000, **operator number portability (NP)** should be offered by all fixed local access providers. In the case of geographic numbers, portability should be offered at a specific location and in the case of other than geographic numbers at any location.²⁶ In Member States where additional periods were agreed for full liberalisation, number portability should be in place two years after the date of liberalisation at the latest.

It can be seen that, unlike Number Portability, Carrier Selection/Pre-selection is at present a **non-symmetric service**. It is imposed by the Directives only on fixed network operators with SMP. However, some Member States, such as Germany and Sweden, have imposed the obligation on all operators.

2.2 Responsibilities of NRAs

Community Directives impose a number of responsibilities on NRAs of which, for the purpose of this study, those that affect cost allocation are most relevant. These are found in the Interconnection Directive (97/33/EC), the Directive amending the Interconnection Directive (98/61/EC), and the Open Network Provision (ONP) Voice Telephony Directive (98/10/EC).²⁷

²² Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on Interconnection in Telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision.

²³ Directive 98/61/EC of the European Parliament and of the Council of 24 September 1998 amending Directive 97/33/EC with regard to operator number portability and carrier pre-selection.

²⁴ Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on Interconnection in Telecommunications with regard to ensuring universal service and inter-operability through application of the principles of open network provision (ONP).

²⁵ Directive 98/61/EC of the European Parliament and of the Council of 24 September 1998 amending Directive 97/33/EC (the Interconnection Directive) with regard to operator number portability and carrier pre-selection. Official Journal of the European Communities L268/37. Note also that Section 24 of Directive 97/33/EC provides that the "functioning of this Directive should be reviewed by 31 December 1999, in particular to examine the scope of universal service and the timetable for number portability".

²⁶ *ibid.*

²⁷ Directive 98/10/EC of the European Parliament and of the Council of 26 February 1998 on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment.

2.2.1 Obligations regarding charges for services

With regard to NP, Article 12 (5) of the Interconnection Directive (97/33/EC) states that:

“In order to ensure that charges to customers are reasonable, national regulatory authorities shall ensure that pricing for interconnection related to the provision of this facility is reasonable.”

Article 15 of the ONP Voice Telephony Directive also refers to a ‘reasonable’ charge for NP services:

“National regulatory authorities shall ensure that any fees for the above facilities are reasonable.”

CS and CPS, on the other hand, are more closely related to interconnection and, therefore, have more detailed conditions associated with them. In particular, Article 17 of the ONP Voice Telephony Directive states that tariffs shall follow the basic principles of cost orientation and shall be sufficiently unbundled.

The Directive amending the Interconnection Directive with regard to operator number portability and carrier pre-selection also discusses the concept of cost orientation. Article 1 (3) states that for operators with SMP:

“National regulatory authorities shall ensure that pricing for interconnection related to the provision of the facility is cost-oriented and that direct charges to consumers, if any, do not act as a disincentive for the use of this facility. ”

Following the Interconnection Directive, the Commission has released Recommendations on Interconnection, dealing with Interconnection Pricing.²⁸ These recommendations propose the use of long run average incremental costs as the appropriate basis for meeting the requirement of cost orientated interconnection charges.

Part 2 of the Recommendations, adopted on 8 April 1998, deals with Accounting Separation and Cost Accounting Systems. It recommends that NRAs require operators with SMP to provide cost oriented interconnection as well as the disaggregation of operating costs, capital employed and revenues of their integrated operations. The Commission recommends that the allocation of costs, capital employed and revenues should be done in accordance with the principle of cost causation and the evaluation of assets should be at forward looking or current value as provided by an efficient operator.

²⁸ Commission Recommendation 98/15/EC of 8 January 1998 on Interconnection in a liberalised telecommunications market. Part 1 – Interconnection Pricing. OJ L 73,12.3.1998, p.42.

2.2.2 General responsibilities

These responsibilities need to be considered alongside some of the other general duties of NRAs, the main such duties being contained in Article 9 of the Interconnection Directive.²⁹ Article 9 (1) states that NRAs:

“shall encourage and secure adequate interconnection in the interests of all users, exercising their responsibility in a way that provides maximum economic efficiency and gives the maximum benefit to end-users.”

The Article also lists the following considerations as ones that NRAs must take into account:

- the need to ensure satisfactory end-to-end communications for users;
- the need to stimulate a competitive market;
- the need to ensure the fair and proper development of a harmonised European telecommunication market;
- the need to co-operate with their counterparts in other Member States;
- the need to promote the establishment and development of trans-European networks and services, and the interconnection of national networks and interoperability of services, as well as access to such networks and services;
- the principles of non-discrimination (including equal access) and proportionality; and
- the need to maintain and develop universal service.

Article 16 of the ONP Voice Telephony Directive states that in reference to special network access:

“National Regulatory Authorities may intervene on their own initiative at any time, where justified, in order to ensure effective competition and/or interoperability of services and shall do so, if requested by either party, in order to set conditions which are non-discriminatory, fair and reasonable for both parties and offer the greatest benefit to all users.”

The major roles of NRAs with respect to cost allocation are summarised in the box below.

²⁹ Article 9 of the Directive also gives NRAs the right to ensure interconnection agreements, promote effective competition, and/or interoperability of services for users.

Summary of the Major Obligations Imposed by Community Directives

1. Ensure that charges for CPS are cost oriented and that direct charges to customers, if any, do not act as a disincentive for the use of the facility (Article 1(3) of the Directive amending the Interconnection Directive);
2. Ensure that any fees for NP are reasonable (Article 15 of the ONP Voice Telephony Directive);
3. Exercise their duties regarding interconnection in a way that provides maximum economic efficiency and gives the maximum benefit to end users. Relevant considerations include the need to ensure satisfactory end-to-end communications for users, the need to stimulate a competitive market, and the need to ensure the fair and proper development of a harmonised European telecommunication market (Article 9 of the Interconnection Directive);
4. Ensure effective competition and/or interoperability of services in order to set conditions which are non-discriminatory, fair and reasonable for both parties and offer the greatest benefit to all users (Article 16 of the ONP Voice Telephony Directive).

2.3 Summary

The Amending Interconnection Directive requires charges for CPS to be cost oriented and not to act as a disincentive for the use of the facility. The ONP Voice Telephony Directive, however, requires charges for NP to be “reasonable”. This difference in terminology has no special significance and is the result only of procedural limitations.

The general responsibility on NRAs in Article 9 of the Interconnection Directive to provide maximum economic efficiency will mean, at a minimum, that tariffs, even for NP, should be cost oriented. Economic efficiency will generally be furthered if the prices that consumers pay for goods and services reflect their respective opportunity cost. Consumers are then able to decide what to buy and, more importantly, whether the benefit they receive from the purchase of any particular product is worth the sacrifice of other goods and service that its production entails.

This suggests that a “reasonable” charge and a “cost oriented” charge will be expected to be similar, particularly given the responsibility on NRAs to ensure economic efficiency.

Although important, ensuring that charges for NP, CS, and CPS are cost oriented will often not be enough to discharge an NRA’s responsibilities under the Interconnection and other Directives. It is also critical that any charges have indeed been imposed on the appropriate party and that these charges provide the correct incentives to encourage operators to introduce efficient solutions. The Directives, however, are less detailed on these issues and particularly on the question of whether operators should be able to pass on their costs to other operators, and if so, which costs.

To that end, this study presents a consistent framework for the allocation of the costs of NP, CS, and CPS which is in line with EU regulatory principles and which could provide guidance for NRAs in all EU Member States.

3 DESCRIPTION OF THE SERVICES

3.1 Terminology

Throughout this study, the following definitions will be used to refer to operators:

- **SMP operator.** An SMP operator is an organisation operating a public telecommunications network that has been notified by NRAs as an organisation having Significant Market Power.³⁰ They typically offer local access as well as long distance and international calls.
- **Incumbent operator.** An incumbent operator is the established telecommunications operator in a country or locality and will usually offer local access as well as long distance and international calls.
- **Local loop operators (LLO).** Local loop operators, also known as fixed local access providers, offer access to end users, usually but not necessarily in urban areas. These operators may need to interconnect to long distance operators to support long distance calls, although in many cases the local loop operator will also offer such calls themselves.
- **Indirect access providers.** These operators are usually new entrants who do not offer local access but provide certain calls to customers. The types of calls typically provided by indirect access providers are long distance and international calls although they could offer more comprehensive services such as local calls. These operators rely on the local access network of other operators.
- **Global operators.** These are new entrants who invest in a local access network and local calls, and long distance and international call services.
- **Donor network operators (DNO).** This term is used mainly with reference to NP and describes the network operator who has lost a subscriber to another operator.
- **Recipient network operators (RNO).** This term is also used with reference to NP and describes the network operator who has gained a customer.

3.2 Number Portability

Number portability refers to the ability of end users to retain their telephone number when they change their network operator/service provider, their location, or their service. End users who retain their telephone number when changing operators are referred to as 'ported' customers.

Services that may be provided to a ported user include the provision of the basic telephony service and additional supplementary services.³¹

A telephone number is not simply a customer identifier; it fits into a highly structured numbering scheme which has been used by the telecommunications operators as the key information for the routing of calls through their networks. Although the precise structure of telephone numbers

³⁰ The definitions of SMP and dominance, although related, are different (see Notice on the application of the competition rules to access agreements in the telecommunication sector: Framework, Relevant Markets, and Principles (98/C 265/02)).

³¹ The services include call associated services such as calling line identification presentation, or non-call associated services such as Customer Care and Billing System and call completion to busy subscriber.

varies between countries, the numbers were traditionally structured to identify the country, the network, the area, and eventually each local exchange.

Number portability fundamentally modifies this approach: if a number has been ported, either between operators or between exchanges of the same network, then the dialled digits no longer contain all the necessary information to enable call routing. It is therefore necessary to collect additional information at some point in the call set-up mechanism (such as information that the number has been ported and an indication of the new network housing this number) in order to be able to complete the call. This requires the operator to modify the logical programming of the switches.

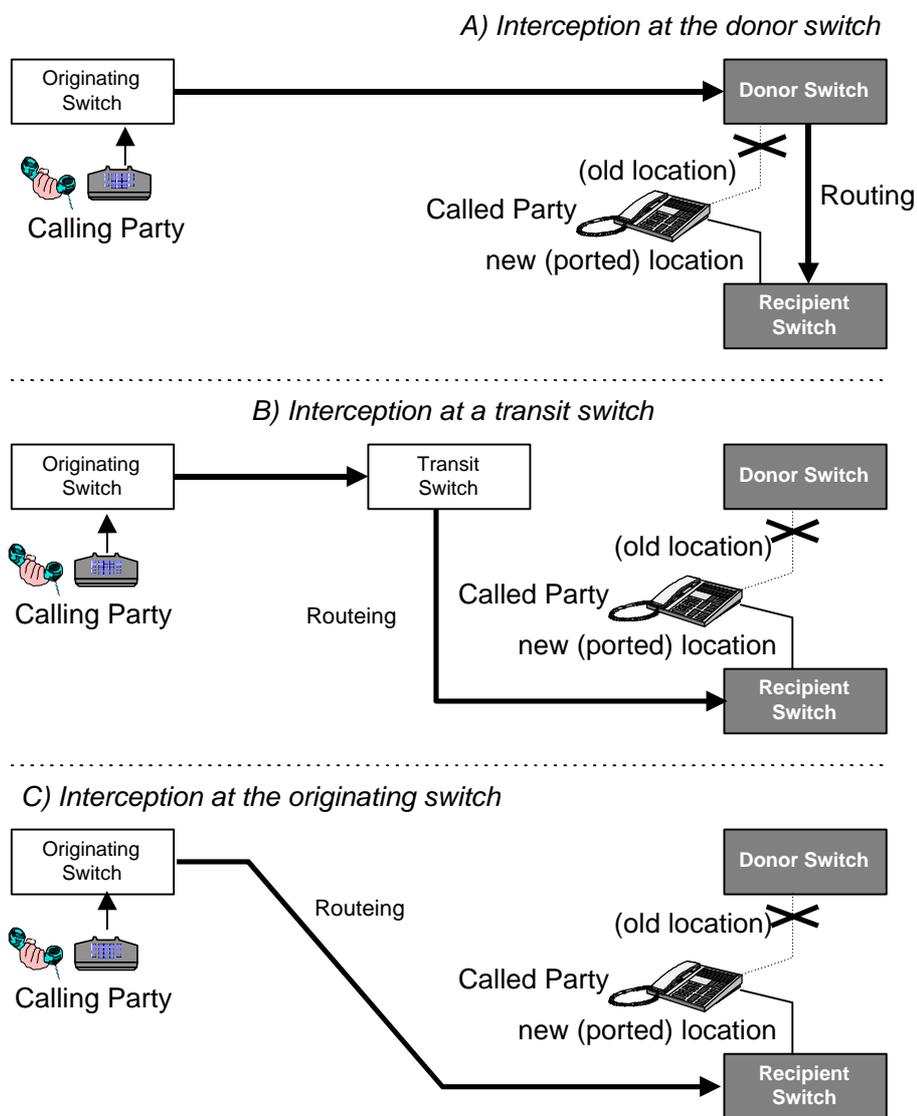
A call to a ported number will be routed in two stages subsequent to dialling of the original directory number. The first stage is the recognition that the call is toward a ported number. This is often referred to as the **interception stage**. Interception can be performed at the donor switch (local exchange where the subscriber line was initially attached before being ported), at some transit switch, or at the originating switch, (i.e. the switch from which the call from the calling party originates).

The second stage, referred to as the **routing stage**, occurs when the call has been recognised as a call to a ported directory number and then re-routed from the intercepting switch to the new terminating switch.³² The second stage of the call must be completed separately.

Figure 3.1 illustrates the different ways of processing a call to a ported number:

³² The terminating switch is also known as the recipient switch and refers to the new local exchange where the subscriber line of the ported number is attached.

Figure 3.1
Processing a call to a ported geographic number



The porting of non-geographic numbers is less difficult to achieve, because calls to such numbers are already processed via a number translation system before the introduction of non-geographic number portability (NGNP). The introduction of NGNP will therefore modify the numbering data management but not the existing call processing mechanisms.

The various types of portability are defined in Table 3.1.

Table 3.1
Classification of number portability services

Type of NP service	Service description
Operator portability	<p>Refers to the ability of an end user to retain the same telephone number when changing from one operator to another. It is also referred to as 'service provider number portability' and is further divided into:</p> <ul style="list-style-type: none"> ● geographic number portability for all fixed public telephone network and integrated services digital network (ISDN) subscribers at a specific location; ● non-geographic number portability or NGNP for fixed numbers at any location; ● mobile number portability or MNP.
Location portability	<p>Refers to the ability of an end user to retain the same telephone number when changing from one physical location to another without necessarily changing their operator.</p>
Service portability	<p>Refers to the ability of an end user to retain the same telephone number when changing from one type of service to another without necessarily changing their operator (e.g., from plain old telephone service to ISDN).</p>

The requirements in the Amended Interconnection Directive refer to geographic and non-geographic number portability; there are, at present, no Directives requiring mobile number portability, location portability, or service portability. The only specific requirement relates to the ability of a customer to be able to retain their number when changing from one fixed operator to another in the same location.

This study focuses on operator number portability, which is the main NP service requiring regulation. Within operator portability, the study will focus on geographic and non-geographic number portability (NGNP), the services listed in the Directive amending the Interconnection Directive. Although mobile number portability has not been addressed yet in the existing Community Directives, several countries have decided to urge mobile operators to implement it within the same timeframe. Therefore, some discussion will also be presented on mobile number portability (see Volume II).

Location portability and service portability are services which may be supplied by an operator to its customers within its own network. Hence it is the responsibility of the operator to define the cost that will be charged to its customer. In most cases, there are fewer inter-operator issues (technical or charging). The impacts of those services on market competition are those of classical differentiation of competitors through a personalised products and services offer. As long as the charges for the services offered by incumbent operators comply with the principle of non-discrimination, there may not be specific requirement for regulators to intervene more deeply in the process.

Location portability and service portability will be considered as factors that might affect the costs for the implementation of operator portability (especially system set-up costs), as some technical

solutions may apply for geographic number portability and for location/service portability. It is also possible that an end user may want to keep the same number when changing to another operator and a new service at the same time.

3.3 Carrier Selection

Carrier Selection has to be understood in a context of network interconnection between operators.³³ It refers to the ability of operators who do not have their own directly connected customers to provide services to subscribers who are directly connected to the local loop of another operator. For this reason, they are referred to as indirect access providers. Carriers with their own directly connected customers may also provide services to other customers as a result of carrier selection. The main local loop operator will, in most countries, be the incumbent operator who will usually be designated as possessing significant market power.

Call-by-call Carrier Selection is a service that enables a fixed subscriber to select a carrier different from its local loop operator for the routing of a specific call.

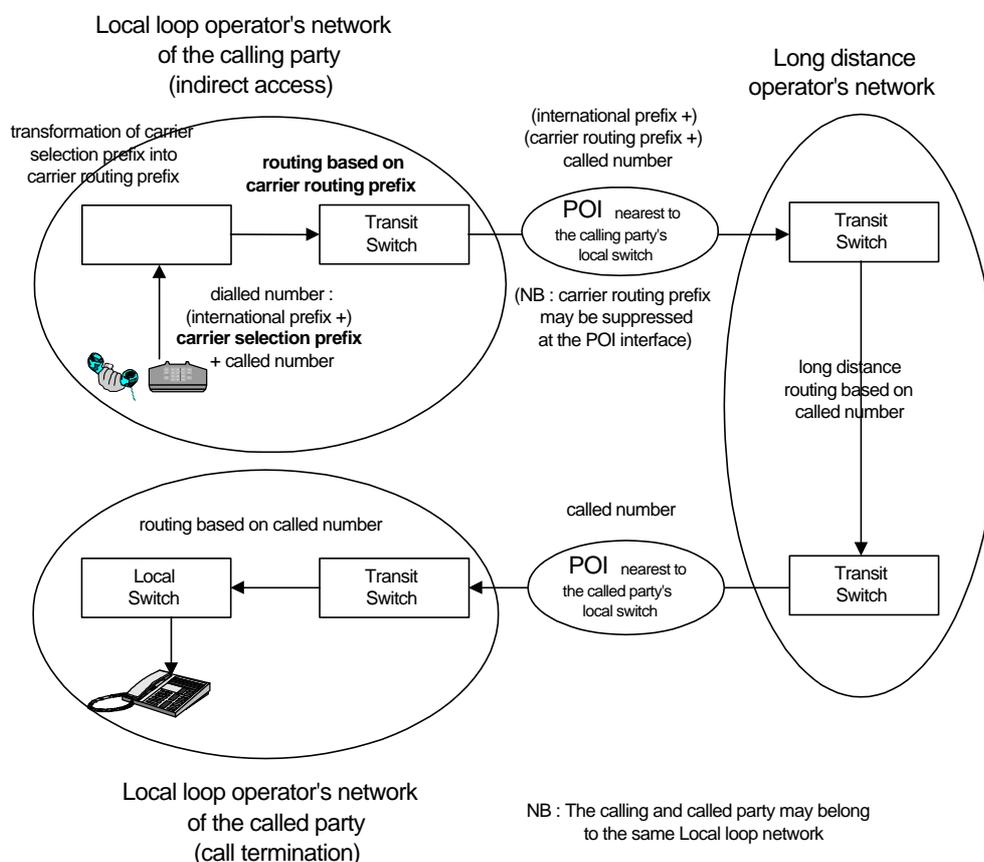
This service **requires the selected carrier to be interconnected to the incumbent's network** through at least one point of interconnection (POI). The way calls are routed for carrier selection is shown in Figure 3.2.

The local loop operator will then analyse the dialled prefix (which identifies the selected carrier's network) and route the call to the indirect access provider via the closest POI. It is then the responsibility of the indirect access provider to check that the subscriber is authorised to use its services.

The following diagram illustrates call-by-call carrier selection in the case when the indirect access provider is a long distance operator (LDO).

³³ Carrier Selection is also called "Indirect Access".

Figure 3.2
Carrier Selection



The implementation of CS has differed across Member States, depending on the regulatory context and the circumstances in each country.³⁴ The differences have included:

- CS may be excluded from payphones. Since customers typically receive bills from the selected operator for use of their service, it is not possible for operators to bill customers calling from payphones;
- CS may be excluded for special "low cost" subscribers. CS may be excluded for special "low user scheme" subscribers. For such subscribers, the incumbent, although required to provide a minimum telecommunications service, may not generate significant benefits (in terms of revenue) and may not, therefore, wish to provide CS to them in case they select another long-distance operator;
- the numbers which can be dialled using carrier selection vary depending on the country. For example, local calls may be excluded (and the incumbent operator may or may not provide local call sorting), as may special numbers (such as freephone and mobile numbers). This is a function of country-specific regulation and interconnection agreements. Indeed, it may not be profitable to send calls to an LDO from one point of interconnection, and to receive it back immediately because the called party belongs to the same area as the calling party.

³⁴ This could raise legal problems with respect to the implementation of the Community Directives but such problems are beyond the scope of this study.

The market sharing arrangements can result in calls made without carrier selection code being processed systematically by the local loop operator, or distributed statistically to all long distance carriers (for example according to their respective market share). This is done quite simply with the standard functions of an exchange, by specific programming of the routing tables to distribute calls to several routes according to a percentage distribution.

It should be noted that an advanced feature of CS is that the local loop operators may in some cases provide customer-billing services on behalf of the long distance carrier. Whilst this is a commercial arrangement, some NRAs have or are considering imposing this on the local loop operator. This requirement has an impact on the magnitude of costs as well as who bears them.

3.4 Carrier Pre-Selection

Carrier Pre-Selection is a service that enables a fixed subscriber to select a carrier different from his local loop operator for the routing of the relevant outgoing calls. This service should include the possibility for the subscriber to ignore this pre-selection and to make a different carrier selection for a specific call ("override capability").

With CPS, one or several default indirect access providers are programmed according to the subscriber's choice. The subscribers then no longer need to dial the carrier selection prefix (unless they wish to override the pre-selection choice for a certain call). The local loop operator analyses the dialled number, retrieves the pre-selected provider from the subscriber context³⁵, modifies the called number accordingly and delivers the call to this carrier's network.

The carrier pre-selection implementation choices also vary depending on the regulatory context and circumstances of each country. In particular:

- the issues presented for CS may also apply; and
- in addition, there may be one or several pre-selection possibilities: national calls only, international calls only, national and international calls only, all calls including special numbers, or a combination of several of those options. This will have an impact on the developments on the switch in terms of call processing mechanism and memory space required for the subscriber context.

In most European countries where CPS is in place or is soon to be implemented, the customer must actively choose to pre-select another operator, otherwise they stay with the incumbent operator (local loop) operator. By contrast, in Finland, subscribers are required to select or pre-select an operator. The traffic which is generated by calls not using CS or CPS is divided between the operators according to their market shares.

³⁵ This refers to the information stored in the local exchange which specifically relates to the characteristics applicable to a particular customer line such as CPS.

4 COST CATEGORIES AND TECHNICAL SOLUTIONS

4.1 Cost Categories

The costs of NP, CS and CPS include:

- system set-up costs;
- per operator set-up costs;
- per-line administration costs;
- additional conveyance costs; and
- administrative costs.

A description of each of these types of cost is provided in Table 4.1. These costs have been further categorised as either establishment or consumption costs, in order to provide guidance on their allocation in Chapter 6. In terms of cost allocation, the key difference between establishment costs and consumption costs is that establishment costs cannot be attributed to particular users,³⁶ while consumption costs can generally be more easily linked to individual operators or customers.

Table 4.1
General cost framework

Cost category	Type of cost	Description
<u>Establishment Costs</u>	System set-up costs	Costs incurred as a result of network evolutions (capacity, functions) and the modification of operational procedures in order to be able to supply the service. They also include set-up costs incurred by third parties on behalf of the industry to introduce national databases.
	Per operator set-up costs	Costs incurred as a result of the activation of the service per operator.
<u>Consumption costs</u>	Per-line administration cost	Costs incurred as a result of the activation of the service per line (or per group of lines).
	Additional conveyance costs	Additional costs incurred as a result of the processing and routing of a call to/from a line using the service.
	Continuing administrative costs	Costs incurred by the operator or NRA (or their agents) as a result of providing the service.

Establishment costs can also be thought of as the costs that are incurred to ensure that all users have the capability to use the service. These consist of system set-up costs (including costs incurred on behalf of the industry for one class of NP solutions), and per-operator set-up costs.

³⁶ Indeed, if no customers port or pre-select their number, the establishment costs may never be attributed to individual users.

Establishment costs arise as result of the policy decision that services need to be in place and be available to all (or at least to most) customers. The reasons for such policy decisions could include the introduction of the service as a requirement in a Directive, or a regulatory desire to remove barriers to competition.

Consumption costs recognise that once consumers use the service, they will impose costs on operators. Consumption costs consist of per-line administration costs, additional call conveyance costs³⁷, and other administrative costs. A cost cannot be classified as a consumption cost if it is incurred when customers are neither exercising a choice nor using the network.

4.2 Implementing Number Portability

The technical solutions available to implement NP will depend on:

- the time scales required;
- the characteristics of the existing network (level of digitalisation, existence of Intelligent Network (IN) platforms, network architecture etc);
- the interconnection structure (number of POIs and level of interconnection, number of transit areas etc),³⁸ and
- the scale of implementation of NP (very small number of lines concerned, or generalised use of this service) and the number of operators involved.

In some countries, a transient, short-term solution was chosen initially. This was not necessarily the most technically efficient solution but nonetheless allowed implementation in a timely way and with minimum investment. In parallel, a nominal "target" solution was studied (looking at issues such as long-term viability, compatibility, and migration path) and deployed progressively.

Technical solutions can be classified into two broad categories – on-switch solutions and off-switch solutions. However, the distinction between on-switch and off-switch techniques has relevance only to the first stage of the porting process (interception). The second stage (routeing) is common to both on-switch and off-switch methods.

4.2.1 On-switch solutions

On-switch solutions restrict the management of the ported numbers and the knowledge of the final destination of a call to the donor local exchange (i.e. the exchange where the subscriber was initially located). Interception is performed at the donor switch.

There are two main families of on-switch solutions, with variants:

³⁷ Additional conveyance costs involve the extension of traffic links capacity and additional call processing – ie traffic related costs.

³⁸ There do not seem to be any cases where digitalisation is undertaken for the sole purpose of implementing number portability. Therefore such costs cannot be allocated to NP and are not addressed in this study.

- **Solution Category 1 : onward routeing** (call forwarding and derivatives):
 - using a second number,
 - using a generic routeing number,
 - using a routeing prefix,
 - transparent call forwarding (using a routeing prefix).

- **Solution Category 2: translation via routeing tables:**
 - using translation into a second number,
 - using translation into a prefixed number.

These different solutions have a number of drawbacks (such as consumption of number resources, loss of services such as caller line identification or CLI) and require a variable amount of software development in the call processing mechanisms and in the signalling.

They also produce “tromboning”: the call is set up all along the path from the originating switch to the donor switch, and then from the donor switch to the recipient switch, and therefore two different traffic connections will be established along the "common" part of the path. Tromboning can be reduced or avoided by implementing a call drop-back mechanism.

On-switch solutions are usually seen as a short term interim solution for Number Portability, but can evolve to a long-term solution with additional specific developments to remove some technical drawbacks such as service limitations or tromboning effects. They are relatively easy and quick to implement compared to off-switch solutions.

4.2.2 Off-switch solutions

Off-switch solutions transfer the knowledge of portability information into one or several external databases that can be accessed by all network switches for query. Interception is performed at the originating switch or at some transit exchange. This type of solution allows for the best routeing of the call towards the final destination, i.e. the recipient switch.

The only way for the originating local exchange (or some transit exchange) to intercept a call to a ported number is to query a global database which would contain the list of all ported numbers, plus re-routeing information associated with each ported number. This query can only be achieved using Intelligent Network (IN) techniques.

The exchange which performs the query must therefore be IN-capable, i.e. be able to act as a Service Switching Function (SSF) and be able to communicate with a Service Control Function (SCF) that contains the ported numbers database.

The IN query is a signalling connection, not a traffic connection. The query is performed by providing the dialled number, and the response returns the re-routeing information, i.e. the prefixed number (another number could be returned as well). The traffic connection from the intercepting exchange to the recipient exchange is then established based on the call re-routeing information obtained as a result of the query. Therefore the **traffic routeing is optimal** and there

is no tromboning, except in very special cases caused by network design choices (for example when the SSF function is implemented only at transit level and the inter-operator interconnection is at local level).

The query is performed once in the call set-up process, and an indicator flag should be conveyed to the second stage of the call for a ported number, in order to avoid a second query to the database. For methods that attach a prefix to the dialled number, the prefix itself can be used as an indicator.

The IN query is triggered because the block to which the called number belongs is known as having at least one number which is ported. For regions where number portability has not yet been introduced, the query would not be performed at all. It is also possible to query the database only for calls to ported numbers; this is referred to as Query on Release (QoR). There are two ways of performing the query:

- **query by default** (query initiated for all calls without discrimination);
- **query on release** (query initiated only for calls which have been detected as calls to ported numbers).

As it is not technically feasible to process all the queries for all the communications of one country within a single IN platform, the query is sent to a database located in the operator's network. For consistency reasons and so that a new ported number can be taken into account at the same time in all networks, there is arguably a need for one national "master" IN database providing distant access to all national operators for the management of ported numbers, and synchronising periodically each operator's "local" database.

This type of solution is sometimes seen as the long-term target solution for Number Portability. It supports optimal call routing and is adapted to an environment where the number information has to be shared by all the operators. However, it is technically much more complicated to implement, involves significant investment (even from operators who are not directly concerned by NP such as long distance operators selected as indirect access providers if they have the responsibility to check whether a number has been ported), and requires considerable national co-ordination.

Nevertheless, although on-switch solutions have been preferred by a number of EU Member States as a way of introducing NP relatively quickly, IN solutions are becoming more common particularly for smaller countries. There are at least three reasons for the heightened interest in IN solutions as a way of introducing NP:

- the additional conveyance costs of an off-switch solution are very low as a call to a ported number does not need to involve the donor network operator;
- while incumbent operators also incur significant set-up costs, they may already have IN functionality in their network for services other than NP;³⁹

³⁹ IN platforms allow operators to provide a variety of value-added services in addition to NP. As long as each operator bears its own system set up costs, the attribution of costs for NP services is not relevant. The issue is more important when considering a centralised database (managed, for example, by an industry body or even perhaps by the NRA) which also provides functionality for a range of services other than NP.

- suppliers are increasingly developing IN as part of their product offerings.

Table 4.2 provides an overview of the types of costs incurred in providing NP, classified into establishment and consumption costs. More details are provided Chapter 1 of Volume II. In addition, Appendix 2 of Volume II provides a more detailed description for each technical solution.

Table 4.2 – Identifying and Classifying Costs of Number Portability

Cost category	Details of costs
Establishment Costs	
System set-up	<p><i>Initial network modifications :</i></p> <ul style="list-style-type: none"> ● for on-switch solutions: software modifications in the switches (local exchanges, transit exchanges) and in the signalling protocol to be able to provide NP services ● for off-switch solutions: investments for the set-up of an IN network (SCP, SMS, Service Switching Point (SSP) functions in the switches) and for the development of the IN NP service <p><i>Software modifications in the information systems:</i></p> <ul style="list-style-type: none"> ● customer care system (contracts and subscriptions, internal directory) and customer accounting and billing system ● inter-operator accounting and billing system <p><i>Set-up of new inter-operator tools and procedures :</i></p> <ul style="list-style-type: none"> ● creation of inter-operator NP service management procedures and tools ● modification of the maintenance and customer support procedures <p><i>Creation of a national "ported numbers" database (for off-switch solutions only)</i></p>
Per operator set-up	<p><i>Initial programming of routeing tables - to route the calls to a new recipient operator using a dedicated routeing prefix.</i></p> <p>(For off-switch solutions only: creation of an access to the national "master" IN database for periodic "local" database updating and NP requests)</p>
Consumption Costs	
Per line set-up	<p><i>Service ordering procedures:</i></p> <ul style="list-style-type: none"> ● usage of inter-operator NP service management procedures and tools (service activation / deactivation / modification) – may be for on-switch solutions only ● validation and processing of number portability requests in a national "ported numbers" database (off-switch solutions, and possibly NGNP) <p><i>Modification of subscriber data in the information systems :</i></p> <ul style="list-style-type: none"> ● customer care and customer billing systems ● inter-operator accounting and billing systems <p><i>Modification of subscriber data in the network elements</i></p>
Additional Conveyance	<p><i>Extension of traffic links capacity</i></p> <p><i>Additional call processing, switching and IN resources</i></p>
Continuing Administration	<p><i>Management of a national "ported numbers" database</i></p> <p><i>Management of allocation of non-geographic numbers to operators</i></p> <p><i>Administration of general number portability information (allocated routeing prefixes and number blocks per operator) in the national database</i></p>

4.2.3 Who incurs costs

The costs of Number Portability are incurred by:

- the donor operator (who is usually the incumbent local loop operator);
- the recipient operator (who is usually a new entrant local loop operator);
- the indirect access provider (IAP), including possibly the donor and the recipient operators; and
- other entities such as NRAs (or, by delegation, their agents).

We can assume that initially the main donor operator will be the incumbent operator. Table 4.3 below summarises the significance of each category of cost and provides an indication of who incurs the costs by each cost category for on-switch and off-switch solutions. The cost estimates underlying this table assume that indirect access providers (IAPs) are only long distance operators.

Table 4.3
Cost Incurred by Operators for Number Portability (by type of solution)

	System set-up cost	Per-operator set-up cost	Per-line set-up costs	Additional conveyance costs	Cost incurred by NRA or database administrator
On-switch solutions					
<i>Significance of costs</i>	High proportion of total cost	Small proportion of total costs	Very small	Varies depending on technical solution: can be quite high	Negligible
<i>Main party incurring cost</i>	DNO: high costs, especially for adaptation of information systems and software evolutions in switches RNO: lower costs mainly for adaptation of information systems	DNO: low costs for initial programming of switches All operators: low costs for initial programming of switches	DNO: low costs for modification of subscriber data RNO & IAPs: very low costs for modification of subscriber data	DNO: high costs for all calls to ported number All call-originating operators: all calls for networks to ported numbers	NRA: very low costs for allocation of non-geographic numbers
Off-switch solutions					
<i>Significance of costs</i>	Significant proportion of total cost-higher than on-switch solutions	Higher proportion of total costs than for on-switch solutions	Very small	Negligible	Very small
<i>Main party incurring cost</i>	DNO: high costs for set-up of IN, adaptation of information systems and creation of inter-operator service management tools and procedures RNO: high costs mainly for set-up of IN and adaptation of information systems IAPs: medium costs for set-up of IN and adaptation of information systems	DNO & RNO: medium costs mainly for set-up of database All operators: low costs for initial programming of switches	DNO: low costs for modification of subscriber data RNO & IAPs: very low costs for modification of subscriber data	All call-originating operators: very low costs for IN query signalling	NRA or others: low costs for set-up and administration of NP database and allocation of non-geographic numbers

4.2.4 Other forms of number portability

4.2.4.1 Non-geographic number portability

By definition, non-geographic numbers do not include information about the physical location of the end terminal. The processing of a call to a non-geographic number therefore has to include a translation to obtain the corresponding geographic number, which often depends on the calling party address. This translation is usually performed via an Intelligent Network function, which initially belongs to (and is managed by) the incumbent operator. It should be noted that the number translation may also be performed using routeing tables, but this method is viable only in very small networks in countries having very few non-geographic numbers.

In a multi-operator telecommunications market, several operators can use all non-geographic numbers, i.e.

- several operators can allocate those numbers to their subscribers,
- but each operator's subscriber must be able to perform calls to those numbers.

This last point requires additional call processing complexity: each operator must be able to access the number translation information for call routeing. This number translation information may be the "final" translated number itself, and/or information such as a prefix which routes calls to the network "owning" the dialled number.

As the basic processing of non-geographic numbers is already usually based on IN techniques, it is generally appropriate to use an IN solution for the portability of those numbers. A common solution is the 'query by default' solution with a reference Service Management System (SMS) which is similar to the one presented for the portability of geographic numbers.

4.2.4.2 Mobile number portability

In order to implement mobile number portability **between Global Systems for Mobile Communications (GSM) networks**, the specific GSM call set-up procedures have to be taken into account. The call set-up starts with an interrogation of the called subscriber's home location register (HLR), in order to retrieve his actual location and to route the call directly to the visited network using a temporary roaming number.⁴⁰

When a mobile number is ported, the routeing information is transferred from the donor Public Land Mobile Network's (PLMN) HLR to the recipient PLMN's HLR. Therefore, a call set-up may involve 3 mobile operators: the donor, the recipient and the visited. The same families of solutions can be used as in fixed networks, i.e. onward routeing (call forwarding using a routeing prefix) and IN solutions.

An additional solution, called signalling relay has also been developed. This solution allows the routeing of HLR interrogation to the recipient HLR on a per subscriber basis.

⁴⁰ Major differences between the signalling protocols used in the corresponding networks must be solved in order to implement mobile number portability between heterogeneous networks (for example analogue and digital mobile networks). Therefore, a solution derived from call forwarding techniques would probably be easier to implement as this type of service is in general provided at the interconnection between heterogeneous networks (i.e. with poor interoperability).

More details can be found in Appendix 2 in Volume II about the description of the various technical solutions to implement Mobile Number Portability between GSM networks.

4.3 Implementing Carrier Selection and Pre-Selection

4.3.1 Carrier selection

Unlike NP, technical solutions for the implementation of CS are limited.

In most EU Member States, the choice was made to assign prefixes to carriers. A subscriber willing to choose a long distance carrier on a call-by-call basis will dial the **carrier selection code (prefix)** and then the called number. Technically, the routing of calls based on routing prefix is a classical mechanism, which only requires the routing tables within the network to be programmed initially, and the interconnection between the incumbent and the new entrant operator's network to be established.

Single-stage dialling is preferable to two-stage dialling. Two-stage dialling can be used as a transient solution for customers who are connected to analogue switches which do not technically allow single stage dialling carrier selection, or outside the customer's home base when the customer needs to be identified by the carrier. However, the implementation of two-stage dialling is mainly dependent on the carrier network operator and has no specific impact on the incumbent operator's network.

The carrier selection prefixes allocated in Europe have up to six digits length depending on the country. As the E.164 numbering plan stipulates a maximum length of 15 digits for a fixed number at international format, and as two additional digits should be reserved to dial the international access code, the systems will have to support a maximum length of $15 + 2 + 6 = 23$ dialled digits. This might raise some problems as certain standards and certain switch equipment are limited to 20 dialled digits. However, this is not a crucial limitation: in most countries a solution was found for this problem for the majority of switches.

Possible restrictions in the implementation of CS may arise from:

- restrictions due to the correct provision of the Calling Line Identification (CLI) information at the interconnection (limits of electro-mechanical and analogue switches, and switches based on old digital technology);
- limits to the number of digits that can be passed through the network (PBXs, switches) : some of them are limited to 18 or 20 digits, whereas a minimum of 23 digits seems necessary;
- the structure of routing tables and routing parameters possibly limiting the number of carriers that can be selected; and
- constraints related to the interconnection between operator networks.

Table 4.4 provides an overview of the costs incurred in providing CS, which are essentially establishment costs. There are no significant consumption costs associated with CS apart from

the administration costs associated with the management of allocated routing prefixes which are incurred by the NRA. More details of the costs of CS can be found in Chapter 2 of Volume II.

Table 4.4
Identifying and Classifying Costs of Carrier Selection

Cost	Details of costs
Establishment Costs	
System set-up	<p>Initial software modifications in the switches (local exchanges, transit exchanges)</p> <p>Software modifications in the information systems:</p> <ul style="list-style-type: none"> - (possibly) customer accounting and billing system - inter-operator accounting and billing system <p>Set-up of new inter-operator tools and procedures:</p> <ul style="list-style-type: none"> - modification of the maintenance and customer support procedures <p>Fees for the right to use the allocated carrier selection prefixes. If applicable, this cost is incurred by each indirect access provider. As this cost depends on the country's regulatory framework, it will not be evaluated further.</p>
Per operator set-up	<p>Initial programming of routing tables:</p> <ul style="list-style-type: none"> - in order to route the calls for each indirect access provider to the nearest POI, based on the analysis of their carrier selection prefix - (optionally) additional programming of routing tables to provide, for each possible carrier selection prefix, the "local call sorting" feature. This cost depends on the country's regulatory framework: local call sorting may be an obligation or not, local calls may or may not be authorised with carrier selection.

Note: there are no significant consumption costs associated with carrier selection.

4.3.2 Implementing carrier pre-selection

Technically, the main change compared to carrier selection is that the Carrier Pre-selection option(s) of a subscriber have to be stored and memorised in the Line Context of this subscriber's local exchange.⁴¹ This is usually a specific software development. Depending on the choice of possible CPS options, several CPS profiles per subscriber might be necessary (for national calls, for international calls, for special numbers, for calls to mobile networks, all calls, etc). This CPS profile will be used when the subscriber has dialled a number without pre-selection override, and depending on the number and the pre-selected carrier for this type of number, the called number will be modified to add a routing prefix. This routing prefix will then be analysed and allow the call to be routed to the nearest POI of the pre-selected carrier. If the subscriber dials a number with a carrier selection prefix (override), the pre-selection information will be ignored and the call will be routed as such to the selected carrier. Technically, the routing of calls based on routing prefix is a classical mechanism, and it only requires to program initially the routing tables within the network, and to set-up (directly or indirectly via a transit network) the interconnection between the incumbent and the new entrant operator's network.

⁴¹ This refers to the information stored in the local exchange which specifically relates to the characteristics applicable to a particular customer line such as CPS.

There is an alternative strategy which may be convenient in small networks: the principle is not to modify anything in the local exchanges and to install **autodiallers** on the customer premises. An autodialler is a programmable smart box which is inserted between the customer terminal and the subscriber line and which adds the relevant prefix in front of the dialled number, depending on the customer's pre-selection options. This technical solution limits the initial investment because it requires no network hardware or software modification, but has a much higher cost per subscriber willing to use CPS, as one autodialler has to be installed per line, in the customer premises. It is therefore used only in very specific cases.

Table 4.5 provides an overview of the types of costs incurred in providing CPS, classified into establishment and consumption costs. More details of the costs of CPS can be found in Chapter 2 of Volume II.

Table 4.5
Identifying and Classifying Costs of Carrier Pre-selection

Cost	Details of costs
<i>Establishment Costs</i>	
System set-up	Initial software modifications in the switches (local exchanges, transit exchanges) Software modifications in the information systems: <ul style="list-style-type: none"> - customer care system (contracts and subscriptions, internal directory) - customer accounting and billing system - inter-operator accounting and billing system Set-up of new inter-operator tools and procedures: <ul style="list-style-type: none"> - creation of inter-operator CPS service management procedures and tools - modification of the maintenance and customer support procedures Fees for the right to use the allocated carrier selection prefixes. If applicable, this cost is supported by each long distance operator. As this cost depends on the country's regulatory framework, it will not be evaluated further.
<i>Consumption Costs</i>	
Per line set-up	Usage of inter-operator CPS service management procedures and tools (service activation/deactivation/modification) Modification of subscriber data in the information systems: <ul style="list-style-type: none"> - in customer care and customer billing systems - in the inter-operator accounting and billing systems Modification of subscriber data in the network elements (local switch)
Additional conveyance	Additional call processing resources
Administrative	This cost category comprises the management of allocation of carrier pre-selection codes to operators. This cost is incurred by NRAs. However, it can be considered as very low, as the task of allocation of carrier pre-selection codes is generally performed as part of the instruction of applications for operator licences.

4.3.3 Who incurs costs

We have identified the following categories of entities that may initially bear the costs of CS/CPS:

- the local loop operator (LLO), which owns the local access to the customer line (generally the incumbent);
- the indirect access providers (IAPs); and
- other entities such as NRAs (or, by delegation, their agents).

Table 4.6 below provides an indication of the significance of the costs and an indication of who incurs the costs by each cost category for on-switch and off-switch solutions. The cost estimates underlying this table assume that IAPs are only long distance operators.

Table 4.6
Cost Incurred for CS/CPS (by type of operator)

	System set-up cost	Per-operator set-up cost	Per-line administration costs	Additional conveyance costs	Cost incurred by NRA or database administrator
Carrier selection					
<i>Significance of costs</i>	High proportion of total costs	Very small proportion of total costs	None	None	Negligible
<i>Main party incurring cost</i>	LLO: medium costs for software evolutions in switches and adaptation of inter-operator billing systems IAPs: low costs from creation of service management tools and procedures and adaptation of billing systems	LLO: low costs for initial programming of routing tables			NRA: very low costs for allocation of operator codes
Carrier pre-selection					
<i>Significance of costs</i>	High proportion of total costs	None	Very small	Negligible	Negligible
	LLO: high costs for creation of service management tools and procedures, software evolutions in switches and adaptation of customer care and billing systems IAPs: medium costs mainly for creation of service management tools and procedures and adaptation		LLO: medium costs for modification of subscriber data IAPs: very low costs for modification of subscriber data	LLO: very low costs for additional processing of calls	NRA: very low costs for allocation of operator codes

5 REVIEW OF EXPERIENCE IN SIX EU MEMBER STATES

This chapter reviews the experience of six EU Member States regarding the implementation of NP, CS, and CPS and, in particular, their experience regarding cost allocation arrangements. The objective of the review is to draw out any existing themes and lessons in order to allow NRAs in those Member States that are currently determining how to allocate costs to benefit from the experience of others. The areas considered include:

- an overview of the implementation of each service;
- cost allocation arrangements; and
- the level of regulatory involvement and disputes.

The countries covered are Finland, France, Germany, the Netherlands, Sweden, and the UK,⁴² and all reference to experience of Member States refers to them. A more detailed study of the experience of Member States is presented in Appendix 1 of Volume II.

5.1 Overview of Implementation

Tables 5.1 and 5.2 present an overview of the implementation of NP and CS/CPS in the six EU Member States.

⁴² These countries were chosen by the project team and the DG XIII because of their experience with the implementation of the services.

Table 5.1 – Overview of Implementation: Number Portability

	<i>Finland</i>	<i>France</i>	<i>Germany</i>	<i>Netherlands</i>	<i>Sweden</i>	<i>UK</i>
1. Service currently offered (date)	Yes (October 1998)	Yes (January 1998)	Yes (January 1998)	Yes (April 1999)	Yes (July 1999)	Yes (April 1996)
2. Technical solution implemented (or planned)	Advanced call forwarding. IN solution seen as long term solution	Onward routeing for geographic number portability. IN solution used for non-geographic number portability	Onward routeing, call drop-back, IN. No specified long-term solution	IN solution. This is seen as long-term solution	Onward routeing (short term solution) and All Call Query (long term IN solution)	For geographic number portability, the current solution is transparent call forwarding with call drop back. (IN for NGNP)
3. Responsibility for choosing technical solution	NRA together with operators and manufacturers	Industry working group with NRA	Industry working group (NRA and operators)	Industry working group (NRA and operators)	All operators	Industry working group

Table 5.2 – Overview of Implementation: Carrier Selection/Preselection

	<i>Finland</i>	<i>France</i>	<i>Germany</i>	<i>Netherlands</i>	<i>Sweden</i>	<i>UK</i>
1. Is the service currently offered?	Yes (January 1994)	Yes (CS only, January 1998)	Yes (January 1998)	Yes (CS only, since July 1997)	Yes (CS since January 1999, CPS since September 1999)	Yes (CS only, since 1984)
2. If not, planned date for introduction	n.a.	CPS (January 2000)	n.a.	CPS (January 2000)	n.a.	CPS (Options 1 and 2 by Autumn 2000, Option 3 during 2001)*
3. Operators required to provide service	Operators with SMP	Operators with SMP	All fixed line operators	Operators with SMP	All fixed and mobile operators	Operators with SMP

* *Option 1 – International Calls; Option 2 – National Calls; Option 3 – all calls (including mobile, local, specially tariffed services)*

5.1.1 Summary of results from country studies regarding implementation

5.1.1.1 Implementation of number portability

Two features can be identified from the experience of the six Member States with regard to the implementation of NP:

- First, all six countries have implemented operator number portability ahead of the 1 January 2000 deadline stipulated by the Amended Interconnection Directive.⁴³ This is encouraging since Directive 98/61/EC requires NRAs to encourage the “earliest possible introduction of number portability.”⁴⁴
- Second, a mix of technical solutions have been used to implement NP with some Member States proposing the use of an interim on-switch solution with a migration to a long-term off-switch solution (such as Sweden and Finland) and others preferring to introduce a one-stage solution (such as the Netherlands and France). In Germany, and initially in Sweden, a number of solutions are running in parallel.
- The migration path to a longer-term solution can either be pre-planned (as with the move to call drop-back in the UK) or left open (as with the move to an IN solution in Finland).

5.1.1.2 Implementation of Carrier (Pre-)Selection

Call-by-call CS has been available in all six Member States. The services offered under CS to date generally only include national long distance and international calls.

CPS must be offered by 1 January 2000.⁴⁵ Most Member States that we have reviewed have met, or expect to meet, this deadline, with the exception of the UK which expects to introduce Option 1 (CPS for international calls only) by Autumn 2000 and have requested a deferment under the Interconnection Directive. Germany and Finland already offer CPS services, with Sweden expecting to do so by September 1999. The services typically offered (or planned) are national long distance and international calls, but are likely to cover other calls as well in the future (e.g. an “all calls” option which includes local calls).

5.1.2 Lessons from country studies regarding implementation

There are a number of lessons that can be drawn from the country studies in the following areas:

- the effectiveness of implementation of NP;
- the impact of the technical solution for NP;
- the scope of the obligations for CS/CPS.

5.1.2.1 The effectiveness of implementation of number portability

Even though all of the Member States we reviewed have introduced NP before the deadline, questions can be raised as to whether the objectives of NP have been fully achieved.

⁴³ OJ L 268, 3.10.98, p.37

⁴⁴ *ibid*

⁴⁵ OJ L 268, 3.10.98, p.37

The experience of the six Member States has shown that implementing NP has not always been an easy process and that there have been delays over agreements on how costs should be allocated. In the UK, for instance, OFTEL required BT to provide NP in certain cable areas by 7 October 1994. However, disputes between the operators over the financial terms on which portability would be provided led to regulatory intervention and a delay in the introduction of NP by 18 months.

Even when the service has been introduced and technically available, the cost allocation arrangements may be deterring the take-up of the service. In Finland, for example, the technical solution has been agreed and charges determined, yet in almost a year only a few dozen subscribers have ported their number. Such an outcome could raise serious questions about the extent of compliance with the requirements laid out in the Directive.

5.1.2.2 Impact of the technical solution for number portability

The review of the six EU Member States has revealed that a mix of technical solutions have been used to implement NP.

The assessment of the costs of NP provided in Volume II shows that the initial incidence of system set-up costs varies significantly depending on whether an on-switch or off-switch solution is chosen. The corollary of this is that the additional conveyance costs will generally vary inversely to the system set-up costs.

The lessons from this experience are that NRAs should seek to avoid locking in a technical solution that involves relatively high additional conveyance costs. The migration path between the interim and longer-term solutions, therefore, becomes important. NRAs may need to ensure that there are no barriers to the migration path and that the move to a longer-term solution is not dependent solely on the volume of porting customers.

In Finland, the volume of porting customers has been affected by the way that charges — particularly those to recover the additional conveyance costs — have been imposed. A charge on the recipient network operator has deterred new operators from promoting NP, thus depressing the number of customers porting. New entrant operators in France have also been less aggressive in marketing the number portability service than their counterparts in other countries.

5.1.2.3 The scope of the obligations for carrier (pre-)selection

Unlike NP, which must be offered by all fixed local loop operators by 1 January 2000, the obligations regarding CS and CPS are limited to those operators with SMP. In practice this obligation has been implemented differently by the six Member States that we reviewed:

- Sweden and Germany have imposed the obligation on all fixed local loop operators;
- France, the Netherlands and the UK have imposed the obligation only on fixed local loop operators with SMP;

- Finland originally imposed the obligation on all fixed local loop operators but narrowed it to SMP operators to ensure consistency with the EU Directive.⁴⁶

5.2 Cost Allocation Arrangements

Tables 5.3 and 5.4 provide a description of cost allocation in the EU Member States that we have reviewed. The tables use the cost categories actually used in each Member State rather than the terms 'establishment costs' and 'consumption costs' developed for this study. (Table 4.1 in Chapter 4 provides a summary of the terminology we have used to classify costs.)

⁴⁶ In Finland, however, there are almost 50 operators with SMP allowing for the obligation to be imposed widely even though technically limited to those operators with SMP.

Table 5.3 – Cost Allocation and Recovery for Number Portability

	<i>Finland</i>	<i>France</i>	<i>Germany</i>	<i>Netherlands</i>	<i>Sweden</i>	<i>UK</i>
1. Costs that each operator must bear itself	System set-up costs	System set-up costs	System set-up and additional conveyance costs	System set-up costs	System set-up costs and the investment costs associated with additional conveyance	System set-up and additional conveyance costs
2. Principles used by NRA	Cost orientation and reasonable costs	Cost causation and cost orientation	Not applicable as industry working group made a decision on this	Cost-orientation	Cost-orientation, cost minimisation	Cost causation, cost minimisation, distribution of benefits, effective competition, reciprocity, and practicability
3. Means of ensuring reasonableness of inter-operator charges	Commercial negotiations	Regulatory approval, as part of interconnection charges	Commercial negotiations	Commercial negotiations	Commercial negotiations	Charges calculated by reference to BT's incremental costs
4. Current (or planned) charging of customers by recipient operators	Yes	Varies (ie some operators charge consumers)	No	Varies	Yes	Varies
5. Level of customer charges	Varies: 0.9 Euros/100 per minute; 20-150 Euros one-off and 5 Euros monthly	n.a.	n.a.	up to 9 Euros	n.a.	8 Euros
6. Perceived impact of customer charges on take-up	Significant (negative impact on take-up)	Argued to be significant	Not applicable	Not significant	Not applicable	Not significant

Table 5.4 – Cost Allocation and Recovery for Carrier Selection/Preselection

	<i>Finland</i>	<i>France (CS only)</i>	<i>Germany</i>	<i>Netherlands (CS only)</i>	<i>Sweden (CS only)</i>	<i>UK</i>
1. Costs that each operator must bear itself	System set-up costs for CS but not necessarily for CPS	Costs recovered from other operators implicitly through interconnection charges	System set-up costs and additional conveyance costs	CS costs incorporated in interconnection charges. CS is a wholesale interconnection service that operators buy from KPN	System set-up costs and the investment costs associated with additional conveyance	CS – no additional set-up costs CPS - Incumbent operator system set-up costs are to be recovered from all relevant originating call minutes
2. Principles used by NRA	Cost orientation and reasonable costs	Cost orientation, transparency, non-discrimination	Cost orientation	Cost orientation, cost causation, reasonableness	Cost orientation, Cost minimisation	CPS - Competitive neutrality, distribution of benefits
3. Means of ensuring cost orientation of inter-operator charges	Commercial negotiation	Part of interconnection charges	Commercial negotiations and international benchmarking of charges	Part of interconnection charges, determined by KPN's (reconciled) EDC model. CPS will be treated in a similar fashion.	Commercial negotiations	CPS set-up charges as a supplement to interconnection charges
4. Current (or planned) charging of customers	No	No	Yes	No	No	Yes
5. Level of customer charges	n.a.	n.a.	21 Euros for per-line administration costs (2-5 Euros by 2000)	n.a.	n.a.	CS – Part of interconnection charges. CPS - Part of call origination charges (there is an explicit mark-up)

5.2.1 Summary of results from country studies regarding cost allocation

5.2.1.1 Cost allocation arrangements for number portability

Cost allocation arrangements for NP do show some variation across the six EU Member States that we reviewed although some common themes can be identified. The general approach to cost allocation has been as follows:

- Operators have borne their own system set-up costs. This has usually been justified by reference to the principles of cost causation and cost minimisation. Other less significant establishment costs such as per-operator costs may be subject to commercial negotiation in Member States (as for example in France).
- Additional conveyance costs are generally subject to commercial negotiation between operators except in Germany and the UK, where these costs cannot be recovered from other operators.
- In the UK, the treatment of the additional conveyance costs before the introduction of the more efficient call drop-back solution led to a dispute between operators. This was resolved through a decision that operators share the “tromboning” costs during the period of the transitional solution.
- Per line administration costs all six EU Member States except Germany can be passed on to other operators. In Germany the NRA, Reg TP, has ruled that a charge on customers could deter them from exercising their right to change operators while retaining their telephone number.

The inter-operator charges are shown in Table 5.5 below.

Table 5.5
Existing inter-operator charges for number portability

	<i>Per-line</i>	<i>Per-operator</i>	<i>Additional conveyance</i>
Finland ¹	140 Euros one-off	4 Euros per month	4/100 Euros per call 0.7/100 Euros per minute
France	15 Euros	520 Euros	0.07/100-0.9/100 Euros per minute
Germany	no charges	no charges	no charges
Netherlands	9 Euros	no charges	subject to commercial negotiation
Sweden	not available	not available	not available
UK	6-8 Euros	no charges	no charges

Notes:

- 1 Refers to charges imposed by the Helsinki Telephone Company (HTC)

5.2.1.2 Cost allocation arrangements for carrier (pre-)selection

The costs of implementing carrier selection have been treated in different ways across the six EU Member States that we reviewed. For example, the costs incurred by operators in the UK and the Netherlands have been passed on to other operators in the form of unbundled interconnection charges. In other Member States, the costs have been absorbed into the generality of charges.

There has been less experience with CPS, but the following themes can be identified with respect to the treatment of system set-up costs:

- in Germany and Sweden, operators are required to bear their own system set-up costs;
- in Finland, operators are allowed to pass on all of the costs of CPS to other operators. This also seems likely to be the case in France;
- in the UK, BT is only allowed to recover a small share of its system set-up costs from other operators.

Other costs are subject to commercial negotiation and the experience in the six EU Member States can be summarised as follows:

- the additional conveyance costs for CPS are negligible and not generally recovered through inter-operator charges;
- per-line administration costs are normally subject to inter-operator charges, although indirect access providers rarely pass these costs on to their customers in the form of an explicit charge for the service;
- in Germany, DT is permitted to charge customers who have pre-selected another operator a one-off charge, although the NRA has reduced this charge to a level it believes to be consistent with international best practice.

Inter-operator charges for CS and CPS are shown below.

Table 5.6
Existing inter-operator charges for carrier selection/carrier pre-selection

	<i>Carrier selection</i>		<i>Carrier pre-selection</i>	
	<i>Per-line</i>		<i>Per-line</i>	<i>Per-operator</i>
Finland	no charges (HTC)		4.2 Euros (Sonera) 87 Euros (HTC)	39 Euros (Sonera) no charges (NTC)
France	no charges		not available	not available
Germany	no charges		10 Euros	no charge
Netherlands	set-up 0.5-1.5/100 Euro/min 0.5-1.5/100 Euro/min		not available	not available
Sweden	na		6-12 Euros	no charges
UK	0.3-1.67/100 Euro/min		not available	not available

5.2.2 Lessons from the country studies regarding cost allocation

5.2.2.1 *Number portability*

In all Member States that we reviewed, operators have been required to bear their own system set-up costs. Incumbent operators — who would incur the majority of these costs — have, often reluctantly, accepted this recommendation. The per-line administration costs in all Member States apart from Germany, have been passed on through an inter-operator change.

The additional conveyance costs have emerged as the cost category most likely to cause difficulties in Member States. Those Member States that have chosen on-switch solutions that create significant additional conveyance costs and have allowed the donor network operator to pass on these costs to the recipient network operator (such as Finland and France) have experienced a low take-up of number portability. In other Member States where this is the case (i.e. Sweden) it is too early to assess the impact.

5.2.2.2 *Carrier selection and carrier pre-selection*

The way that the obligations regarding CS and CPS are imposed on operators appear to have influenced the cost allocation arrangements in the Member States that we reviewed. In general:

- system set-up costs have been borne by each operator where the obligations were symmetric; and
- where obligations were non-symmetric, the transfer of costs has generally been allowed.

Where inter-operator charges have been permitted, these do not appear to have impeded the development of competition. Both CS and CPS (where it is in place) have generally been regarded as successful services. In Finland, for example, CPS has led to significant changes in the market for long distance and international calls with the Finnet Group capturing almost half the long distance market in almost two years.

Indirect access providers have not usually explicitly passed on any inter-operator charges to their new customers, principally for commercial reasons. In Germany, however, customers who pre-select other operators are charged directly by Deutsche Telekom.

5.3 Regulatory Involvement and Appealed Disputes

The level of involvement by NRAs with respect to cost allocation arrangements has varied across Member States with NRAs becoming involved in different issues to different degrees. A summary of the involvement by NRAs is provided in Tables 5.7 and 5.8.

Table 5.7 – Regulatory Intervention and Appealed Disputes: Number Portability

	<i>Finland</i>	<i>France</i>	<i>Germany</i>	<i>Netherlands</i>	<i>Sweden</i>	<i>UK</i>
1. Level of intervention by NRA	Limited. Provided guidance on cost allocation (but no details on cost assessment), but relied on commercial negotiation for cost recovery (accepting the delays that this introduced).	Medium. ART approves the various inter-operator charges as part of interconnection charges.	High (limited initially). RegTP followed policy of leaving the decisions to the industry and intervening in the event of disputes or on issues related to customer charging (relied on consumer protection laws). Industry decided on cost allocation.	Medium. OPTA took a supervisory role on technical and cost allocation issues. Cost allocation decided by industry, with OPTA intervening in the event of disputes. Charges need to be approved by OPTA, as part of the interconnection charges.	Limited. Cost allocation proposals decided by PTS. Emphasis on commercial negotiation with PTS intervening in the event of disputes.	Significant (limited initially). Initial emphasis that allocation should be determined by the industry. This led to disputes and cost allocation decided following an investigation by competition authorities.
2. Disputes submitted to NRA	No	No	Yes (on imposition of per-line administration charges)	No	No	Yes (additional conveyance costs and per-line set-up costs)

Table 5.8 – Regulatory Intervention and Disputes: Carrier Selection/Pre-selection

	<i>Finland</i>	<i>France</i>	<i>Germany</i>	<i>Netherlands</i>	<i>Sweden</i>	<i>UK</i>
1. Level of intervention by NRA	Limited. Guidance on cost allocation, but emphasis on commercial negotiations.	Medium. ART approves the various inter-operator charges.	Significant.	Medium. CS/CPS charges are part of interconnection regime and need to be approved.	Limited.	Significant. Oftel provided proposals for cost allocation.
2. Disputes	No	No	Yes (level of customer charges)	No	Yes (scope of services)	No

5.3.1 Summary of results from country studies regarding regulatory involvement

The level of involvement by the NRA in the allocation of costs has varied across EU Member States.

- Two NRAs (Finland and Sweden) provided only high level advice to operators and left the details of cost allocation to be decided by commercial negotiation between operators.
- The other four NRAs have been involved to some extent in regulating the charges levied by SMP operators.
- NRAs in all six Member States have emphasised the principle of cost orientation in determining the allocation of costs for all services. A variety of tools have been used by NRAs to help to ensure that charges are cost oriented. These include:
 - use of cost accounting system or alternative methodology developed for determining interconnection charges. In the Netherlands the costs of CS have been incorporated into the interconnection regime. This increases the transparency of costs and could help to ensure cost-orientation of charges as the methodology (using cost accounting systems) involves assumptions on reasonable or allowable costs that can be included in charges.
 - international benchmarking. The European Commission and Reg TP both drew on international benchmarks to help them assess whether the per-line administration charges for CPS proposed by Deutsche Telekom were cost oriented.

5.3.2 Two Disputes

The two major disputes requiring significant regulatory involvement have been in Germany and the UK. These are summarised below.

5.3.2.1 Germany

The issue was whether Deutsche Telekom was able to levy a charge on customers to reflect the cost of retaining the number when changing operators.

The starting point for the regulator was to assess whether the charges were cost oriented. The regulator could then also consider other regulatory aims, such as the encouragement of effective competition or other public policy goals. Although a per-line administration charge was not explicitly ruled out by the Telecommunications Act, the regulator relied on customer protection laws which referred to the right of customers to use their telephone numbers. The regulator then concluded that Deutsche Telekom could not charge customers to activate their rights. This decision is currently (September 1999) subject to appeal.

A dispute also arose over the appropriateness of Deutsche Telekom's charge for CPS. The regulator conducted international comparisons of customer charges, looking in particular at the experience in the US. They drew on these findings to reject Deutsche Telekom's proposed charges and to recommend a lower range of charges.

5.3.2.2 UK

The approach adopted to recover the costs of NP in the UK can be traced back to a dispute between BT and Videotron in the UK in 1994. In August of that year, the Director General of Telecommunications (DGT) directed BT to provide portability to Videotron Corporation (Videotron), a cable company. The DGT then proposed modifications of BT's licence which would require BT to bear most of its own costs and, in the event of disagreements with other operators, allow the DGT to settle the terms.

BT found the proposals unacceptable, arguing that while it was willing to bear its own system set-up costs, there was no justification for it being unable to recover its per line set-up and additional conveyance costs, and no need for a licence amendment. OFTEL referred the case to the Monopolies and Mergers Commission (MMC).

The MMC's conclusions were that:

- system set-up costs were an essential part of the investment, which any operator needs to make in providing telecommunications services. BT should therefore bear its own system set-up costs.
- BT should be able to pass on its per line set-up costs to the operators to which its customers port their numbers.
- Additional conveyance costs should be treated differently under the different technical solutions: under the call drop-back solution, BT should bear the costs; and during the period of tromboning, the additional cost compared with call drop-back should be shared equally between BT and other operators.

5.3.3 Lessons from the country studies regarding regulatory involvement

The lessons that emerge from the experience of the six EU Member States concerning NRA involvement can be summarised under the following headings:

- the need for clarity regarding the roles and responsibilities of different regulatory authorities;
- the level of charges resulting from high regulatory involvement; and
- the appropriate method for ensuring cost orientation.

5.3.3.1 *The need for clarity regarding the roles and responsibilities of different regulatory authorities*

EU Directives, and most NRAs, provide little guidance to NRAs and operators on the broad question of how the costs of NP, CS, and CPS should be allocated. There has been some importance placed on the principle of cost causation but few NRAs have drawn on other principles such as fairness or the effectiveness of competition to lay down clearly how the costs should be allocated. In some of the Member States that we reviewed, operators expressed the need for more detailed guidance from the regulator on the extent and level of inter-operator charges.

The clarity of roles and responsibilities of regulators and other government bodies can help to ensure that appropriate cost allocation arrangements are introduced in a Member State. In Finland, the Ministry set the high level principles for cost allocation and left the responsibility for the technical solution with the TAC. Such an allocation of responsibilities between the Ministry of Transport and Communications and the TAC may have contributed to the current problems with NP in that Member State, particularly given the inter-relationship between technical solutions and cost allocation arrangements.⁴⁷

5.3.3.2 *The level of charges resulting from high regulatory involvement*

Our review has identified three broad levels of regulatory involvement arising from the cost allocation arrangements for NP, CS, and CPS:

- Limited involvement: in Sweden and Finland NRAs have tended to leave many of the decisions to operators to determine through commercial negotiation.
- Medium involvement: in the Netherlands and France, the NRA has at least monitored charges to ensure that charges are cost oriented.
- High involvement: in Germany and the UK, NRAs have become involved in disputes with their SMP operators either on the cost allocation recommendations or on the level of charges (or both).

In general, those Member States with high levels of regulatory involvement have tended to produce the lowest inter-operator charges. For example, in Germany there are no inter-operator charges for NP and relatively low charges for the per-line administration costs associated with CPS. In the UK, there are only per-line administration costs for NP since the decision to migrate to the call drop-back solution reduced the additional conveyance costs. The system set-up costs for CPS are passed on to a large customer base rather than passed on through an inter-operator charge.

5.3.3.3 *The appropriate method for ensuring cost orientation*

The requirement that charges be cost oriented, although one of the most important requirements in EU telecommunications regulation, is not usually clearly defined. One common definition is that charges must be reasonably proportioned to underlying costs (including a mark-up for profit). Such a requirement could improve economic efficiency if the charge is levied on the appropriate party (see section 5.2.2.1).

A clearly preferable method for ensuring cost-orientation has not yet emerged. However, the use of cost accounting systems, where in line with Commission guidance on accounting separation and cost accounting, could be a suitable basis for assessing whether charges are cost oriented.

⁴⁷ In Finland the technical solution chosen, at least in the short term, results in additional conveyance costs. The way that these costs have been allocated has been attributed to the low take-up of number portability. Such a result cannot be totally attributed to either the technical solution or the cost allocation arrangements on their own, but might have been better foreseen and be corrected by ensuring that one authority has responsibility for overseeing all of the issues associated with NP.

5.4 Conclusion

The experience of the Member States and the possible lessons for other NRAs have been summarised in Table 5.9 below.⁴⁸

⁴⁸ Full details are provided in Appendix 1 of Volume II of this study.

Table 5.9
Summary of and lessons from the experience of six EU Member States

Issue	Summary of experience in Member States	Lessons from Member State experience
<i>Implementation of NP</i>	<ul style="list-style-type: none"> • Long term solutions do not necessarily have to be IN based solutions. In the UK the long term solution involves call drop-back. • A mix of technical solutions has been used to implement NP: <ul style="list-style-type: none"> – Three Member States (Finland, Sweden and the UK) plan to introduce or have already introduced an interim solution prior to the introduction of a longer-term technical solution. – The migration path to the longer-term solution can be either pre-planned (e.g. to call drop-back in the UK) or left open (e.g. to an IN solution in Finland). – Two Member States moved straight to their long-term solution: France with onward routeing and the Netherlands with an IN solution. A number of technical solutions are working in parallel in Germany. 	<ul style="list-style-type: none"> • Some on-switch solutions involving high additional conveyance costs can affect the take-up of NP, and therefore NRAs should ensure that obstacles to migration to a more efficient solution do not exist (i.e. they should try to avoid locking in a technical solution that involves additional conveyance costs). Incentives to migrate to a suitable long-term solution should be contained in the cost allocation arrangements.
<i>Implementation of CS/CPS</i>	<ul style="list-style-type: none"> • NRAs have imposed the obligation regarding CS and CPS differently in different Member States: <ul style="list-style-type: none"> – Two Member States (Sweden and Germany) have imposed the obligation on all fixed local access providers. – Three Member States (France, the Netherlands and the UK) have imposed the obligation only on operators with SMP. – One Member State (Finland) originally imposed the obligation on all fixed local access providers but subsequently narrowed it. 	<ul style="list-style-type: none"> • The scope of the obligation has tended to influence the way that NRAs allocate costs. The common themes were: <ul style="list-style-type: none"> – where obligations are symmetric, operators have borne their own establishment costs. – where they are not symmetric there have been divergences but some operators have been allowed to pass on some of their establishment costs to other operators (e.g. France and the Netherlands with CS).

Table 5.9 (Cont'd)
Summary of and lessons from the experience of six EU Member States

Issue	Summary of experience in Member States	Lessons from Member State experience
<i>Cost allocation arrangements</i>	<ul style="list-style-type: none"> Operators have generally had to bear their own system set-up costs for NP but have been allowed to pass on their per-line costs for NP (except in Germany). The additional conveyance costs of NP have generally been subject to commercial negotiation. In some countries where CS and CPS has been imposed only on SMP operators the system set-up costs have been recoverable through inter-operator charges (for example in Finland for CPS and the Netherlands for CS). 	<ul style="list-style-type: none"> Inter-operator charges to recover the additional conveyance costs associated with NP could deter the take-up of the service when imposed on the recipient network operator. Donor network operators may find it difficult to levy an “exit” charge on customers leaving their network. Inter-operator charges for CS and CPS do not appear to deter the development of effective competition.
<i>Regulatory Involvement</i>	<ul style="list-style-type: none"> Two NRAs (Finland and Sweden) provided only high level guidance and left the details to operators to agree through commercial negotiations. The others have been more closely involved in some way in regulating the charges levied by SMP operators. NRAs in all six Member States emphasised the principle of cost orientation when providing guidance on charges. A number of different approaches have been used by NRAs to arrive at cost oriented charges including the use of cost accounting systems and international benchmarking. The latter has been used by one NRA (Germany) to arrive at a cost oriented charge for the per-line administration costs of CPS. 	<ul style="list-style-type: none"> Guidance is often required on the type of costs that should be passed on to other operators. The absence of such guidance can lead to high inter-operator charges. NRAs may need to take a more pro-active role when assessing whether changes are cost oriented. It is too early to assess which of these approaches are best. The use of cost based accounting systems for interconnection, however, is consistent with the existing EU regulatory framework.

6 FRAMEWORK OF GUIDING PRINCIPLES

6.1 Introduction

The Terms of Reference required an examination of guiding principles that might be applied in order to ensure that the facilities would have the desired pro-competitive effect. Such an examination was timely given the view expressed by some operators in the six EU Member States that we reviewed on the need for more detailed guidelines on how the costs of NP, CS, and CPS should be allocated.

This chapter draws on the principles laid down in the Directives (see Chapter 2) and the review of Member State experience (Chapter 5) to develop a framework of guiding principles to assist NRAs in determining how the costs should be allocated. In particular, this chapter looks at whether — and to what extent — the costs incurred by operators should be passed on through inter-operator charges.

Other issues relating to the level of charges (ensuring that they are cost oriented and reasonable) are considered in Chapter 8.

6.2 The General Approach to Whether Operators Should Bear their Own Costs

One possible way of allocating the costs of NP, CS, and CPS is to let each operator bear their own costs and to recover them in the same way that they recover other costs that they incur in developing their network. This would normally mean that incumbent operators (who will usually be designated as having SMP and be subject to additional regulatory controls) should be able to recover the costs from their own customers through broadly based charges approved by the NRA.

New entrants — who will not usually be designated as having SMP — would also recover their costs from their customers, according to what the market will bear.

In general, requiring each operator to bear their own costs has a number of advantages that align neatly with a wide range of EU regulatory principles. These advantages include:

- providing operators with strong incentives to minimise their costs (contributing to the efficiency objective referred to in Article 9 of the Interconnection Directive);
- reflecting that the benefits of the service may be spread widely (recalling the goal of providing “maximum benefit to end-users” referred to in Article 9 of the Interconnection Directive);
- implying that inter-operator charges will not thereby increase the costs faced by new entrants (thus helping to ensure effective competition as required in Article 9 of the Interconnection Directive); and
- treating all operators in a consistent way (meeting the objective to avoid non-discrimination referred to in Article 16 of the ONP Voice Telephony Directive).

For these reasons, requiring operators to bear their own costs is generally to be recommended as the preferred way to allocate the costs of NP, CS, and CPS subject to three important potential exceptions, where inter-operator charges may be justified. These exceptions relate to the principles of reciprocity, competitive neutrality, and the principle of cost causation.

6.2.1 Reciprocity

A lack of reciprocity in the obligations, meaning that they do not apply to all operators, can influence the way that the establishment costs of NP, CS, and CPS are best allocated.

Reciprocity has two major implications:

- that customers directly connected to any operator can use the service; and
- that all operators can benefit (even though the incumbent will be expected to lose market share in the short-term).

The principle of reciprocity is also closely related to that of equity. Reciprocal arrangements, by allowing the possibility for all fixed local access operators and all customers to benefit, may generally be considered to be fair.

6.2.2 Competitive Neutrality

We are concerned with three types of operators:

- the SMP operator whom we assume to be a local access provider and also open to carrying calls originated through other local access providers.
- other local access providers who could also be open to carrying calls originated through any other local access providers.
- indirect access providers who are looking to carry calls originated through a local access provider.

NRAs will wish to have regard to issues of competitive neutrality that affect both access provision and call services. Competitive neutrality at the level of access (or the local loop) will mean that cost allocation arrangements treat access operators equally. Competitive neutrality at the level of call services will mean that the cost allocation arrangements will not tilt the playing field for call services in favour of one particular type of operator.

6.2.3 Cost causation

Cost causation is a basic principle which provides a well-established approach to cost allocation, implying as it does that the party that causes the costs to be incurred, should bear the costs. This principle is in practice more relevant to consumption costs than to establishment costs, because it is generally easier to attribute consumption costs to customers.

Where cost causation can clearly be established, and where there would be benefits in passing on the costs to the party that causes the costs to be incurred, we would argue that the relevant costs should be passed on. These criteria will usually be met and justify inter-operator charges

for the per line administrative costs of NP and CPS and for the additional conveyance costs of NP incurred under some less efficient on-switch solutions.

The application of the general principles of reciprocity, competitive neutrality, and cost causation to the establishment and consumption costs of the services is considered in more detail below.

6.3 The Extent to which Establishment Costs Should be Passed on to Other Operators

Establishment costs incurred in order to make the services available arise as a direct result of the need to meet the requirements of the Directives and related national legislation. These requirements were imposed in the general interest of developing effective competition, and having regard to the widespread consumer benefits that effective competition should bring.

In general, costs which are incurred as a result of legislation intended to ensure effective competition in a liberalised market should be recovered in broadly based charges (ie charges paid by the generality of customers). This is particularly so when the obligation is imposed on all operators thus allowing all customers and indeed all operators, even those with SMP, the possibility of benefiting from the services in the long run.

A further basic consideration is that of ensuring that costs involved in introducing the services are reasonable and efficient. This could be achieved by ensuring that a significant part of the costs fall on the operators that incur them, rather than being passed on to other operators. Regulatory constraints on how these costs may be reflected in prices should provide incentives to ensure that the costs are at the efficient level.

6.3.1 Recommendations for the establishment costs of number portability

In the case of NP, all fixed local loop operators are required to offer the service. This means that customers that are directly connected to new entrants could choose to switch to the SMP operator and retain their number. Movements in such a direction (new entrants to incumbent SMP operator) would be expected to be relatively small during the early years of competition, but to grow over time.

The fact that the obligation applies symmetrically to all operators has been used by NRAs to recommend that all fixed line operators should bear their own establishment costs, as is our recommendation. The Monopolies and Mergers Commission (MMC) in the UK (now the Competition Commission) suggested that for NP, the decision that operators bear their own system-set-up costs reflected the fact that these costs are part of the investment which any operator needs to make to enable it to provide telecommunications services in today's circumstances.

This recommendation holds regardless of whether an on-switch or off-switch solution is to be implemented, or even if both will be introduced over the long-run.⁴⁹ Clearly, the establishment costs associated with an off-switch solution will be relatively higher than those for an on-switch solution.

⁴⁹ The issues associated with a migration from an interim solution to a long-term solution are discussed in Section 8.1.

It is possible that some establishment costs will be incurred by a central agency, on behalf of the industry as a whole, in introducing a master database for some, off-switch, IN solutions. These costs should then also be recovered from all operators as discussed in section 8.5.

6.3.2 Recommendations for the establishment costs of carrier selection and pre-selection

EU Directives require only operators with SMP to offer CS and CPS; other operators may choose to do so as the result of a purely commercial decision. NRAs, however, have latitude in deciding how far to extend the obligation to provide carrier pre-selection where this does not impose a disproportionate burden on organisations or create a barrier to entry in the market for new operators. The difference in the scope of the obligation would have implications for competitive neutrality and this could in turn affect how the establishment costs of CS and CPS are allocated.

6.3.2.1 When the obligation is imposed on all fixed local access providers

When obligations are made symmetric, all fixed local access providers are required to offer the service. In other words, the service could be viewed as a condition of access and it would be reasonable to expect that, as with the establishment costs associated with number portability, each local access provider should bear their own establishment costs, recovering them from their customers where appropriate.

Fixed local access providers would then not be permitted to impose an explicit inter-operator charge on each other to recover the establishment costs that they incurred. This would be consistent with competitive neutrality in that all fixed local access providers are treated in a similar way regarding the recovery of their establishment costs associated with implementing a condition of access.

Such an outcome may also be considered equitable as all fixed local access providers — including operators with SMP — could benefit as a result of carrying calls made by customers connected to another operator. CS and CPS will be particularly important to new entrants as they may rely on indirect access to gain market share while they are rolling out their own local networks.

A question arises as to whether indirect access providers should be required to pay an explicit inter-operator charge to the local access providers given that they do not incur any significant establishment costs themselves and would be considered to be major beneficiaries of the service.

There are, however, arguments against such a charge, mainly on the grounds of competitive neutrality. That is, as the costs are incurred by local access providers as a condition of offering local access, an explicit charge to indirect access providers (and not to local access operators) may distort the terms of competition faced by indirect access providers in the market for call services. A charge to indirect access providers could increase their cost of call services and put them in a worse position relative to their competitors in the market for core network services.

6.3.2.2 *When the obligation is imposed only on fixed local access providers with SMP*

When the obligation is imposed only on operators with SMP, we would argue that there is a case for allowing the SMP operator to recover an allowance relating to their costs directly from other operators who use but do not provide the service, whether or not those operators are also local access providers. In these circumstances, inter-operator charges may have the following advantages:

- they could be seen as a fair outcome as the operator with SMP is introducing a facility that will benefit other operators;
- they could promote efficiency as indirect access providers decide whether to offer their own access network, rather than face the CPS charge; and
- by setting the charge at a level that recovers no more than reasonable costs of an efficient operator they could promote cost minimisation.

An argument could thus be made that, in the absence of reciprocity, the SMP operator should be able to recover all or part of the costs that it incurs from those operators who use the facility. (The factors that could influence the share of the costs that is recovered from other operators are discussed below.)

Such a recommendation is also consistent with the principle of competitive neutrality, but in this case, competitive neutrality applies to the arena of call services in which both (non-SMP) direct and indirect access providers are concerned. In other words, the issue of competitive neutrality at the access (or local loop) level is no longer relevant as the obligation only falls on the operator with SMP. Other local access providers will not need to incur establishment costs.

Here competitive neutrality will mean that those operators who use (but do not provide) the CS/CPS service — whether these operators are other direct access providers offering indirect access services to the SMP's customers or whether they are purely indirect access providers — are treated in the same way. That is, they will both face a charge when they use the service. These cost allocation arrangements will help to ensure that there is no distortion in the market for call services — all operators using the CS/CPS service of the SMP operator being treated in the same way.

The study is not prescriptive on how such an inter-operator charge for the use of the facility could be levied. In the Netherlands, they have recovered the costs of CS through a surcharge on interconnection charges. In Finland (and probably in France), the establishment costs look likely to be recovered through a one-off charge to the indirect access providers. Provided that the charge is cost oriented and unbundled, and related to use, we see no reason for prescribing how the charge should be structured.

A special case can be identified where the obligation has been limited to SMP operators but particular non-SMP operators choose to offer these services on a bilateral basis with the SMP operator, or on a multilateral basis. Assuming that the NRA is satisfied that a genuine offering was being made by the non-SMP operator, that operator would bear their own establishment costs and not be obliged to make a contribution to the SMP operator's establishment costs.

This special case may occur where non-SMP operators find customers less inclined to switch from the SMP operator because they would lose the CS/CPS services. It would not only be unfair to burden those operators that voluntarily offer these services but it would also be inconsistent with the earlier treatment where all fixed local access operators are providing these services, and inconsistent with the objective of allowing as many customers as possible the opportunity to benefit from the service.

Recommendation 6.1

Establishment costs

Where all operators are under equivalent obligations, each operator should bear the establishment costs it incurs when introducing these services rather than passing them on in inter-operator charges. Operators without significant market power and not subject to price controls will be able to seek to recover these expenses from customers in any way they choose. Operators with significant market power will usually be subject to controls limiting the extent to which costs can be recovered from their own customers.

When obligations are not made symmetric, ie where they are imposed on operators with significant market power but not on other operators, it would be reasonable for operators obliged to offer the service to be able to pass on at least a proportion of these costs to those operators who use the facility.

6.3.3 Determining the share of establishment costs which should be passed on to other operators

If NRAs determine that, in the absence of reciprocal obligations, the operator with SMP can pass on their establishment costs to those operators who use the facility, the issue they will then face is to decide what share of the costs could be passed on to other operators.

This decision will be affected, in part, by the extent to which an inter-operator charge is consistent with EU regulatory principles. Two of the key factors that NRA may need to consider when determining what of the establishment costs for CS/CPS can be passed on include:

- the extent of the indirect or “Type 2” benefits (explained below); and
- the impact on competition.

If an inter-operator charge looks likely to have an undue influence on competition there may be a case for the NRA to reduce the share of the establishment costs that can be passed on through an inter-operator charge. NRAs may also wish to take account of likely indirect benefits.

6.3.3.1 The extent of indirect benefits

The indirect benefits of NP, CS, and CPS refer to the wider benefits that accrue to all customers, not just those that use the service. These benefits may arise from the improvements in efficiency and any associated price reductions which result from increased competition brought about by

the introduction of the services. The presence of indirect benefits may justify at least part of the establishment costs being borne by the generality of customers.

Indirect benefits have been referred to as “Type 2” benefits⁵⁰ and have been used by OFTEL as one of the factors that guided its decisions regarding cost allocation. In its recent decision on the allocation of the costs of CPS, OFTEL suggested that the presence of these indirect or Type 2 benefits was one reason why the system set-up costs should be shared by the pre-selecting operators and BT’s own customers.

These indirect benefits have in the past proven to be difficult to measure. We would expect these benefits to be significant (relative to the direct or “Type 1” benefits) when the incumbent operator is inefficient (providing the scope for efficiency improvements) and when competition is immature. While precise quantification is not possible, it seems reasonable to expect NRAs to provide some robust evidence on the magnitude and incidence of these benefits if relying on them to prevent operators recovering their costs from other operators.

6.3.3.2 *Impact on competition*

Directive 98/61/EC amending the Interconnection Directive with regard to operator number portability and carrier pre-selection has noted that NP and CS are ‘key facilitators of consumer choice and effective competition in a liberalised telecommunications environment’.

There are two aspects of this principle that are important:

- That any inter-operator charges do not deter entry by competitors by artificially raising their costs or do not impose a disproportionate burden on existing competitors; and
- That any inter-operator charges, if passed on to consumers, do not act as “a disincentive for the use of the facility”.⁵¹

There is some experience with inter-operator charges to recover the establishment costs of CS. In the Netherlands, for example, the establishment costs are passed on to other operators through an unbundled interconnection charge for the service. There have not been any studies undertaken on the impact of the charge, but OPTA in the Netherlands believe that the charge has not deterred the take-up of the service. OFTEL in the UK provided some ball-park estimates of the impact of a surcharge on CPS minutes in an attempt to determine the effect of an inter-operator charge for the system set-up costs of CPS. The results are provided for illustrative purposes only.

⁵⁰ This classification of benefits can be traced back to OFTEL’s cost-benefit analysis of number portability in 1994. That study also identified Type 1 benefits which were defined as the benefits that accrued to subscribers who retain their telephone number when switching operators and Type 3 benefits which resulted from having fewer number changes (such as fewer misdialled calls and fewer changes to information stored in customer equipment).

⁵¹ Article 1(3) of the Directive amending the Interconnection Directive.

Table 6.1
Illustrative charges for system set-up costs for CPS in the UK
(pence per minute)

	2000/01	2004/05
System set-up costs of £30 million		
-surcharge on all call origination minutes	0.006	0.003
- surcharge on CPS minutes	0.125	0.041
System set-up costs of £45 million		
-surcharge on all call origination minutes	0.008	0.004
- surcharge on CPS minutes	0.187	0.061

Note: OFTEL assumed that the system set-up costs are depreciated over 5 years and that straight line depreciation is used. Call origination minutes are assumed to grow at 10 per cent per annum while CPS minutes grow at 20 per cent per annum.

The charges in the table suggest that the surcharge would be relatively low, although its impact on other operators and on the development of the service is impossible to assess without a comprehensive study. The establishment costs for CPS across Member States will also differ according to their networks and to the types of services offered. For example, the establishment costs when an “all calls” option is included may be higher than those without such an option.

6.3.3.3 *Impact on customers*

Directive 98/61/EC (the Directive amending the Interconnection Directive) requires that direct charges to customers “should not act as a disincentive for the use of the facility”.

In most Member States, direct charges, at least for the establishment costs, will be in the form of inter-operator charges which may or may not be passed on the customers. This section explores the point at which these inter-operator charges, if explicitly passed on to customers, could act as a disincentive for the use of the facility.

While Directive 98/61/EC allows a charge to be imposed, NRAs will need to balance this with the requirement that it should not act as a disincentive. This will not be easy given that any charge will inevitably deter at least some customers from using the service and the higher the charge, the fewer the people that would use the service. This should not be considered as an anti-competitive outcome and indeed could be a requirement for an efficient outcome. However, NRAs will be interested in the point at which a charge prevents the service from acting as a “key facilitator of consumer choice and effective competition in a liberalised telecommunications market”.

To date, the experience in Member States has been that indirect access providers generally absorb any inter-operator charges into the generality of their tariffs making the service appear free to customers.

The relevant question for the purpose of this study is whether the inter-operator charge is set at an appropriate level, meaning that the charge is cost oriented. If the charge is not cost oriented, it could affect the competitive position between operators.

If, however, the inter-operator charge is cost oriented and an indirect access operator is still unable to compete with the local loop operator, the reason may be that the underlying costs of the indirect access provider are higher than those of the local loop operator. The NRA will then be faced with two choices:

- it can retain the charge, given that the disincentive to customers arises principally from the inability of the indirect access operator to compete against the local loop operator; or
- it can remove or reduce the inter-operator charge. This would mean that CPS customers would be cross-subsidised by all other customers in order to promote competition in the short term.

In short, NRAs will need to balance the need for charges to be cost oriented with the possible longer-term benefits of encouraging entry by reducing charges to a level below current costs.

6.4 The Extent to which Consumption Costs Should be Passed on to Other Operators

Consumption costs result from the decisions of individual end-user customers to make use of the services. They are distinguished from establishment costs in that there is a closer alignment between the party that causes the costs to be incurred and the party that benefits.

In order to encourage efficient use, charges should generally reflect costs, and the consumption costs associated with NP and CPS⁵² should, therefore, be passed on through inter-operator charges.

The relevant principle for the allocation of these costs is that of cost causation, which suggests that there is a need for user charges that broadly reflect the additional costs incurred. This too accords with economic efficiency, and with the principle of cost oriented charges.

Three main types of consumption costs have been distinguished: per-line administration costs, additional conveyance costs, and some administration costs incurred by NRAs or other bodies.

6.4.1 Per-line administration costs

The principle of cost oriented charging indicates that per line administration costs of both NP and CPS should be passed on through inter-operator charges. In the case of NP, the charge would be levied from the donor network operator to the recipient network operator. In the case of CPS, the charge would be levied from the local loop operator to the indirect access operator. In both cases the charge would be at a level which reasonably reflects the likely level of costs for an efficient operator.

⁵² There are no significant consumption costs associated with CS.

The recipient network operator or the indirect access operator would then make a commercial decision as to whether they would explicitly recover these costs from end users. In practice, not surprisingly, many operators have chosen not to impose such an explicit charge on customers. There is, however, no reason to prevent recipient network operators and indirect access operators — even those with SMP — from passing on the per-line administration charge to their customers. Market forces in general, and the desire to attract customers from other networks in particular, will help to restrain any charges to their new customers (see Section 8.4).

Recommendation 6.2

The per-line administration costs associated with number portability should be reflected in a charge from the donor network operator to the recipient network operator.

Recommendation 6.3

The per-line administration costs associated with carrier selection and carrier pre-selection should be reflected in a charge from the local loop operator to the indirect access provider.

6.4.2 Additional conveyance costs

The major differences between the treatment of consumption costs associated with NP and those associated with CPS arise because of the additional conveyance costs, which can be significant under some of the on-switch solutions for NP but are negligible for IN solutions for NP and for CPS. A sensible, practical approach to the recovery of the additional conveyance costs where they are negligible (that is, for CPS and the more efficient technical solutions of NP) would be to require operators to bear their own costs.

The additional conveyance costs incurred under some of the less efficient on-switch solutions for NP, however, can be significant. Our review of Member States' experience has shown that it is the additional conveyance costs that have led to most of the problems with NP. In the UK, the treatment of the additional conveyance costs was one of the major reasons behind the MMC inquiry. The current arrangements regarding the additional conveyance costs in Finland and France have allegedly substantially limited the take-up of NP in those Member States.

While we would recommend that the additional conveyance costs be passed on through inter-operator charges, there is likely to be some debate about the party upon whom such a charge should be levied.

There are two parties who typically have borne the additional conveyance costs associated with some on-switch solutions — the donor network operator (DNO) which has lost the customer; and the recipient network operator (RNO) which has gained the customer. The impact of charging these operators is considered below.

6.4.2.1 Recovering the additional conveyance costs from the recipient network operator

A charge on the recipient network operator has been justified in the past on the basis that this operator gains the customer and the associated revenue stream. This benefit, it has been

argued, would offset the ongoing costs that would be incurred every time a call is made to the ported customer.

A charge on the called party would be inconsistent with the way that telephone calls are normally charged. Classically, the calling party is the party deciding to make a call and therefore the party responsible for paying the costs of that call. The originating operator, in the particular sense of the party primarily responsible for routing a call, is responsible for paying for the chosen route.⁵³

If the additional conveyance costs of number portability were to be passed on to the called or porting customer by the recipient network operator, the called customer would be in the unusual situation of paying a fee every time they received a call. This could not only deter people from porting, but it would also effectively impose a charge on customers to use what they may consider to be their own telephone number.

Imposing the additional conveyance costs on the RNO would not be appropriate mainly because it would not contain the right incentives. The recipient network operator is not able to control calls to its network and is not in a position to minimise the associated costs. Further, the exposure to an uncertain level of ongoing charges may make the portability service unattractive to new operators effectively limiting the availability of the service to consumers.

6.4.2.2 Recovering the additional conveyance costs from the donor network operator

It could be argued that a charge on the donor network operator is appropriate in order to provide it with incentives to minimise the costs in its own network. However, this could be seen as unfair by effectively penalising the DNO twice — once for losing the customer and the associated revenue stream and again for having to bear a cost arising principally out of their position as the customer's former operator.

A stronger argument would be that the responsibility for routing a call should lie with the operator which originated the call, and it is in this capacity that the DNO should bear responsibility for the additional conveyance costs. Initially at least, it will be the DNO (as the incumbent operator) which originates most of the calls to ported numbers, and as the originating operator, they would face the incentive to minimise those costs.

6.4.2.3 Recovering the additional conveyance costs from the originating operator

The traditional role and responsibility of the originating operator⁵⁴ in terms of routing calls and the incentive effects that this implies suggests that the originating operator may be the most appropriate party to bear the additional conveyance costs. Such a charge is likely to lead to the most efficient outcome as the originating operator is generally in the best position to control the

⁵³ This, however, is changing with the advent of call forwarding away from geographic numbers, termination away from the primary geographic translation of a non-geographic number and cellular roaming away from the home country which have introduced the concept of the termination of such calls being paid for by the recipient party through the recipient operator or through special billing procedures.

⁵⁴ The originating operator in our discussion and in our recommendations is the first operator who has options in relation to routing through the national network. In the case of a call coming from outside the Member State, the originating operator is likely to be the incumbent operator.

additional conveyance costs. This is so even though the main additional conveyance costs may be incurred in the donor's network.

We would expect operators with SMP, and the incumbent DNO in particular, will be worse off under such a charge, largely because they will originate the majority of calls in the short-run. Levying a charge for the additional conveyance costs on the originating operator will then mean that the principal donor operator bears its own additional conveyance costs.

The donor network operator (as the incumbent operator), faced with the majority of the additional conveyance costs, would then face a strong incentive to migrate to a more efficient on-switch solution (for example, call drop-back) or migrate to an IN solution. This decision will benefit other originating operators who, on their own, would not be able to expedite the introduction of more efficient NP arrangements. In other words, the cost burden imposed on the donor network operator through their position as the most significant originating operator, would help to ensure that a more efficient technical solution emerges to the benefit of all operators.

NRAs may then face arguments, based on the grounds of fairness, to allow the DNO to recover some of the additional conveyance costs from the RNO. Such a charge would however run the danger of an inefficient technical solution as the call originating operator would no longer face such a strong incentive to introduce a more efficient technical solution.

Operators without SMP ought to benefit from such an arrangement. As RNOs, these operators will no longer be subject to an uncertain level of ongoing charges for calls to their customers. This will enable them to promote NP aggressively — something that operators in some Member States (such as Finland and France) have to date been reluctant to do. As originating operators, they will be worse-off as they would be liable to a charge when their customers originate a call to a ported number.

During the initial stages of liberalisation, the proportion of calls originating from the networks of operators without SMP would be small, and the additional conveyance costs they would face would also therefore be small. In the longer term, and in a multi-operator environment, third party operators will increasingly originate calls that terminate in another network via the incumbent's network. In these cases it would seem fair and efficient for the third part operator, who is originating the call and receiving revenue from the calling customer, to pay the donor network operator an amount for the additional conveyance costs incurred in the donor's network.

The call originating operator without SMP will be faced with the choice of paying the charge or investing in a technical solution that minimises the additional conveyance costs, and/or negotiating with others in a position to contribute to the efficient solution. In practice, however, a third party originating operator may not, on their own, be able to implement a more efficient solution. A charge on them, however, may force them to exert pressure on the NRA and other operators to migrate over time to a more efficient technical solution. In the meantime, the revenue they receive from their subscriber making a call will to a large extent offset the charge for the additional conveyance costs that they are facing.

There is a real issue concerning how the additional conveyance costs could be recovered by originating operators. We do not, of course, envisage that the calling customer pay an additional

charge for calls to a ported number.⁵⁵ In most cases, calling customers would be unaware that the party they are calling has ported and they should not, therefore, be subjected to additional charges. Rather, the additional conveyance costs should be borne by the originating operator who could recover them in the following manner:

- Originating operators without SMP would recover the charges from their own customers through broadly based charges.
- Originating operators with SMP would recover the additional conveyance costs imposed on them through broadly based charges normally subject to price control. In order to encourage a move towards a more efficient technical solution, the price control would presumably allow for the recovery of an allowance for the additional conveyance costs that represents the costs of an efficient technical solution (such as call drop-back).

It is worth thinking through the possibility of multiple porting. This can be done in two distinct ways:

1. the number is ported sequentially in single steps from the first donor to the second donor, from the second to the third and so on; or
2. the number can be ported from the first to the second, and then, in a virtual two steps, back to the first and on to the third and so on.

This can be important when there is an on-switch solution. The call-originating operator will route a call to the operator of the block of numbers from which the ported number originally came. In the first approach, the first donor operator would route onwards to the second donor and so on. In the second approach to sequential donation, there is a two stage porting process in which the first donor operator is advised *and is therefore able to reroute the call directly to the latest number recipient operator*.

In this case, a responsibility is likely to be placed upon the latest recipient operator to update the block (first donor) operator (akin to responsibility to update the database(s) where an off-switch solution is in place). A per-line administration charge could be deemed payable to the block operator.

A question may be raised about operators being penalised for the recipient operator's failure to update others. In practice operators, finding that they are bearing additional conveyance costs, will have an incentive to police recipient operators' behaviour.

⁵⁵ An exception may be conceivably considered if a warning about the cost implications could be provided to the calling customers.

Recommendation 6.4

Where additional conveyance costs are negligible (as is likely to be the case for carrier pre-selection or under an intelligent network or call drop-back solution to number portability) they should be borne by each operator.

Where additional conveyance costs are significant they should be recovered by the donor network operator through an inter-operator charge to the call-originating operator. We take it as axiomatic that a customer calling a ported number would not face a charge additional to the expected tariff for a call to a non-ported number in that block of numbers.

National Regulatory Authorities should generally resist proposals for charges between the donor network operator and recipient network operator to recover additional conveyance costs arising from number portability. If such charges are permitted, this should be only for a short period of time (to avoid locking in an inefficient solution).

6.4.3 Administration costs incurred by third parties

There are two categories of consumption costs that fall to an NRA and to a central agency from the introduction of NP, CS, and CPS.

6.4.3.1 Costs that arise from the implementation of IN solutions for NP

If an off-switch solution is implemented, it requires a central agency to manage the database of “ported” numbers.⁵⁶ This agency (which could be an independent body acting under the authority of the NRA or the industry as a whole) will incur set-up costs and some on-going costs.

The bulk of these costs (system set-up and maintenance) will be establishment costs and as NP is a symmetric service, all operators should contribute to these costs, which could be amortised over a period of years. Such a charge could be determined by reference to the market share of operators measured in a volumetric way, or simply be based on an equal annual “membership charge”.⁵⁷

The usage costs, to the extent that any could be identified, should be recovered from the parties that cause them. This may well be the recipient operator, who notifies the database of a ported number. Levying a charge on the recipient could deter operators from offering the service, but the usage costs are likely to be small. It may be more practicable to roll the usage costs into the annualised costs and treat them both in the same way.

6.4.3.2 Additional administrative costs for NRAs

For NP, this involves the management of the allocation of non-geographic numbers. Numbering allocation is typically the responsibility of the regulatory authority and costs associated with the

⁵⁶ Operators could then download information on all porting activity (if a distributed database solution implemented) or all operators could have copies of the national database for real-time interrogation, which are synchronised daily (if a centralised database solution is chosen).

⁵⁷ These options are explored briefly in Chapter 8 of Volume I.

management of the allocation of non-geographic numbers will probably be treated in the same way as the costs associated with the management of geographic numbers.

For CS and CPS, it involves the management of allocation of carrier selection codes to operators. The administrative costs associated with carrier selection are likely to be very low as the task of allocating carrier selection codes is generally performed as part of the instruction of applications for indirect access providers. Hence, NRAs are likely to be able to support such costs as part of their general regulatory responsibilities.

For both NP and CS/CPS there may also be costs for facilitating processes which need to be put in place between operators.

6.5 Summary

This chapter has presented a framework for allocating the costs of NP and CS/CPS, which for the purposes of this study is one of the major roles of NRAs. If the model suggested here for cost allocation is followed, this should ensure that the service of NP, CS and CPS develop as an effective part of the competitive EU telecommunications market. This framework is summarised in Box 6.1.

BOX 6.1
RECOMMENDED MODEL FOR COST ALLOCATION

<u>Number Portability</u>	
Establishment costs	
Recommendation:	<ul style="list-style-type: none"> All operators should bear their own costs.
<i>Implication:</i>	<i>SMP operators should recover an allowance for their costs from broadly based charges subject to price controls.</i>
Consumption costs	
Recommendation:	<ul style="list-style-type: none"> When practicable to do so, <u>additional conveyance costs</u> should be charged by donor network operator to call originating operator.
<i>Implication:</i>	<i>Charges for additional conveyance costs will fall mainly on the incumbent operator. Such charges would provide an incentive to introduce more efficient technical solutions.</i>
Recommendation	<ul style="list-style-type: none"> <u>Per-line administration costs</u> should be passed on by the donor network operator to the recipient network operator.
<i>Implication:</i>	<i>A cost oriented inter-operator charge for the per-line administration costs should not impede the development of competition.</i>
<u>Carrier Selection and Carrier Pre-Selection</u>	
Establishment costs	
Recommendation:	<ul style="list-style-type: none"> If all operators are obliged to introduce the service, they should bear their own establishment costs.
<i>Implication:</i>	<i>When operators bear their own costs, the SMP operator can presumably recover an allowance for their costs from broadly based charges subject to price controls.</i>
Recommendation:	<ul style="list-style-type: none"> If only the SMP operators are obliged to offer the service, part of their costs could be recovered in inter-operator charges, possibly as part of the interconnection regime to the users of the facility.
<i>Implication:</i>	<i>NRAs will need to ensure that any inter-operator charges are cost oriented and do not impede effective competition nor deter the take-up of the service.</i>
Consumption costs	
Recommendation:	<ul style="list-style-type: none"> An allowance for the <u>per-line administration costs</u> can be recovered by the local loop operator from the pre-selected operator <u>Other consumption costs</u> should not be significant and should be borne by the operators which incur them.
<i>Implication:</i>	<i>A cost oriented inter-operator charge for the per-line administration costs should not impede the development of competition.</i>

7 CROSS-BORDER EFFECTS OF DIVERGING COST ALLOCATION ARRANGEMENTS

7.1 Introduction

Within the overall framework of telecommunications liberalisation laid down for the European Union there will be differences between Member States. These differences will arise because of differences in national situations and policies as well as in the application of principles. Nevertheless, divergences in cost allocation arrangements could, in certain circumstances, present internal market concerns.

The EU telecommunications market is served by companies many of which are powerful SMP operators in their home country and at the same time entrant (or potential) competitors in other Member States. It is important that the terms on which these companies compete in the EU as a whole are reasonably even-handed, and not distorted by differences in national regulation.

7.2 The Role of Harmonisation

Concern with the effect of diverging cost allocation arrangements is at the heart of many of the Directives issued by the European Parliament and Council. For example, the ONP framework — an important part of the EU regulatory framework — provides harmonised rules for access and interconnection to telecommunications networks and voice telephony services. The Notice on the application of the competition rules to access agreements in the telecommunications sector⁵⁸ stated in paragraph 2 that:

“Both the liberalisation legislation (the Article 90 Directives) and the harmonisation legislation (the ONP Directives) are aimed at ensuring the attainment of the objectives of the Community as laid out in Article 3 of the Treaty, and specifically, the establishment of a ‘system ensuring that competition in the internal market is not distorted’ and ‘an internal market characterised by the abolition, as between Member States, of obstacles to the free movement of goods, persons, services and capital’.”

This concern is made more explicit in Article 9 of the Interconnection Directive, which requires NRAs to secure adequate interconnection in the interests of all users and to exercise their responsibility in a way that provides maximum economic efficiency and gives the maximum benefit to end-users. The Article also lists a number of factors that NRAs must take into account, including the following:

- the need to ensure the fair and proper development of a harmonised European telecommunication market; and
- the need to promote the establishment and development of trans-European networks and services, and the interconnection of national networks and interoperability of services, as well as access to such networks and services.

⁵⁸ Notice on the application of the competition rules to access agreements in the telecommunication sector. Framework, Relevant Markets, and Principles (98/C 265/02).

The review of experience in six EU Member States in Chapter 5 suggests that NRAs have not explicitly addressed the issue of harmonisation when determining cost allocation arrangements.

The potential cross border effects of divergent cost allocation arrangements for both NP and CS/CPS are considered below.

7.3 Number Portability

Within the framework of existing EU Directives, there is scope for NRAs across EU Member States to allocate the costs of NP differently. This generally has not happened to date in the six Member States that we reviewed with regard to the establishment costs — they all, for example, required operators to bear their own system set-up costs even though this is not a requirement of the Directives.

7.3.1 Establishment costs

The major costs of introducing NP are the establishment cost. It would be theoretically possible within the terms of the Interconnection Directive, as amended, for Member State A to impose a significant proportion of these costs (eg the cost of national IN master database) on its dominant SMP operator(s) while Member State B imposed the corresponding costs on all operators active in its market. The upshot might be that the SMP operator(s) in A paid most of the establishment cost in A and a share of the corresponding costs in B whilst the competitor(s) based in B would pay only a share of the relevant establishment costs in B and nothing towards the costs in A.

This could amount to an imbalance in the terms of competition within the EU market. Our recommendations would prevent this, by having each operator meet its own establishment costs, and encouraging NRAs to recover costs of an IN master database from all operators an even-handed basis.

7.3.2 Consumption costs

There has been some divergence across the six EU Member States that we reviewed in the way that the consumption costs and, in particular, additional conveyance costs have been allocated. Some Member States have allowed operators to pass on the additional conveyance costs in charges to other operators, while others have not (see Table 7.1)

Table 7.1
The treatment of NP additional conveyance costs in six EU Member States

	Passed on in inter-operator charges?
Germany	x
France	✓
Finland	✓
Netherlands	✓
Sweden	✓
UK	x

With regard to these additional conveyance it is, at present, likely that incumbent operators in one Member State, say Germany, may be required to bear their own additional conveyance costs, yet face a charge for them as a new entrant recipient operator in another Member State, say Finland. Such a charge on the German new entrant in Finland may not simply reflect a potential cost burden, but by discouraging NP, may deter entry into the market by the new entrant.

It is not clear to what extent charging arrangements for the conveyance costs in the six Member States surveyed has affected the competitive position of new entrant operators in those Member States. NP — although a key facilitator of competition — is only one variable that will affect the profitability of new entrants. It may be too early to determine the impact of divergent cost allocation arrangements on cross border trade.

7.4 Carrier Selection and Pre-selection

The scope for problems is greater for these services, since the Directives leave it open to Member States to limit the basic requirement to provide the services to the SMP operators and some Member States have done so (see Table 7.2).

Table 7.2
The obligation to offer CS/CPS

	Imposed on operators with SMP	Imposed on all operators
Germany		✓
France	✓	
Finland	✓	
Netherlands	✓	
Sweden		✓
UK	✓	

In terms of cost allocation, different approaches have been taken, although these follow some common themes. Those NRAs that have imposed the obligation on all fixed local loop operators have required operators to bear their own costs. On the other hand, those that have imposed the obligation on operators with SMP only are taking different approaches with some at least likely to allow the SMP operator to pass on some of their establishment costs to other operators. Other approaches are to be expected as more EU member States implement the Directive.

Table 7.3
Recovering the establishment costs of CPS

	Operators bear own	Operators can pass on the costs
Germany	✓	
France		Likely policy
Finland		✓
Netherlands	na	na
Sweden	✓	
UK	✓ (mostly)	

Differences in the scope of the obligation and in cost allocation may have cross border impacts. If a new entrant is considering entering the market, and is required to offer CS/CPS services, the

prospects of entering a market where its future market share is under threat may affect the entry decision. In addition, if a new entrant is already in the market, and then a requirement to offer CS/CPS services is introduced, this may affect the business plan of the company as it may expect to either lose or affect the growth of its market share.

The Directive provides NRAs with latitude in deciding how far to extend the obligation to provide carrier (pre-) selection “where this does not impose a disproportionate burden on such organisations or create a barrier to entry in the market for new operators”.

Cable and Wireless, the second largest operator in the UK, noted that if the obligation were imposed on them it would affect their business plan, but that they may consider offering the service voluntarily one day.⁵⁹ The decision would be a commercial one. O.tel.O in Germany, on the other hand, stated that it was not concerned by the decision of their regulator to impose the obligation regarding CS/CPS on all operators in Germany.

Our recommendations would reduce divergences and the consequent risk of cross-border divergences and provide greater certainty to operators across the EU. Firstly, we recommend that where the obligation to provide CS/CPS is universal, all operators should bear their own establishment cost, without inter-operator charges. Secondly, where the obligation is applied only to the SMP operator, it is recommended that these costs should be recovered through inter-operator charges. The potential for such cross-border effects would moreover be minimised if NRAs which can foresee an extension to the obligation would consider the following in order to promote certainty:

- an early decision that all operators should bear their own system set-up costs. This would prevent the SMP operator from passing on some of its establishment costs to other operators who would then be subject to their own costs once the obligation was extended to all operators;
- a transitional arrangement during which the SMP operator could pass on its costs; and
- a reciprocal arrangement whereby those indirect access providers with a fixed local network who were willing to offer CS/CPS could avoid the charge from the SMP operator. This could have the added advantage of facilitating the widespread introduction of the CS/CPS service.

⁵⁹ This view is similar to that expressed by OFTEL in its response to OVUM's interim report on access networks and regulatory measures. There it stated that “what is most important is a stable and predictable regulatory regime which is not subject to major changes which undermine the commercial backdrop to the business case against which investment decisions were taken”.

8 THE ROLE OF NATIONAL REGULATORY AUTHORITIES

This concluding chapter reviews the recommendations made from the perspective of NRAs considering tasks that each will need to undertake in order to allocate the costs of NP, CS and CPS in a way that ensures that the services facilitate choice and effective competition in a liberalised telecommunications environment.

These tasks include the following:

- for NP, assessing the impact of the agreed technical solution(s);
- for CS/CPS, determining whether obligations should be imposed on all operators;
- ensuring cost orientation of charges;
- monitoring customer charges; and
- managing databases and other regulatory responsibilities.

8.1 Assessing the Impact of the Technical Solution(s)

8.1.1 Cost implications of Technical Solutions

The methods used to implement NP have potential to influence or distort the take-up of the service. As discussed in Chapter 4, the technical solutions for NP can be categorised as on-switch and off-switch solutions. To recapitulate:

- An on-switch solution will generally mean that the operator whose customer is transferred, usually the incumbent or SMP operator, will incur some system set-up costs. These costs will however be low compared to the consumption costs (mainly additional conveyance costs).
- An off-switch solution, on the other hand, imposes significant system set-up costs for all operators relative to an on-switch solution, although the burden (as a percentage of total network costs) is likely to be higher for new entrants. Consumption costs will be lower with an off-switch solution.

Although on-switch solutions have been preferred by a number of EU Member States as a way of introducing NP relatively quickly, IN solutions are becoming more common particularly for smaller countries. There are at least three reasons for the heightened interest in IN solutions as a way of introducing NP:

- the additional conveyance costs of an off-switch solution are very low as a call to a ported number does not need to involve the donor network operator;
- while incumbent operators also incur significant set-up costs, they may already have IN functionality in their network for services other than NP;⁶⁰ and
- suppliers are increasingly developing IN as part of their product offerings.

⁶⁰ IN platforms allow operators to provide a variety of value-added services in addition to NP. As long as each operator bears its own system set-up costs, the attribution of costs for NP services is not relevant. The issue is more important when considering a centralised database (managed, for example, by the NRA) which also provides functionality for a range of services other than NP.

The recommendations in Chapter 6 regarding NP were that each operator would bear their own establishment costs. This recommendation holds for both on-switch and off-switch solutions. The key question is how the consumption costs — and in particular the additional conveyance costs — are treated. Table 8.1 illustrates that on-switch solutions involve significant additional conveyance costs.

Table 8.1
Assessment of the Balance between Establishment and Consumption Costs for NP

Technical Solution	Relative importance of establishment costs	Relative importance of consumption costs (additional conveyance cost)
Call forwarding (use of second number)	Lowest. No software modifications for dynamic call processing at the donor and recipient switch; no initial updating of routing tables.	Highest, given routing inefficiencies and number translation to be done in the recipient network
Call forwarding (use of generic number)	Low. No software modifications for dynamic call processing at the donor switch but required at the recipient switch; no initial updating of routing tables.	High, given routing inefficiencies
Call forwarding (use of a prefix)	Medium. No software modifications for dynamic call processing at the donor switch but required at the recipient switch; initial updating of routing tables required for routing using a prefix, and possibly software modifications in the signalling protocols to support “long” numbers.	High, given routing inefficiencies
Call forwarding (transparent call forwarding)	High. Software modifications for dynamic call processing required only at the donor switch; initial updating of routing required for routing using a prefix, and possibly software modifications in the signalling protocols to support “long” numbers.	High, given routing inefficiencies
Number translation	Low. No software modifications for dynamic call processing at the donor switch but required at the recipient switch; initial updating of routing tables required for routing using a prefix but no updates are needed at the donor switch, and possibly software modifications in the signalling protocols to support “long” numbers.	High, given routing inefficiencies
Off-switch (query by default)	Very high. Each call requires an IN database lookup – this results in high initial investment costs.	Lowest. Routing is optimised
Off-switch (query by release)	Highest. Only calls to ported numbers require an IN database lookup resulting in high initial investment costs – compared to query by default, software development in the switches are needed to modify the signalling protocol.	Low. Routing is optimised, but only after an unsuccessful call set-up

How the additional conveyance costs are allocated could clearly affect take-up of the service and the way that the services are introduced. For example, incumbent operators, if required to bear establishment costs but allowed to pass on their consumption costs (additional conveyance cost) to recipient network operators, may prefer to implement solutions that minimise their establishment costs and maximise the consumption costs arising from the service. These

arrangements may also delay any move to a longer-term solution, as has been the case in Finland.

The recommendations regarding additional conveyance costs in Chapter 6 are aimed at providing operators with the right set of incentives to select a technical solution that provides a sensible balance between the establishment costs and the consumption costs. The recommendation is that the additional conveyance costs, when significant, should be imposed on the originating operator. These costs will generally be significant for most on-switch solutions except those involving call drop-back. Given that in most cases, the donor network operator would also be the originating operator, they would face a strong incentive to migrate to a more efficient technical solution.

When technical solutions are in place that result in negligible additional conveyance costs, we would recommend that each operator bears their own additional conveyance costs.

Together, our recommendations on the recovery of the establishment and consumption costs should provide the correct incentives for operators to select the most appropriate technical solution and agree on an appropriate migration path. Smaller operators, for example, who are not in a position to offer NP through IN solutions may be better off reaching an agreement with other operators to determine how to route its outgoing calls. NRAs, however, will still be required to ensure that individual operators do not delay the introduction or migration to particular technical solutions and that the solutions chosen by operators are capable of providing the requisite benefits to consumers.

If, of course, an IN or call drop-back solution could be cost effectively introduced in the foreseeable future, it may not be sensible to introduce an interim on-switch solution that would only operate for a few months.

The recommended role of NRAs in assessing the impact of the agreed technical solution can be summarised as follows:

- NRAs should participate in industry discussions on the choice of technical solution and ensure that no operator is able to impose the choice of an inappropriate technical solution (eg one that would deter the take-up of the service, or one that would give an unreasonable economic advantage to one operator or supplier over others).
- NRAs should assess the impact of cost allocation arrangements on the choice of technical solutions and, in turn, on the cost burden of operators (the relationship between establishment costs and consumption costs) for each technical solution. This assessment should consider the best available solution given the network in place and the extent of competition in the market and should attempt to optimise the benefits available to consumers.
- NRAs should, where appropriate, ensure that there are no barriers in place to the migration path between an interim solution and a longer-term solution.

8.1.2 Information Requirements

Through their involvement in technical discussions, NRAs will also need to ensure that the relevant data are available and that procedures for data flows and billing systems are in place.

Operators may argue that the cost of keeping the records necessary to charge for each individual call to a ported number would outweigh the benefit of charging for them individually. NRAs may therefore need to oversee an alternative statistical analysis of traffic so that charges may be assessed on a cost oriented basis or – if the traffic concerned is minimal – suggest to operators that they do not render charges to one another on a uneconomic basis.

Recommendation 8.1

National Regulatory Authorities in most countries may wish to avoid being drawn too closely into decisions about the technical solutions. However, the National Regulatory Authority will need to be satisfied that the arrangements for cost assessment and recovery are workable for all concerned, provide the right incentives for operators to migrate to more efficient solutions, and do not distort competition.

8.2 Determining how Obligations should be Imposed on Operators

8.2.1 Whether to impose the obligation on all fixed local loop operators

Directive 98/61/EC enables NRAs to extend the obligation to provide CS/CPS to operators without SMP where:

“... this does not impose a disproportionate burden on such organisations or create a barrier to entry in the market for new operators.”

NRAs will need to determine whether to impose the obligation to provide CS/CPS on the SMP operator alone or whether to impose it on all operators. This issue is within the scope of this study only to the extent that it affects the cost allocation decisions. For example, NRAs which extend the obligation to all fixed local loop operators may conclude that all operators should bear their own establishment costs.

NRAs will need to consider many factors when determining whether or not to extend the obligation in the Directive, including tariff rebalancing and type of competition envisaged by NRA to develop the market (there may, for example, be a choice between service or network competition).

Thus the impact of CS/CPS on investment in the access network in Member States may need to be explored by NRAs when determining whether to extend the obligation. It has been suggested that pre-selection services are likely to create a disincentive to invest in alternative access networks.⁶¹ This may be true, but it is not an argument against CS/CPS. There need be no automatic policy presumption in favour of new investment as opposed to more competitive use of existing networks; this is a matter of prioritisation which will need to be considered in each Member State.

The extent to which tariffs need to be rebalanced in order to be aligned with costs may also influence the decision of a NRA to extend the obligations in the Directive to other operators.⁶²

If tariffs are unbalanced and CS/CPS is imposed on the SMP operator only, new entrants may rely on profits from long distance and international calls to finance investment in access network infrastructure. If in these circumstances entrants are obliged to offer CS/CPS, they may fear that their profits are under threat, and this may deter some investment that would otherwise have taken place.

On the other hand, if tariffs are aligned with costs, new entrants will not be relying to the same extent on long distance and international call profits and the imposition of CS/CPS on new entrants would not have the same potential effect on access network investment.

Chapter 7 suggested that if NRAs can foresee an extension to the obligation, they may consider the following in order to promote certainty:

- an early decision that all operators should bear their own system set-up costs. This would prevent the SMP operator from passing on some of its establishment costs to other operators who would then be subject to their own costs once the obligation was extended to all operators;
- a transitional arrangement during which time the SMP operator could pass on its costs; and
- a reciprocal arrangement whereby those indirect access providers with local fixed networks who were willing to offer CS/CPS could avoid the charge from the SMP operator. This could have the added advantage of facilitating the widespread introduction of the CS/CPS service.

8.2.2 What services to include in the CPS offering

The implementation decisions made by NRAs or operators (or both) will be affected by the impact of establishment costs, whether borne by each operator or passed on through inter-operator

⁶¹ eg, OVUM, 1998. "Access networks and regulatory measures: A final report for DGXIII." OVUM note that in some Member States, the obligations relating to CPS have been imposed on all access network operators and argue that: "Such a measure is justified on the grounds that it maximises user choice of long distance service provider. But in our view such a measure is more likely to do harm than good. It means that entrants building access networks are in a weaker position to carry the long distance calls (and attract the associated profit) generated by their directly connected customers. As such, this requirement acts as a disincentive to investment in alternative access networks". (page 43)

⁶² In the UK, OFTEL have questioned whether rebalancing is a key factor in whether investments will be made in competing access networks. They noted that the experience in the UK suggests that investments have been made in the UK against a framework which included unbalanced retail tariffs. They have also noted that full tariff rebalancing would be likely to leave a large number of consumers worse off. Source: OFTEL's response to OVUM's Interim Report for DGXIII.

charges, which will be affected by the services included in the CPS offering. The implementation decisions which may be affected are:

- the number of CPS options available. Costs may be higher for certain CPS options such as “all calls”; and
- regulatory obligations to provide customer billing services on behalf of the indirect access operator. For instance, if the SMP operator is required to offer a full range of billing services its establishment costs may increase and those of CPS operators may reduce.

If NRAs decide that the SMP operators can pass on their costs to other operators, the incentive may be to include as many features as possible and try to increase the cost impact on new entrants. On the other hand, if they do not allow SMP operators to pass on all of their establishment costs to other operators (as is the case in the UK), they might then have the incentive to attempt to limit the scope of the CPS service that they are required to offer to other operators.

8.3 Ensuring Cost Orientation

The Amending Interconnection Directive requires charges for CS/CPS to be cost oriented and not to act as a disincentive for the use of the facility. The ONP Voice Telephony Directive, however, requires charges for NP to be “reasonable”. This difference has no special significance and is the result only of procedural limitations. The basic principle of cost orientation was mentioned by the NRAs that we reviewed as part of their guidance of cost allocation arrangements to operators.

The Interconnection Directive (Article 9) also contains a list of general responsibilities of NRAs, which include the need to stimulate a competitive market, the need to ensure the fair and proper development of a harmonised European telecommunications market, and the principles of non-discrimination and proportionality.

A first step towards assessing what charges would be cost reflective might be to consider how costs are allocated in the relevant operators’ accounting systems. These cost accounting systems should be used by operators with SMP in order to calculate interconnection charges and should also be consistent with the Commission guidance on accounting separation and cost accounting.

According to Commission Recommendation of 8 April 1998 on interconnection in a liberalised telecommunications market: Part 2 — Accounting separation and cost accounting (referred to as the Part 2 recommendations), interconnection costs should be calculated on the basis of forward-looking long-run average incremental costs, since these costs closely approximate those of an efficient operator employing modern technology. This in turn implies a cost accounting system using activity-based allocations of current costs rather than historic costs.

The cost accounting system recommended by the Commission requests that the allocation of costs, capital employed and revenue be done in accordance with the principles of cost causation. It also recommends that the costing system of a notified operators need to be sufficiently detailed to permit — as far as possible — the allocation of costs to unbundled network components, in particular to determine the cost of interconnection services.

The Part 2 recommendations state that NRAs require from their notified operators the disaggregation of operating costs, capital employed and revenues, into at least the following broad business lines:

- core network (switched infrastructure);
- local access network (local loop infrastructure);
- retail; and
- other activities.

The core network business is described in the Part 2 recommendations as providing a range of wholesale interconnection services internally and externally in order to allow the customers of one operator to communicate with customers of the same or another operator, or to access services provided by another operator. These services include the switching and conveyance of calls but also services related to the development of competition (such as number portability and carrier selection).

To the extent that such cost accounting systems are in place, NRAs could use these in order to determine the following:

- that any costs that operators are required to bear themselves and are, as a result, passed on to the generality of their customers through broadly based charges, are no higher than necessary. This will mean that the establishment costs incurred for NP, for example, could be recovered through charges on existing customers, but only if those costs have been calculated using current costs and reflect the costs incurred by an efficient operator employing modern technology; and
- that any costs that could be passed on through inter-operator charges are cost oriented. A cost accounting system of the type recommended by the Commission should ensure that any costs that could be passed on to those operators that use the facility are sufficiently unbundled, reasonable (by reflecting the costs incurred by an efficient operator employing modern technology), and include a reasonable amount of common or shared costs.⁶³

Where cost accounting systems of the type recommended by the Commission are not yet in place, NRAs may consider undertaking studies based on any existing cost studies and/or engineering studies to determine whether the costs incurred by operators are reasonable and cost oriented. This approach could be informed by the discussion in Volume II of this study.

Another method which may provide a useful check on estimates arising from cost accounting systems, is international benchmarking. This approach has been adopted in Germany in order to estimate the per-line administrative costs of CPS, although the parties are in dispute about the level of charges.

⁶³ The Commission suggests that a well defined cost-allocation system will enable at least 90 per cent of the costs to be allocated on the basis of direct or indirect cost-causation.

There are some instances when international benchmarking may not be appropriate too to determine whether charges are cost oriented. For example, many of the costs incurred to implement NP or CS/CPS will differ depending on the operator, the network, and the technical solution selected. Benchmarking these types of costs may mean that NRAs fail to capture some of the costs that are actually incurred in implementing the service for a particular operator.

International benchmarking may be more appropriate for the per-line administration costs. However, these costs too will depend on the process that has been agreed between operators when a customer retains their number or pre-selects another operator. This has been one criticism levelled at the German regulator, RegTP by Deutsche Telekom in their regarding the per-line administration costs for CPS. Deutsche Telekom have argued that:⁶⁴

“The principle of using an international benchmark in this case is not understandable since it reflects in no way the actual costs incurred to Deutsche Telekom for carrying out a pre-selection order which had been described to the Regulatory Authority in all detail. A benchmark comparison with operators that have implemented pre-selection several years ago does not give a valid assessment of the level of costs incurred by an operator that has only recently introduced these services.”

For benchmarking to be a relevant exercise, it is important that the cost categories being compared are similar and reflect the same costs and processes.

Recommendation 8.2

There two approaches to the assessment of the costs of operators with significant market power:

- use of cost accounting systems recommended by the European Commission in Commission Recommendation of 8 April 1998 on interconnection in a liberalised telecommunications market.
- in the absence of such detailed cost accounting systems, the use of existing cost studies used to derive interconnection charges, perhaps supplemented by engineering studies.

Useful confirmation may sometimes be derived from international benchmarking comparisons.

8.4 Monitoring Customer Charges

This study has presented a consistent framework for allocating the costs of NP and CS/CPS between operators. An important questions for NRAs is whether these charges should be passed on directly to the customers that use the services, particularly given Directive 98/61/EC (the Directive amending the Interconnection Directive) which requires that direct charges to customers “should not act as a disincentive for the use of the facility”.

There are two categories of operators who are in a position to charge customers. The first is the donor network operator (in the case of NP) or the local loop operator (in the case of CS/CPS). This operator has lost the customer to a recipient network operator or to an indirect access

⁶⁴ Deutsche Telekom's position on the assessment and allocation of costs of number portability and carrier selection/carrier pre-selection. Response to EER's questionnaire.

provider. The second category of operators who can charge customers are those that gain the customers — the recipient network operators or the indirect access providers.

It is possible that either type of operator could charge customers for some of the costs of NP and CS/CPS.

8.4.1 Should donor network operators (for NP) or local loop operators (for CPS) be able to charge customers?

The costs in question are usually the per-line administration costs of NP and CPS although the issue could apply more broadly. The per-line administration costs are typically the costs that DNOs or local loop operators can recover from other parties.

These costs are generally recovered by the DNP or local loop operator through an inter-operator charge rather than through a charge on the former customer. The exception is in Germany where the local loop operator, Deutsche Telekom, currently imposes a one-off charge to customers who choose to pre-select another operator.

There is no doubt that there are costs involved when customers change operators and choose to retain their number or when they pre-select another operator and we have recommended that these costs be recovered through inter-operator charges in the following manner:

- in the case of NP, the charge should be levied from the donor network operator to the recipient network operator.
- in the case of CPS, the charge should be levied from the local loop operator to the indirect access operator.

In both cases the charge would be at a level which reasonably reflects the likely level of costs for an efficient operator.

This recommendation has a number of advantages. It is consistent with the principle of fairness (as the operator gaining the customer pays for the administration costs incurred by the former operator) and it meets the conditions of efficiency (by being consistent with cost causation and by setting the charge at that incurred by an “efficient” operator).

More importantly, by allowing the DNO or local loop operator to recover their costs from other operators, it removes the need for them to levy a charge on their former customers. Such a charge could be considered to be anti-competitive as it could be seen to “lock-in” customers to a network and constitute a barrier to exit. This would raise the switching costs faced by customers.

In Germany, the telecommunications regulator (RegTP) rejected proposals by Deutsche Telekom to charge its former customers for NP on different grounds. It argued that the consumer protection legislation implied that customers had the right to retain their telephone number when

changing operators. RegTP argued that Deutsche Telekom could not levy a charge on customers who were simply exercising that right.⁶⁵

8.4.2 Should recipient network operators or indirect access providers charge their new customers?

Once RNOs or indirect access providers have paid the relevant inter-operator charges they would be free to pass on these costs to the customers who have used the service. Consumer groups, however, may oppose such a charge arguing that consumers should not be charged for the services. The European Consumers' Organisation, BEUC, for example, believe that NP or pre-selection facilities should not cost anything to the consumer. They argue that:

- the consumer in a liberalised market has a right of choice. The consumer cannot fully exercise their right if they have to pay for it; and
- it is important that the consumer is not hampered in their right to choose so that competition can develop fully.

In practice, recipient operators or indirect access providers have tended not to pass the costs that they have incurred on to their customers. These operators have an interest in promoting the services and would not want to deter customers from joining their networks. Operators — even those with SMP — who gain customers through NP or CPS would, by virtue of competitive pressure, be unlikely to impose charges on customers joining their network.

Nevertheless, NRAs do have a duty to ensure that that direct charges to customers, particularly for CPS, should not act as a disincentive for the use of the facility and may wish to monitor charges to ensure that the RNOs or indirect access operators do not set charges which act as a disincentive. Whether or not new entrants pass on these costs to their customers is, ultimately, a commercial decision that each operator will need to make; we see no strong general case for preventing them from doing so.

8.5 Managing Databases

If an off-switch solution is implemented, it requires a central agency to manage the database of “ported” numbers.⁶⁶ This agency (which could be an independent body acting on behalf of the industry) will incur set-up costs and on-going costs.

As NP is a symmetric service, all operators should contribute to the set-up costs, which will vary by the type of database introduced in each Member State. The most likely type of database to be implemented will be a central reference database (we believe this to be the solution favoured in the Republic of Ireland and Spain). Such a database will not normally be involved in the routing of calls as each operator will have their own operational databases which will include copies of the information held on the reference database. All operators would need access to the information stored on this database in order to allow for the optimal routing of calls.

⁶⁵ It is unclear whether Deutsche Telekom would have succeeded in imposing a per-line administrative charge on recipient network operators.

⁶⁶ Operators could then download information on all porting activity (if a distributed database solution implemented) or all operators could have copies of the national database for real-time interrogation, which are synchronised daily (if a centralised database solution is chosen).

Management of such a database could be offered for tender to a third party, and the costs of establishing and running it should be borne by the industry. The scope of the central body should be as limited as possible, and should not include data communication systems to and from the database: these should be procured by each user of the database.

Assuming that the start-up costs are recovered over a number of years, two possible charging bases for annual system costs (maintenance and annualised capital costs) might be:

- an equal charge for all users of the database: this may be perceived to discourage entry as it will fall as heavily on smaller operators as on larger ones; however, a number of smaller operators might opt to share a single data feed from the database, reducing their costs; or
- a charge to each operator in proportion to a measure of its market share, perhaps number of subscribers, lines, or calls originated: this will further increase the burden of cost carried by the incumbent operators, who will already be bearing a large proportion of the costs for service from which they are unlikely to benefit, but might facilitate entry.

We would expect that these start-up and maintenance costs would be independent of the level of use, eg the volume of numbers ported. If, however, additional non-negligible usage costs are identified, they should be recovered from the people who cause them to be incurred, eg the recipient operator when a number is ported. This could, however, deter firms from offering NP services.

Overall the costs associated with the central database are likely to be relatively small and any combination of the above methods could be acceptable.

Other database solutions may require different cost allocation arrangements. If, for example, operators and/or NRAs choose an IN solution whereby calls require a look-up from a centralised database, it may be more appropriate to recover the establishment costs through a charge on the operator for each “look-up” or use of the database.