NUMBER PORTABILITY IN THE UK: A TWO-EDGED SWORD?

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Number portability, the facility enabling customers to keep their existing telephone numbers when changing supplier, is currently being deployed throughout the UK's access networks. This innovation follows a prolonged (and sometimes acrimonious) debate about the economic costs and benefits of portability, and precisely how it should be paid for. Ultimately, however, the prevailing view of the regulatory regime was that the corresponding reduction in switching costs was an essential requirement for effective competition in the local loop. This belief was universally endorsed by the new access providers in the UK: indeed, several cable operators argued that the absence of portability was the single most significant impediment to competition in the UK telephony market.

The focus has now shifted from regulatory economics to commercial realities. Based on the experiences of its pioneers, this Paper assesses the early evidence of the effectiveness of portability and its impact on consumer decisions. It also describes the daunting complexities of the implementation process itself, and sets these against the parameters of the earlier economic debate.

INTRODUCTION

Number portability, offering the prospect of much easier customer migration, was eagerly awaited by BT's competitors in the UK. The service was finally launched, on a limited basis, in the summer of 1996. The scope and logistics of portability are still evolving but there are already some important lessons to be drawn from the first year's experience.

This paper concentrates on so-called 'geographic' portability, relating to ordinary subscribers on the fixed networks, and particularly on the residential market. In this context, BT's principal competitors are the UK's cable operators, and the paper inevitably focuses on that sector. But portability has equally important implications for the business market, especially following the launch of multi-line and non-geographic portability (freefone, premium rate services etc.), and the paper will also touch on these issues.

In relatively narrow, business interest terms, the underlying thesis of the paper is that the UK operators both overestimated the benefits, and underestimated the costs of geographic portability. Part I of the paper reviews the background to the introduction of NP, including the system's expected costs and benefits. Part II goes on to look at some early evidence of the impact of NP, the actual operational data that has emerged over the last year.

TERMINOLOGY

Some terms and abbreviations used frequently in the paper:

NP	Number portability
OFTEL	Office of Telecommunications, the UK equivalent of the FCC
DGT	The Director General of Telecommunications, OFTEL's chief executive (currently Don Cruickshank)
BT	British Telecommunications plc
OLOs	Other licensed operators, i.e. BT's competitors
DLE	Digital local exchange
Donor network	The network that is losing the customer through portability
Recipient network	The network that gains the ported customer
System set-up	Network modifications required for portability
Per line set-up	Process of enabling individual customers to port their number
Additional conveyance	Additional call traffic created by the portability process

PART I

BACKGROUND

One of the UK cable industry's biggest challenges is that CATV penetration, at least for the time being, seems to have stalled. The current penetration rate, at around 22.0%, is still below the level seen in 1992 (22.4%). With typical penetration rates in the 25-40% range, the telephony product has been considerably more successful but the interplay between pricing and penetration remains crucial in determining the success of the service. Once subscribers have signed up for cable, price elasticity may be quite low, but this is unlikely to be the case for potential new subscribers. And, as far as telephony is concerned, the overwhelming reason given by customers for why they switch from BT to a cable operator is price, (although research shows that consumers are rather hazy on the discounts they actually receive.)

In strategy terms, one school of thought has it that the existence of two streams of revenue over a single network, together with the (generally) downward trend in interconnection rates, means that the cable operators will for the foreseeable future have the potential to undercut BT's prices by whatever it takes to win the industry its customers. Others contend that fiercer price competition will ultimately work against cable and to BT's advantage: as the price differential between BT and its rivals falls, so does the incentive for customers to switch from one supplier to another. Cable should therefore be trying to move away from price as its main competitive weapon.

The reality seems to be that the conventional discounts of cable telephony have been sufficient to attract customers who are interested primarily in entertainment services, plus a (smaller) proportion of extremely price-sensitive telephony consumers. That is, cable pricing was attractive enough while it was seen as a marginal buy over TV, or where telephony usage was unusually high. But, as the industry's coverage expanded, it started to run out of these 'early adopters'. This is a difficult

hypothesis to substantiate but it did receive some support from market research carried out for OFTEL last year. This showed that the majority, 'medium' telecoms spenders were more likely to use or remain with BT than customers who had lower or higher levels of spend, i.e.

TABLE 1: Percentage of residential customers taking up services from non-BT suppliers

	Level of household telecoms spend per quarter		
Household income level	**Low (<£35)**	**Medium (£36-£70)**	**High (>£70)**
Low (<£6,240 pa)	12%	9%	20%
Medium & High	20%	11%	14%

(Source: Taylor Nelson, 1996)

Whatever the causes of this inertia, many in the cable industry argued that penetration rates would increase sharply with the introduction of number portability. Indeed, they contended that the absence of portability was 'the single most significant impediment to competition in the UK'. Based on their own industry research, these operators suggested that **cable penetration could increase by as much as 5-8 percentage points with the advent of portability**, and several market analysts (e.g. SBC Warburg) regarded this as conservative. OFTEL's own research had also revealed that a significant proportion of residential users who had declined cable telephony did so because of the need to change their telephone numbers or because of problems with number listings. (And the effect on business users was likely to be even more pronounced). A 1995 survey conducted by the Consumers' Association found that:

"70% of BT customers would be tempted to move operator if they had the ability to keep their existing telephone numbers".

The word *'tempted'* was clearly very important here because 70% of tempted customers might translate into very few actual subscribers. Indeed, there were indications in the survey report that the discounts required to be offered by alternative operators to warrant a switch might be high. Of 244 respondents (residential telephony customers) who quantified the necessary discount, well over a third said 30% was a realistic figure before they would seriously consider changing supplier (see below). In total, two-thirds said the discount would have to be 20% or more - even assuming no cable connection fee or portability charge. This compares with the discounts against BT of 10-15% that the UK operators have typically offered in the past.

But one has only to look at cable's advantages over BT to realise that competing on price alone would be folly. BT already trades heavily on its customer service, which is increasingly accepted to be good, and it is committed to defending its domestic base by offering a growing range of quality products and services. So even if portability made switching to a cable operator easy, it would be equally easy for customers to switch back to BT if cable quality of service is inferior or if pricing differentials are eroded too soon. One implication was that cable operators might not wish to roll out

number portability across their franchises until they were sure they could compete on quality of service.

RESEARCH DATA

A number of UK consumer surveys in the early 1990s included questions about attitudes to keeping or changing telephone numbers. The results presented below relate to responses by BT (residential) customers only, as porting of numbers was most likely in the first instance to be from BT to other operators.

TABLE 2: Reasons for not switching from BT - residential customers

TOTAL RESPONDENTS	566
GIVEN AS A REASON:	
Happy with BT	87
Hassle; can't be bothered	55
Lack of information	50
Don't want to change number	36
Concerns about service quality/value for money of alternative supplier	14
Cost: not convinced of saving	22
GIVEN AS MOST IMPORTANT REASON:	
Happy with BT	47
Hassle; can't be bothered	13
Lack of information	16
Don't want to change number	9
Concerns about service quality/value for money of alternative supplier	2
Cost: not convinced of saving	5

(Source: CA telephone survey, March 1995)

As Table 2 shows, not wanting to change their telephone numbers was one of a number of reasons customers gave for not switching supplier but was generally not the most important reason. The survey responses suggested that a high proportion of respondents were happy with the range and quality of services provided by BT and that this was a deterrent to changing supplier. Other significant deterrents to changing supplier suggested by the surveys included lack of information and 'hassle'. (As OFTEL pointed out, 'hassle' may itself reflect problems arising from the absence of NP). Around a half of residential respondents thought changing number was a problem for them (very big or quite big) and 'agreed a lot' with the statement that they did not want to change number and felt unhappy (very or quite unhappy) about changing number.

A higher proportion of businesses than residential customers referred to having to change their telephone number as a reason for not switching supplier; in an OFTEL survey, for example, 16% of non-cable users said that changing number was the main reason for not taking cable telephony. Multi-line business customers may choose to dual source and are thus able to retain their BT numbers; they may decide to use their BT lines for incoming calls and their non-BT lines mainly for outgoing calls and thus avoid the disadvantages associated with changing their telephone numbers.

Evidence suggests that some OLOs have a significantly higher proportion of outgoing than incoming call traffic and this would support the idea that it is important to business to keep their numbers. (However, businesses may dual source for security or other reasons as well as to keep their number).

Table 3 below reproduces the research findings quoted earlier, residential customers being asked what level of discount they would require against their BT bill before seriously considering changing supplier. In all cases, the necessary discounts declined when respondents were able to keep their number - although the extent of the effect varied between this and other surveys).

TABLE 3: Propensity to switch - with/without number portability

	WITH PORTABILITY	WITHOUT PORTABILITY	
TOTAL RESPONDENTS	487	487	
			Difference
Would switch (assuming no NP charges) at:			
0-4% discount	7	7	-
5-9% discount	24	18	6
10-14% discount	52	36	16
15-19% discount	60	47	13
20% discount or more	91	80	11
Would not switch	4	17	
Don't know	6	4	

(Source: CA telephone survey, March 1995)

The results of the research therefore confirmed that not being able to retain their number is one of the factors that deter residential customers form changing suppliers. However, the surveys did not provide any strong evidence of how much switching would result from the introduction of NP. This was expected to depend on a number of factors, including the strength of marketing by cable companies and other suppliers; the speed with which the cable networks are built; the price discounts offered compared with BT; and the extent of charges for NP.

REGULATORY INTERVENTION

Whatever their limitations, OFTEL took these research findings to heart. So, quite early in the UK's liberalisation process, the regulator became convinced that the absence of number portability was a major barrier to customers changing operator, and hence to the development of effective competition in the UK. In fact, the organisation had been working to introduce portability since the Government's review of the duopoly policy in 1991. At that time, a modification to BT's operating licence was introduced which would enable the DGT to direct BT to provide portability to other operators if:

(i) it was shown to be technically feasible, and;
(ii) it was clear that the benefits of portability outweighed the costs.

These criteria are discussed in more detail below, but both were ultimately satisfied. However, despite clearing these hurdles, the introduction of portability was delayed. When the DGT directed BT to supply Videotron (a UK cable operator) with number portability in October 1994, no agreement could be reached on financial terms. BT argued that all the costs which it incurred in providing portability to Videotron should be paid by the cable operator, whereas Videotron believed that each operator should bear its own costs. OFTEL took a middle position, arguing that the external benefits deriving from portability suggested that BT should be able to recover some, but not all, of its costs from the other operators (and that the same should apply to other operators in recovering their costs). Charging the full cost to BT's competitors would result in an inequitable loading of responsibility - given the broader benefits associated with portability - and would provide no incentive for BT to make a reasonable commercial offer which would promote the early introduction of number portability.

However, under BT's existing licence, OFTEL had no power to allocate costs in this way. In February 1995, the DGT therefore proposed a modification to BT's licence which would enable him to rule that BT should not recover all the costs it incurred in providing portability. BT rejected this proposal, and the DGT accordingly referred the matter to the UK Monopolies and Mergers Commission (MMC). In doing so, the DGT asked the MMC to consider the following questions:

(i) did the absence of portability operate against the public interest?

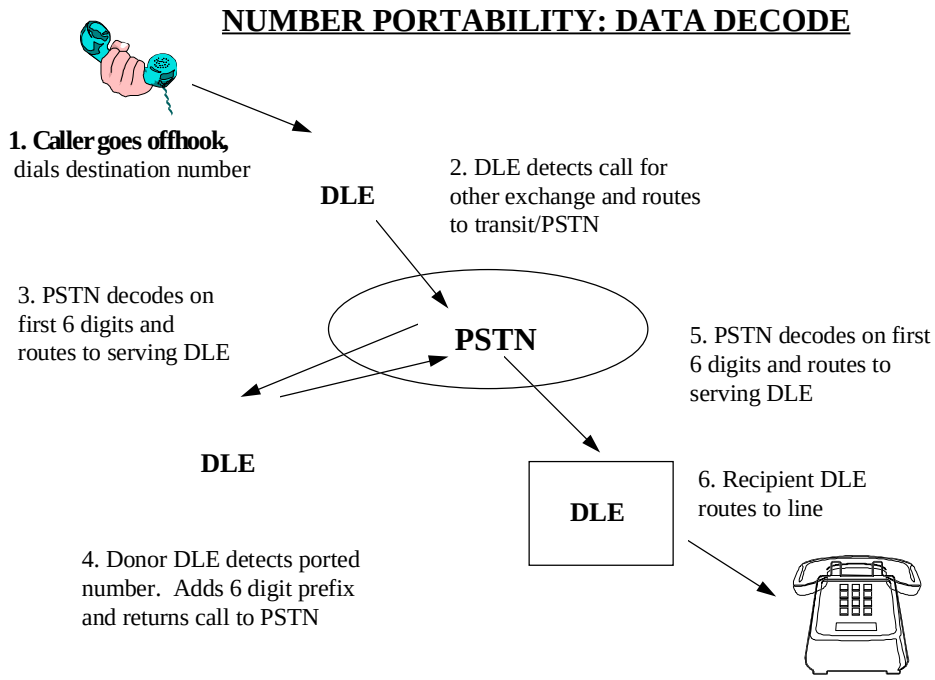
(ii) if so, could this be remedied by a modification to BT's licence dealing with the allocation of the costs of portability?

TECHNICAL SPECIFICATION

In order to enforce NP as a licence requirement, OFTEL had to be sure that its technical demands were not unreasonable. If a number has been ported, the dialled digits no longer contain all the necessary information for call routing, and additional information must therefore be supplied at some point during the call set-up process. In principle this can be done at the originating local exchange, at one of the trunk exchanges, at the destination local exchange or even outside the network itself . Each of these cases gives rise to different technical challenges and introduces different cost elements.

OFTEL asked the NICC, an industry-wide standards body, to identify both a short term solution which could be introduced as soon as possible and a longer term solution - although the NICC's 1994 report was concerned only with the former. (There was considerable pressure on the NICC to expedite the NP project: its terms of reference included the requirement that the interim solution should be capable of implementation by the fourth quarter of 1994). Its recommendation, for a solution called 'data decode', was accepted by the DGT and was the basis of the trials which were subsequently conducted between BT and the OLOs.

The data decode solution establishes a procedure by which information is added to permit calls to be made to ported numbers. The information takes the form of a six-digit prefix, beginning with the digit 5, which an exchange within the donor operator's network must insert before the dialled number. The initial digit 5 indicates that the subsequent dialled number has been ported and the remaining five digits of the prefix identify the particular exchange to which it has been ported. The recipient operator then decodes the remaining information in order to complete the call. This process is illustrated, generically, in the diagram below.



The solution recommended by the NICC did not prescribe the point in the call set-up process at which an operator should insert the prefix. However, in order to avoid a fundamental change in its network routing procedures, BT has to add the prefix at the destination local exchange - where information about the called party is held. This can be done in either of two ways:

(i) tromboning;

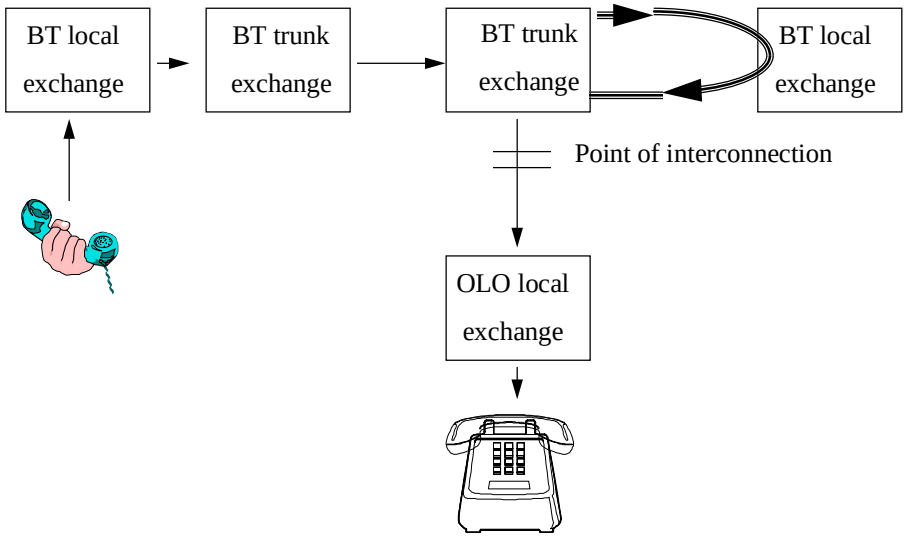
(ii) call dropback

Tromboning

In this solution the physical call path is established as far as the destination local exchange, i.e. the exchange to which the called party was connected before porting his or her number. This exchange recognises that the number has been ported and inserts the six-digit prefix. Because BT typically

interconnects with OLOs at trunk exchange level, the call then has to be routed from the local exchange to its trunk exchange for hand-over to the recipient operator. For calls which have been routed in from the trunk exchange in the first place there is thus a doubling-back or 'tromboning', creating an additional loop in the call path which continues for the duration of the call. This is illustrated below.

CALL PATH WITH TROMBONING SOLUTION



For calls originating on the same local exchange, however, NP will not require tromboning, only routing to the trunk exchange and thence to the point of interconnection. This is the same routing as would be necessary if the called party had transferred to a new operator and been given a new number. There is a third category of call, namely those originating in a local exchange adjacent to that to which the called party was originally connected. NP does require additional routing in this case although it does not take the form of tromboning. BT suggested that a typical split between these three categories was 48% trunk calls and 26% for each type of local exchange call (and OFTEL subsequently used these weights in its determination of NP conveyance costs). The tromboning phenomenon was thought less likely in the short term to affect OLOs providing portability because they either interconnect at their local exchanges or have a single-tier network, with no distinction between trunk and local exchanges.

Call drop-back

Call drop-back is an improved form of data decode which eliminates the need for the tromboning of trunk calls. As with tromboning, the recognition of ported numbers and insertion of the 5xxxxx prefix is carried out at the donor operator's destination local exchange. However, during the call set-up phase the signalling system passes this information back to the trunk exchange so that the call path to the recipient operator can be established directly from the trunk exchange. The donor operator's

terminating local exchange then takes no further part in the call. Call drop-back does not affect calls originating on the same or adjacent local exchanges.

IN Solutions

Under any future IN solution the database, held outside the switches, would be consulted at some point during call set-up and supply the switches with the information necessary to complete the call. Unless a form of drop-back signalling were introduced the database would have to be looked up for all calls, not just calls to ported numbers. IN solutions therefore differ from tromboning and call drop-back in introducing additional costs for calls to numbers which have not been ported. The extent of these costs depends on where the database reference is made - at the terminating local exchange, terminating trunk exchange or originating local exchange - but, there are disadvantages to each of these possibilities. The advantage of INs is that they would be capable of supporting a wide range of other services as well as NP. The consensus view at the time was that IN structures would not be commercially justified solely as the means of providing NP for geographic numbers but would in due course be the preferred means of providing such portability alongside other services.

Migration path between solutions

The transition between different solutions depends both on the time-scales on which new technology can be introduced and on the volume of ported numbers. On the basis of submissions subsequently made to the MMC, a possible timetable was suggested as follows:

- tromboning from early 1996;
- call drop-back replacing tromboning before the end of 1997;
- IN solutions with database reference at appropriate points in the network, potentially being introduced by 1998/99; and
- IN solutions with database reference at the originating exchange available some time after 2000.

Implementing different types of portability

The data decode solution was designed specifically for the portability of single geographic numbers at a fixed location. Nonetheless, both data decode and IN solutions - or some combination of the two - could also be applied to other forms of portability. The relative merits of the technical options could, however, be different in these circumstances. In particular, it was argued that:

- data decode will only be justified for number block portability once call drop-back is available (since the porting of number blocks may generate a high volume of demand and hence a high level of the additional conveyance required by the tromboning solution);

- portability of complete blocks of 10,000 numbers may, however, be achievable without the use of local exchange data decode (in this case the changes in routing procedures could be made at the trunk exchange by reassigning the full 10,000 number block); and

- IN solutions could provide the best approach to portability for certain non-geographic services such as freefone (these services already employ a form of IN technology, so it may make sense to use this same IN platform for the provision of portability).

Consultation with the industry therefore demonstrated that portability was indeed technically feasible in the short term - albeit that the delivery technology would almost certainly have to evolve over time. In the summer of 1994, the NICC produced detailed recommendations on how ported numbers could be recognised and routed within networks. Their report was endorsed by all major operators, including BT.

COST/BENEFIT ANALYSIS

The second precondition for number portability, that its benefits should outweigh its costs, was the subject of a study by the economic consultants NERA, commissioned on behalf of OFTEL in late 1992. NERA investigated the costs and benefits of several different technical methods of providing portability, and identified three categories of prospective benefits:

- *Type 1 benefits*, which accrue to customers who port their numbers. These include savings from not having to change number; from switching to lower costs operators; and from the convenience of dealing with only one operator. (As noted earlier, some customers who do not wish to change number use BT lines for incoming calls and another operator for outgoing calls).

- *Type 2 benefits*, which accrue to all UK telecommunication customers. These arise from efficiency improvements and associated price reductions which result from increased competition in the telephony market due to the availability of NP.

- *Type 3 benefits*, by which NERA meant other savings which accrue generally - but mainly to calling subscribers - as a result of there being fewer number changes. These include fewer misdialled calls and fewer calls to directory enquiries.

NERA found that the most important benefits were the Type 2 benefits and that the total benefits substantially exceeded the costs of NP, i.e. that the net benefits were positive. NERA estimated that over the period 1995/96 to 2004/05 Type 1 benefits could be valued at around £550 million, Type 2 benefits at £1,280 million and Type 3 at around £20 million (1993 prices). For every technical

solution examined but one (the immediate introduction of a full IN solution) the total value of these benefits substantially exceeded the expected costs of providing NP. In the central case, it was estimated that net benefits between 1995/96 and 2004/5 would be some £1.85bn at 1993 prices (see Table 4 below). As noted in Table 4, NERA considered costs under a number of different assumptions about technology but their estimates were quickly outdated as new information emerged from BT (see below). Within the industry, the extent of the costs which would arise from the introduction of NP was in practice a matter of lengthy dispute.

Table 4: NERA's estimates of the benefits and costs of NP

	TOTAL 1995/6 - 2004/5 (£million, 1993 prices)	
	Undiscounted	Discounted @ 6% real
Type 1 benefits:		
- customers switching supplier	487	
- customers avoiding number change	67	
Type 2 benefits	1,280	
Type 3 benefits	19	
TOTAL BENEFITS	**1,851**	
COSTS (lowest cost technology)	423	
NET BENEFITS	**1,427**	**915**

(Source: NERA, 1993)

Costs of the tromboning solution

BT estimated its *system set-up costs* for implementing the tromboning solution at £35 million. This figure was relatively firm as much of the expenditure had already been incurred. There was little controversy about this element because all operators expected to bear their own system set-up costs. But BT's estimates of its *per line set-up* costs varied widely:

(i) In February 1995 BT gave OFTEL a first estimate of £3.

(ii) In May 1995, after the MMC reference was made, BT quoted a figure of £36.61 to the cable companies with which it was negotiating.

(iii) In June 1995 the estimate was reduced to £24.60 in BT's main submission to the MMC.

(iv) In August 1995 BT told the MMC that it had revised its estimate down further to an average of £18 and saw scope for an additional reduction to an average of £12.

(v) In September 1995 BT told the MMC that it was prepared to make a firm commitment to introduce the average rate of £12 from April 1996. This average was made up of £8 for digital exchanges and £32 for BT's remaining analogue (TXE4) exchanges - which required more work. If the DGT agreed, BT was willing to 'de-average' the cost so that from April 1996 most

charges would be at the £8 rate. BT said that it intended to phase out the TXE4 exchanges by the end of September 1997 but this was not a firm commitment.

In explanation of these changes BT told the MMC that the initial £3 was a very early estimate which reflected the future position with all systems development in place and the phasing out of TXE4 exchanges completed, and excluded overheads and a profit mark-up. It added that it had probably been mistaken to quote such an estimate. The £36.61 was an estimate of BT's direct pay costs for the various set-up tasks - based on an average of one hour's work - plus an allowance for overheads and profit consistent with the rates which it had already submitted to OFTEL for data amendments, an existing service. The subsequent fall to £24.60 reflected the application of reduced overhead rates and a lower profit mark-up consequent on a recent determination by the DGT of other, comparable charges.

At a hearing with the MMC in July 1995, BT said it expected its costs to fall fairly quickly as NP was implemented but that there was as yet no field experience on which to base estimates, nor had procedures yet been agreed with OLOs. The August 1995 estimate of £18 reflected a reduction from one hour to 45 minutes in the labour time required, based on what had been learnt in the trials with cable companies then taking place; while the further envisaged reduction to £12 reflected a labour time of 30 minutes as a result of some automation being introduced (an automatic link between the customer service system and the operational management centre). BT also mentioned that it was examining the feasibility of another element of automation, real-time routing, which if implemented would reduce the cost further.

The calculation of *additional conveyance* costs was a more complex matter. The extent of the additional conveyance depends on both the type of call and on the nature of the comparison. BT based its calculations on a comparison between calls to a customer who had changed to a new operator and been given a new number, and calls to a customer who had changed operator but ported his or her number. The other possibility is to compare calls to a customer who is still on the BT network with calls to a customer who has both changed operator and ported his or her number. BT said that it considered the former basis to be appropriate as it isolated the effects of NP itself from other factors. NYNEX, on behalf of a group of cable companies argued that the latter basis was necessary to give the full picture. The DGT took the same view but added that in principle the choice of basis depended on whether the customer concerned would, or would not, have switched operator even if portability was not available.

In September 1994, during its negotiations with Videotron, BT quoted 1.23p a minute as its estimated charge for additional conveyance. This rate was subsequently used in the trials of the tromboning solution conducted between BT and certain cable companies during 1995 and was incorporated in the standard contract which BT prepared for the full commercial introduction of NP early in 1996, (with the proviso that the rate would be adjusted retrospectively in line with the arrangements which resulted from the MMC inquiry). BT said that the 1.23p a minute was based on the ready reckoner rate, for use in interconnection, for a 'single tandem segment', a standard combination of network

components which BT felt equated most closely to the use of the network involved in tromboning and was therefore a reasonable initial basis for estimate costs. The ready reckoner rate was based on actual information for 1991/92.

In June 1995 BT told the MMC that the average cost of additional conveyance in 1995/96, based on broadly the same method of calculation, was 0.7p a minute and that the cost was falling by 10% a year. In August 1995, having reviewed its assumptions and taken account of more recent interconnection information which had become available. BT revised its estimate down to 0.54p a minute and the rate of reduction in costs was revised to 7% a year.

BT said that it expected to recover from OLOs the full cost of additional conveyance on its network. It envisaged this being done by collecting information on the actual number of minutes of ported calls and the time of day/week and then applying the standard interconnection rates for the network components used, i.e. to treat NP conveyance costs as simply a form of interconnection. In accordance with normal practice, charges would be based initially on estimates and reviewed when actual data were available.

Costs of call drop-back

BT thought that the additional *system set-up costs* of a move to call drop-back would be around £2 million, while per line set-up costs would be the same as for the tromboning solution. It assessed the additional conveyance costs for ported calls under call drop-back at 0.2p a minute for 1995/96, falling at 7% a year and thus down to 0.18p a minute by 1997/98 when call drop-back was due to be introduced.

Total costs of introducing NP

In order to estimate the total costs to BT of introducing NP it was necessary to make assumptions about the number of lines ported and (for conveyance costs) the number of call minutes arising on those lines. BT provided the MMC with a range of such assumptions. However, these estimates assumed that porting would begin on a substantial scale in 1995/96, which proved to be unrealistic. The table below, based on updated estimates from BT (which assumed that porting would begin in April 1996), gave an illustration of BT's total costs from the introduction of NP if 3.9 million lines were ported over the four years 1996/97 to 1999/2000 and some 67 billion call minutes arise. It was assumed that call drop-back would be implemented in November 1997.

TABLE 5: Projected costs for BT of introducing NP, 1996/1997 - 1999/2000

	£m
System set-up:	
- tromboning	35
- call drop-back	2
	37
Per line set-up:	

- 3.9m ports @ £8 each	31
- additional conveyance	152
	220

(Source: MMC, based on information from BT)

COST ALLOCATION

The problem with cost allocation is of course that many of the costs of NP are borne by parties that do not gain the benefits. In particular, the operator losing the customer bears some administrative costs and the costs of re-routing calls to ported numbers, as well as losing revenue from the customer. Meanwhile, the new operator has some costs of administration, but gains the benefit of the revenue stream from the new customer.

Table 6 below illustrates this mismatch between costs and benefits - although it makes no attempt to estimate relative magnitudes. This suggests that the main loser is likely to be the donor network and its customers or shareholders (who will have to pay for the loss through higher charges, lower service quality or lower profits). The main gainers are the recipient network and its stakeholders, the porting customer and the callers to ported numbers.

TABLE 6: distribution of NP costs and benefits

	Portability cost category			
	System set-up	Per line set-up	Added conveyance	Caller costs
Donor network & stakeholders	**-**	**-**	**-**	
Recipient network & stakeholders	**-/+**	**-/+**	**+**	
Porting customer	**+**	**+**	**+**	**+**
Calls to ported numbers	**+**		**-/+**	
All telephony customers	**+**			

[+ = benefit; - = cost]

(Source: OVUM, 1997)

The distribution in Table 6 can be described in more detail:

- the *system set-up costs* are incurred by all operators, and by permitting NP confer benefits to porting customers, callers to ported numbers and to all telephony customers (through the wider impact of NP on market competition);

- the *per line set-up costs* of customer transfer costs are shared between the donor and recipient operator, and the porting customer gains the utility of costs saved from NP or the benefits of switching supplier. The recipient network gains the revenue from the new customer;

- the additional conveyance costs are borne by the donor network, to the benefit of the recipient network (which gains interconnection revenue), the caller (who can have the call routed without the costs of finding the new number) and the porting customer - who presumably benefits from receiving the call;

- finally, the caller costs (of additional call set-up delay) are borne by the callers, but they will gain from being able to complete the call successfully.

From this complex system of interactions, a range of views developed on how to deal with the costs of number portability. There were four main options:

(i) Option A: the donor operator charges the receiving operator the costs caused by a customer porting his number. The receiving operator may, or may not pass on the charge to the customer.

(ii) Option B: the donor operator charges the porting customer the costs caused by that customer porting his number.

(iii) Option C: operators bear all their own costs.

(iv) Option D: the donor and receiving operators share the costs in some proportion.

Charging principles

There are a number of different economic principles that can be applied to these options. Each can be backed up by good arguments and each has different financial implications. During the MMC inquiry, the Commission adopted the six principles advocated by OFTEL for the allocation of costs in number portability, i.e.

- *cost causation:* the costs of NP should be allocated to those who cause them. This gives cost causers the right price signal and encourages economically efficient behaviour from them. Cost causation is a fundamental principle in developing charging regimes in telecommunications. It forms the basis of interconnect charging in the UK and elsewhere. On its own it suggests that other operators should recover in full the customer transfer costs and additional traffic costs from the porting customer or from the receiving operator (as the customer's agent).

- *costs minimisation:* the costs of NP should be allocated so as to give operators an incentive to minimise the costs of NP. This suggests limiting the proportion of an operator's costs which it can recover from the receiving operator. Alternatively the price an operator charges for NP services can be fixed so that the donor operator keeps the residual cost savings as profit.

- *distribution of benefits:* benefits from NP accrue to callers and to users in general (through fiercer competition) as well as to those porting their numbers. Maximising these external benefits means stimulating demand for NP by limiting the prices which are charged for NP services - that is, only partial cost recovery.

- *effective competition:* the methods of costs recovery should not frustrate the wider benefits that NP will bring to all customers. For example, a high charge to porting customers may deter most customers from porting, thus making it unnecessary for operators to reduce prices or improve services, which would benefit all their customers.

- *reciprocity and symmetry:* a rule for the costs of a customer porting from one operator to another should apply to a customer porting in the opposite direction.

- *practicality:* the rules should be easy to implement.

MMC REPORT

The MMC report of November 1995 concluded that the introduction of portability was necessary to promote effective competition between operators which, in turn, would benefit customers and promote efficiency. The MMC considered that BT should not be able to recover its costs in full from other operators, and that portability needed to be introduced more rapidly and effectively than was likely if BT's licence remained unchanged. Without such a licence modification, there would be further protracted argument about the level of costs, and any take up by other operators would be on a restricted basis, preventing full realisation of the benefits which the widespread introduction of number portability was expected to bring.

The MMC therefore proposed the following rules on cost allocation:-

- BT should bear its own system set-up costs;

- BT should be able to pass on to the other operator concerned the appropriate per-line set-up costs (as determined by OFTEL);

- after October 1997, BT should bear the additional conveyance costs associated with the call dropback method. During the period up to October 1997, the extra costs of tromboning over and above call dropback costs should be shared equally between BT and the other operator.

Table 7, below, summarises how the six charging principles were applied by the MMC. The first few lines show how the six principles led to the allocation of costs either to each operator bearing its own costs, to costing sharing between the operators, or to the cost causer bearing the cost. The three last

lines show how these were then applied to the system set up costs, the per line set-up costs and the additional traffic (conveyance) costs. As noted above, the conveyance costs were to be shared for the call tromboning method and then borne by the donor operator (mainly BT) once the call dropback method was introduced.

In terms of the options outlined above for the distribution of costs the MMC therefore leant heavily towards Option C (operators bearing their own costs) and Options A (charges to the receiving network) and D (cost sharing). A number of recipient operators do make one-off charges to the porting customer for the administration of porting (see Part II below).

TABLE 7: Rationale for NP cost allocation

PRINCIPLES	Operators bear own costs	Operators share costs	Cost causer bears costs
Cost causation			**X**
Cost minimisation	**X**		**X**
Maximise external benefits		**X**	
Effective competition	**X**		
Reciprocity & symmetry	**X**	**X**	**X**
Practicality	**X**		
Costs			
System set up	**X**		
Per line set up			**X**
Additional conveyance	**X**	**(X)**	

(Source: OVUM, 1997)

PART II

IMPLEMENTATION

BT's licence was modified in line with the MMC recommendations in July 1996. On the same day, the DGT directed BT to provide portability to other operators in accordance with the new licence condition. The licence condition embodies the principle of reciprocity - BT is obliged to provide portability to any operator who, in turn, is willing and able to provide portability to BT. Corresponding modifications have since been incorporated into the licences of the other fixed telecoms operators in the UK.

In January 1997, OFTEL determined BT's 'reasonable costs' in providing portability, and the standard charges it would be allowed to recover. The determination confirmed that each operator should absorb its own system set-up costs, including the cost of data build at each switch. For the costs of per line set-up and additional conveyance, the OFTEL figures continued the downward trends seen in BT's earlier estimates. The progression is shown in Table 8 below.

TABLE 8: progression of BT portability charges

Per line set-up charges (digital exchanges)		Additional conveyance charges (tromboning) (ppm)	
Feb' 95 (BT)	£3	Sep' 94 (BT)	1.23
May '95 (BT)	£37	Jun' 95 (BT)	0.70
Jun' 95 (BT)	£25	Aug' 95 (BT)	0.54
Sep' 95 (BT)	£8		
Jan' 97 (OFTEL)	£4-6	Jan' 97 (OFTEL)	0.32

(Source: MMC, OFTEL)

OPERATIONAL EXPERIENCE

NP ESTABLISHMENT COSTS)
PRICING STRATEGY)
DEMAND FOR PORTABILITY) To be presented at TPRC
RECIPROCITY IMPLICATIONS)
CONCLUSIONS)

John Cluny,

August '97