INDEPENDENT PROJECT for IV Term:

Analysis of Number Portability

&

Challenges in Implementation in India

Project Report submitted to

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By

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Executive Summary

Telecom Regulatory Authority of India in its Recommendations on Mobile Number Portability released on 8th March 2006 suggested 1st April 2007 as the deadline for implementation of MNP in India. With the industry representatives stressing on the futility of Number Portability in an already competitive mobile market and then Department of Telecommunications suggesting against its implementation, the situation deserves an analysis of the necessity of MNP in India at this time. This paper attempts a discussion of conceptual issues involved in the implementation of MNP in India.

The paper first introduces the concept of Number portability and identifies the costs and benefits generally associated with it. This is followed by a brief review of MNP implementation in other countries (like Hong Kong) to draw lessons for India.

The study presents a critical analysis of a selected few features of MNP implementation as recommended by TRAI. These are

- Phasing out of implementation
- Choosing Mobile Number Portability before Fixed line Number Portability
- Technological solution for MNP implementation
- Allocation of costs of implementation
- Tariff transparency

Further, it looks at other issues that are likely to arise during implementation, e.g. ownership of the number, issues in porting process, location portability, handset compatibility.
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1. Introduction

1.1 TRAI announces the implementation of NP by April 2007

The Telecom Regulatory Authority of India (TRAI) had issued a consultation paper on Number Portability (NP) in July 2005. The paper explained the concept of number portability and invited comments from various stakeholders on the operational, economic and technical issues listed in the paper, arising during the implementation of NP in India [Consultation Paper on Mobile Number Portability, 2005].

In 8th March 2006, TRAI released its recommendations on the NP implementation in India, whereby it had asked the operators to provide Mobile Number Portability services to its (mobile) subscribers by 1st April 2007. It suggested a phased out implementation beginning with services within the same service area only. The “All Call Query” method would be used, and there would be a Centralized Clearing House to be set up by all mobile operators and to be administered by a neutral third party. All the common setup costs (of Clearing House, Number Portability Administration Center, etc.) would be borne by the operators in the ratio of their market share in the mobile market as on 1st January 2007. Further, the recommendations also identified the operator responsible for routing of each call made after the NP has been implemented [Recommendations on Mobile Number Portability, March 8 2006].

1.2 Industry’s reaction

As an immediate reaction to the announcement of the deadline, the operators said that the move would increase network costs, forcing them to divert resources from their current plans. They also declared that they would present a counter-report on TRAI’s recommendations [Number Portability set in motion, 2006].
Ever since the Consultation paper was released, the Cellular Operators Association of India (COAI) has kept on arguing that TRAI is biased in implementing Mobile Number portability (MNP) and that Fixed-line NP (FNP) should be implemented before MNP. COAI has emphasized that MNP is “premature and undesirable” because “the cost structure of the Indian telecom sector was the highest” with “lowest tariffs” [COAI’s Monthly Bulletin, 2005, p. 6]. The industry felt that BSNL and MTNL combined have 94% share in the fixed line market and if competition is the prime motive of introducing NP, then it has to be introduced for fixed lines first. The COAI wished to initiate a fresh round of consultations with TRAI on the issue and it hired an international consultant to study the subject [Number portability: Operators seek fresh consultation, 2006].

However, as a setback to TRAI’s recommendations, the central government on 10th August 2006 clarified that no decision on the NP policy has been taken yet because of technical limitations involved in its implementation [No policy on cell number inter-portability yet: Govt, 2006].

In the wake of the above developments, this project seeks to analyse some of the objections raised by COAI against MNP in India. We also try to bring forth other issues that are likely to arise during the implementation of MNP based on the experiences in other countries like Hong Kong, UK, etc.

The report starts with an introduction to the concept of Number Portability and a description of its benefits and the costs involved in its implementation. The next section briefly looks at the implementation in other countries and tries to draw lessons from the way NP was implemented there. The fourth section gives a brief outline of the recommendations given by TRAI in March 2006. Finally in the fifth section, the report looks at various issues raised by the industry, the regulator and other issues identified as relevant to the Indian context.
2. The Background

2.1 Number portability

The term number portability refers to the feature of telecommunication wherein the customers are able to use the same telephone number across different service providers, different locations or different service types.

Lack of number portability is seen as a major deterrent to the customers in changing their existing service providers even if they are not satisfied with the service rendered to them. This holds true especially for the business customers who cannot change their telephone numbers as they are a vital medium to communicate with their customers, clients or business partners. A change in the telephone number would require communicating the new number to all these contacts. It also involves modifications in their stationery or other media through which the number may be displayed (e.g. advertisements, hoardings, etc.). The total cost of these activities might not be off-set by the lower tariffs offered by the new operator or by the better quality of service provided. Thus, this hindrance in changing operators tends to reduce the level of competition in the market as the operators know that the customers will not shift that easily.

2.2 Types of Number Portability

The TRAI and the industry recognize the following three types of number portability [Consultation Paper on Mobile Number Portability, 2005]:

1. Service provider/Operator portability

This refers to the number portability in the same geographical location or telecom circle and also same service that allows the customers to switch between operators in that circle (this does not refer to the switching from fixed to mobile and vice versa). Operator portability however can be regulated to be implemented within a geographical region or throughout the country. For fixed
lines, it is usually limited to the geographical circles as the numbers are used to refer to the region specific to that number.

TRAI has further recognized the following types of Operator Portability:

a. **Fixed Line Portability (FNP):** This refers to portability of fixed line/geographic numbers.

As of July 2006, the fixed line service provider market was dominated by BSNL and MTNL, with market shares of 85.4% and 8.77% respectively. Though there is limited choice available to most of the fixed line subscribers, players like Bharti Telnet have registered significant growth in their subscriber base compared to the incumbents in the circles they are active in. The fixed subscriber base overall has however shown marginal dip in 2006 as customers are shifting to mobile telephones [Srinivasan, Ahire & Narsimhan, 2006]. As a result, the entry of new players in this segment is highly unlikely unless this market is made more competitive for new players to enter. More analysis on FNP is presented in the later sections.

<table>
<thead>
<tr>
<th></th>
<th>Wireline</th>
<th>WLL</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSNL</td>
<td>37510000</td>
<td></td>
<td>37510000</td>
<td>85.40%</td>
</tr>
<tr>
<td>MTNL</td>
<td>3851665</td>
<td></td>
<td>3851665</td>
<td>8.77%</td>
</tr>
<tr>
<td>Bharti</td>
<td>1483393</td>
<td>21447</td>
<td>1504840</td>
<td>3.38%</td>
</tr>
<tr>
<td>HFCL</td>
<td>206846</td>
<td>61798</td>
<td>268644</td>
<td>0.47%</td>
</tr>
<tr>
<td>Reliance</td>
<td>296769</td>
<td></td>
<td>296769</td>
<td>0.68%</td>
</tr>
<tr>
<td>Shyam</td>
<td>144366</td>
<td>37216</td>
<td>181582</td>
<td>0.33%</td>
</tr>
<tr>
<td>Tata</td>
<td>428762</td>
<td>3738036</td>
<td>4166798</td>
<td>0.98%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43921801</strong></td>
<td><strong>3858497</strong></td>
<td><strong>47780298</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Table 1: Market Shares in Fixed line services*

[Source: Srinivasan, Ahire, Narsimhan, 2006]
b. **Mobile Number Portability (MNP):** MNP provides mobile-to-mobile porting facility to the users. A typical MNP network is presented below:

![Figure 1: Components of Number Porting](image)

A call made from the originating network would obtain the information about the current operator to whom the dialed number is subscribing to and the call would be routed through that network, to the destination phone number in the Receiving network. The donor network is the network to which the number originally belonged to and Old Serving Network is the network that the number has most recently ported from.

Based on the technical solution adopted, a call would be routed accordingly across the four networks. As is obvious, a most efficient routing path would let the call get transferred through the minimum number of networks, which is from the originating network to the receiving network, through the Centralised Database. The “All Call Query” suggested by TRAI is based on this solution.

Other solutions available are “Query on Release” and “Onward Routing”. These will be discussed in the later sections.
The Indian mobile market stands divided as shown in the figure below:

None of the Category ‘A’ circles has a market leader with more than 35% market share, and around 80 - 90% each circle is dominated by 4 operators with 10 to 25% market share. This shows the competitive nature of the category ‘A’ circles for mobile telephony. Some of the category ‘B’ circles also display such distribution of subscribers, and the rest are dominated by three operators. Again, some of the category ‘C’ circles have three active operators (e.g. Assam, Orissa, etc.) and the rest are duopolies [Srinivasan, Ahire, Narsimhan, 2006]. TRAI seeks to make the market more competitive by introducing MNP. Though TRAI does agree that the market is already competitive, but it feels that competition can further be increased for the benefit of the customers. Since MNP is seen as the last step in breaking hindrances to competition, and mobile market shows the potential of high growth in future, TRAI has recommended implementation of MNP by next year.
c. **Intelligent Number Portability (INP):** This refers to the non-geographic portability of numbers. This is out of consideration of TRAI as India does not have non-geographic numbers and hence it has not been discussed in the consultation paper.

2. **Location Portability**

This service provides the subscribers the facility to retain their telephone numbers even while changing their geographic locations. This can be within a circle or within a numbering plan. Given the structure of the telephone market in India, location portability if at all can be implemented, can be done only in the mobile segment because of the restrictions of the National numbering plan. Moreover, this requires the operators to be present in the new location as well, which is not always possible in the Indian context except for the incumbent state owned operators.

3. **Service portability**

This is the facility given to the subscribers to retain the number while porting from one service to another, e.g. from fixed line network to mobile. Most of the countries who have implemented NP (operator portability) have gone ahead with MNP while Location and Service portability is still being discussed. TRAI recognizes service portability to be highly complicated because of issues of tariff transparency and the capacities of the fixed line networks.

2.3 **Benefits of Number Portability**

A common method of classification of the benefits of NP is based on a framework suggested by NERA & Smith [NERA, Smith, 1998] in their cost-benefit analysis of MNP implementation in Hong Kong. This framework has been widely used for similar analysis of the benefits of MNP in other countries.
The framework classifies the benefits into three types [NERA, Smith, 1998]:

1. **Type 1 benefits**: These are the benefits accruing to the subscribers who use number portability. There are further two categories of Type 1 benefits:
   
a. **Type 1A benefits**: These accrue to the subscribers who would have changed their numbers regardless of the availability of MNP. These subscribers have been incurring switching costs that include the cost of a new SIM, as well as the costs of communicating their new numbers to their contacts, with possible costs incurred on new business stationery like visiting cards, brochures etc. These customers would have ported to the new numbers only if these switching costs are less than the benefits derived from the new service provider/service in terms of call charges and/or quality & reliability of service. Also included in this type are the benefits to the customers who dual source i.e. subscribe to two operators only to avoid switching costs in the absence of MNP. The study further suggests a four stage process to determine the type 1A benefits:
   1) Forecasting churn rates by estimating the number of subscribers porting their numbers over next 10 years.
   2) Estimating the cost savings to the subscribers who would have ported their numbers even without MNP.
   3) Assuming the number of subscribers who dual source
   4) Adjusting for other economic losses (like loss of business due to porting)
   NERA/Smith conducted a survey over a sample of 1000 subscribers to collect data for the above analysis and hence measure the Type 1A benefits.

b. **Type 1B benefits**: These accrue to the subscribers who port their numbers only because MNP is available. For these subscribers, it is highly likely that the switching costs had been a deterrent for them to
change over to new subscribers for better quality. These subscribers thus have high sensitivity to price.

Measuring this type of benefits would involve estimating the number of such subscribers and then estimating benefit to each such subscriber arising out of the availability of MNP.

A diagrammatic representation of the type 1 benefits as adapted from the same study is shown in Figure 3. Suppose $S_0$ is the number of subscribers switching to a given operator when MNP is not in place such that $D_0$ is the threshold discount (i.e. the benefits offered by the new operator so that the subscriber will switch over to its network). With the introduction of MNP, the number of subscribers porting to this network would go up to $S_1$ at a lower threshold discount of $D_1$ as the subscribers getting Type 1B benefits would also start porting. The areas A and B indicate the Type 1A and Type 1B benefits respectively.

2. **Type 2 benefits:** These are the efficiency improvements arising out of the increased competition in the market and they accrue to all the subscribers in the mobile telephony market. These benefits arise from the cost efficiency and a faster rate of innovation. Measuring these benefits would require the
identification of steps taken by the industry in response to the MNP as distinct from the steps it would have taken even without MNP. In a market like the Indian telecom market, which is highly competitive without MNP, the type 2 benefits are expected to be much lower compared to type 1 and type 3 benefits. These benefits are theoretical and under the assumption that MNP would lead to positive competition instead of collusive strategies by the operators.

3. **Type 3 benefits**: These benefits accrue to the subscribers that communicate with ported numbers. These benefits are of two kinds. First is the benefit that arises out of less number of misdialed calls. Second is the benefit of reduced efforts in updating information about changed numbers.

### 2.4 Costs of Number Portability

The costs of implementing MNP can also be classified the way benefits have been classified (type 1, 2 or 3). However, TRAI has recognized the cost structure of MNP implementation to have the following three categories [Recommendations on Mobile Number Portability, 2006]:

1. **System setup costs**: These are the one-time costs incurred on setting up the necessary infrastructure for enabling MNP. This is the capital expenditure that the operators would have to invest in, the amount of which would depend on the existing status of the network at the time of implementation of MNP. TRAI has suggested that the systems costs for the Indian operators will have to be borne by the operators themselves. In its recommendation paper, TRAI estimates the total setup costs to stand around Rs. 938.7 crores (US$ 208 million). This would mean that smaller operators would have to incur a cost of Rs. 27.9 crores while the larger operators would bear Rs. 12.5 crores per license area. However, the industry has claimed that the setup costs would be far more, amounting to Rs. 1300 crores.

2. **Administrative costs**: These include the costs of National Portability Administration Center, as well as the costs associated with porting the
numbers (costs of closing the account, setting up a new account and coordination costs). TRAI estimates the cost of one NPAC to stand at Rs. 9.49 crores. Setting up 5 regional NPACs would cost Rs. 47.45 crores. This means that each operator would have to spend Rs. 36 lakhs per license area. TRAI has suggested that all common setup costs would be shared by all the operators based on their market share as on 1st January 2007. On the other hand, all operational costs would be borne by the recipient networks.

3) **Call Conveyance costs:** These are the costs incurred in routing calls from the calling network to the called network. As TRAI points out, these costs are negligible when the technology of “All Call Query” is used.

### 2.5 Estimate of Benefits of MNP in the Hong Kong market

As per the NERA/Smith study on the Hong Kong market, NPV of the Type 1A benefits ranged from HK$652 to HK$1124 million over a period of 10 years, while that of type 1B benefits ranged from HK$76 to HK$1999 million. Estimates of type 2 benefits ranged from HK$13 to HK$18 million, while type 3 benefits ranged from HK$28 to HK$ 54 million. In total, the benefits in the worst case scenario stood at HK$ 769 million and in best case at HK$ 1396 million. Compared to this the costs of implementation of MNP was estimated to be in the range of HK$ 613 to HK$878 million. Thus in a market that was already competitive, the net benefits of MNP were positive even in the worst case scenario. However, it should be noted that the analysis did not take into account the issue of tariff transparency and hence its impact on the cost to the customers. Nor did the analysis take into account the indirect costs incurred by the operators post implementation in order to maintain their market shares (discussed below).

### 2.6 Estimate of Costs and Benefits of MNP in the Indian context

While TRAI has provided an estimate of the costs for the three categories mentioned above, there are a number of indirect costs that have been ignored by TRAI. We may say that the costs estimated by TRAI are the direct costs of NP, while there are a number of indirect costs that the operators would have to incur.
to support NP in their systems. One such major indirect cost would be the change in their software systems to support billing of the customers in the new scenario. There would also be an expenditure on advertisements of the new schemes to be offered by the operators in the wake of the new systems. There are also minor indirect expenses to be incurred in training the staff and customer care professionals, etc. Thus while TRAI assumes that at an average Rs. 14 crore [Appendix A: Response from Mr. S. Mohan Kumar Chandra, Senior Research officer, TRAI] would be the cost of upgrade for a mobile operator, we feel that this figure might just be the minimum expense, rather than an estimate.

It should be noted that TRAI has not come up with an estimate of the benefits that MNP would bring to the Indian telecom market. Instead, it presents the following rationale for introducing MNP in its recommendations:

- Reducing the switching cost (Only switching cost will be the one time porting fees Rs.200/- )
- Increased choice to the customer in terms of service provider
- Greater choice for customer will mean higher competition and hence betterment services offered to the customer
- Facilitating competition in saturated markets
- Efficient use of the numbering resources
- Reduction in entry barriers for the new entrants

However, is the comparison of the costs and benefits sufficient to evaluate the feasibility of MNP? In fact, the evaluation on the basis of costs vs. benefits in this case can never be conclusive simply because the benefits are largely public and diffuse while most of the costs are private and identifiable [Buehler & Haucap, 2004]. E.g. the costs of upgrade are allocable (as per the decision of the regulator) to the operators, even when they are likely to trickle down to the customers. On the other hand, the benefits accrue not only to the customers who port their numbers but also to the entire customer base because of the positive
externalities of the technological improvement in the infrastructure and the quality of service. There is also no scope of limiting the benefits to the customers actually making use of MNP. As a result, the benefits are not only difficult to estimate, but are also ambiguous.

While Buehler & Haucap also suggest that the benefits of MNP are ambiguous, they specify that the chances of achieving the benefits are less in case

a) Mobile networks are close substitutes and
b) Fixed line telephones have a large market.

Both the above arguments are fairly intuitive. If the mobile networks are already close substitutes, the churning rate is expected to be high enough or at a saturated level even while number portability is not in place. In such a case, introducing MNP does not provide significantly higher benefits to the customers and hence the net benefits could be negative. Moreover, if the market for the fixed line telephones is high, the incumbents would have incentive to increase the call termination charges making use of customer ignorance problem (discussed later in the report). As a result, the benefits to the customers would be offset by the higher costs they would eventually pay because of lack of tariff transparency.
3. MNP in other countries

A lot of countries have implemented MNP by now. Study of the implementation of MNP in these countries can be beneficial in providing guidelines for India. In this section we study these implementations with greater focus on Hong Kong.

3.1 Market Structure in Hong Kong:

At the time of deciding on implementation of MNP in Hong Kong, telecommunications market in Hong Kong was one of the most competitive markets in the world. Hong Kong had four fixed line service providers and seven operators providing mobile telecommunications service. By November 1997, there were around 2 million mobile subscribers making the teledensity figure of 32%. From the forecasts available then, it was expected that this figure would rise to 50% by 2002 and 60% by 2007 [NERA, Smith, 1998]. Hong Kong is a major economic hub for the entire world and as such the number of business subscribers is expected to be substantial. This makes it an ideal case for MNP implementation where competition was certain to increase with MNP introduction.

With such a background, a survey revealed that around 59% personal subscribers and 64% business subscribers mentioned change of number as the most important constraint on switching the mobile service provider. This translated into a churn of 30% of the subscriber base in the first year after implementation of MNP. However this high churn rate stabilized to 16% with passage of time [ICRA’s View on Number Portability, 2006]. Following figure shows the churn rate and subscriber base of Hong Kong after implementation of MNP.
The features of Hong Kong market related to the teledensity and its growth and economic activity are also shared to quite some extent by the metros and ‘A’ circles in India. On the other hand, Hong Kong already had FNP implemented and the technology of the mobile networks was also different. While it is not appropriate to directly apply the findings from Hong Kong to Indian context, it can provide a reasonable estimate about how Indian markets may behave after MNP implementation.

### 3.2 Need for MNP in Hong Kong:

In the consultation stage with the various operators, new entrants like Personal Communications Services (PCS) operators were in favour of MNP implementation whereas the older operators were skeptical about effects of MNP and were uncertain about its implementation. They argued that the market was already quite competitive and that most of the subscribers in the market were new and hence the switching cost incurred in changing and publicizing the changed number would not be significant. Thus the need of MNP itself was doubtful. However the regulator decided that MNP implementation was imminent at that stage as it provided benefits as listed by NERA/Smith. It is thus not surprising that similar questions are being asked in India as well.
3.3 Issues for regulation in Hong Kong:

The incumbent Hong Kong Telephone Company Ltd. (HKTC) was carrying much of the traffic through its network as most of the calls originating from or terminating to mobile networks were routed through HKTC’s points of interconnection. Hence the regulating body Office of Telecommunications Authority (OFTA) was asked to provide regulatory guidelines for the interconnection charges and related issues. India too has a history of confrontations and legal disputes involving the incumbent operator in the Interconnection charges and sharing of revenues.

OFTA also needed to decide on the technological solution for implementing the MNP. For FNP, Hong Kong had gone for Call Forward method as an interim solution as most of the traffic was routed through HKTC. While selecting the best option for routing the call in a ported number, the important parameters taken into consideration were:

- Technical feasibility
- Cost involved (both direct and indirect)
- Migration of the ported customer and timescales
- Impact on the Operational Support Services (OSS), i.e. front desk and the retail distribution network of the service providers
- Fixed and mobile network convergence in long term
- Cost recovery compatibility for the different stakeholders
- Mapping solutions onto the requirement criteria

On these parameters several options like Call Forwarding, Call Drop Back, distributed database query by mobile operators, external database with fixed network look-up, etc. were assessed and then finally distributed database query by mobile operators was selected. In this process, standardization of these methods with the organizations like ITU-T, ANSI and ETSI was also stressed.

As compared to the technical solutions available then, options now with Indian regulators are more advanced and hence while the technological options may not
be applicable, the evaluation criteria presented above is definitely applicable in identifying the right technology to use. TRAI in its recommendation paper have listed Operational Support System modifications, call charging arrangements, routing arrangements in the National Numbering Plan, timeframes involved in the introduction of solutions, cost-effectiveness of different solutions, etc. for selecting the technical solution for implementation of MNP. These are similar to the criteria used in HK.

3.4 Market response after implementation of MNP in Hong Kong

Telecommunications industry responded positively to MNP implementation in Hong Kong and market became aggressively competitive. MNP implementation was accompanied by heavy subsidies on handsets, decreasing tariffs and fierce price competition. In an attempt to gain significant market share, GSM operators launched intensive marketing initiatives and promotion plans offering cut-throat bucket plans. These spurred heavy growth of market and by end of 1999, penetration of mobile services in Hong Kong crossed that of fixed line services [Ingelbrecht & Trivedi, 2004]. The overall churn increased to three times the pre-implementation figures, i.e. from 25% to 66% in 2003. However this also led to decrease in ARPU with only one operator, CSL, being profitable throughout its operations and having highest ARPU. It is also noteworthy that CSL has the least churn amongst all.

India may not show such heavy increase in churn figures and the ARPU in India is already amongst the lowest in world. Since Hong Kong went for service portability as well, subsidy on handsets was a major deciding factor. Also MNP implementation was followed by increase in the number of operators. These may not be the case in India and hence again the response from Indian market needs some more consideration, which is attempted further in the report where we comment on the TRAI’s recommendations for MNP implementation.
3.5 Brief study of MNP implementation in other countries

Besides Hong Kong, MNP has been implemented in various other countries like UK, Netherlands, US, Australia, etc. UK had very low churn out after MNP implementation where only 1% of total subscribers ported out in first 12 months [Wireless Number Portability – More than Just a Churn Game, 2003], while Netherlands had a porting rate of 5% in first 10 months. This low success of MNP implementations in UK has been attributed to long implementation timeframe (as high as 1 month initially), high porting fees ($45) and obligation for paying early termination fees as a result of contract with the operator. Netherlands also had long porting times ranging from 3 to 12 weeks and hence porting was discouraged by the retailers and operators themselves. Australia had a more carefully rolled out implementation of MNP where the impact on operators has been marginal with churn rate increasing by just 10% from 17% to 19% per year. Australian operators in general seemed to have downplayed MNP and refrained from getting into dirty price games or offering large subsidies for handsets. US had a complete and hence complex roll out of number portability. With a much matured market equipped with latest technology, US has seen further increase in healthy competition and best operators are getting the rewards. Verizon, arguably the best service provider, has best port-in ratio and AT&T the worst port-out ratio.
An analysis of MNP implementation in different countries is given below:

<table>
<thead>
<tr>
<th>Country</th>
<th>Year of Implementation</th>
<th>Time for porting</th>
<th>Porting Fees (USD)</th>
<th>Number of Operators</th>
<th>Penetration at Implementation</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong†</td>
<td>1999</td>
<td>1-2 days</td>
<td>3</td>
<td>6</td>
<td>50%</td>
<td>25% of customers ported out in first year</td>
</tr>
<tr>
<td>Netherlands*</td>
<td>1999</td>
<td>3-12 weeks</td>
<td>11</td>
<td>5</td>
<td>25%</td>
<td>&lt; 2000 customers per month availing porting facility</td>
</tr>
<tr>
<td>UK</td>
<td>1999</td>
<td>Up to 25 days</td>
<td>51</td>
<td>4</td>
<td>28%</td>
<td>1% of customers ported out in first year</td>
</tr>
<tr>
<td>Sweden</td>
<td>2001</td>
<td>5 days</td>
<td>≈0</td>
<td>3</td>
<td>77%</td>
<td>Immaterial</td>
</tr>
<tr>
<td>Australia^</td>
<td>2001</td>
<td>1-5 days</td>
<td>6</td>
<td>4</td>
<td>59%</td>
<td>10% of customers ported in first year</td>
</tr>
<tr>
<td>Portugal</td>
<td>2002</td>
<td>27 days</td>
<td>≈0</td>
<td>3</td>
<td>88%</td>
<td>&lt; 3000 customers per month ported out</td>
</tr>
<tr>
<td>Belgium</td>
<td>2002</td>
<td>2 days</td>
<td>0</td>
<td>3</td>
<td>74%</td>
<td>100,000 ports in first five months</td>
</tr>
</tbody>
</table>

† HK regulatory body OFTA reduced the porting fees continuously and porting time was also guaranteed to be less than 2 days (usually few hours)

* Donor operator was not allowed to charge anything however recipient can collect charge up to 20 Dutch Guilders for porting a number

^ Although a maximum of 5 days was allowed by regulatory body ACA, actual time required was three hours or less

Table 1: Impact of MNP Implementation in a few countries
[Source: Wireless Number Portability – More than Just a Churn Game, 2003]

Analysis of these implementations of MNP in several countries brings out some deciding factors listed here:

- Time frame for completing porting process
- Porting fees
- Charges for termination of contract with the donor network
- Incentives provided to customer for porting, like subsidies on handset
- Capabilities of operators to sustain the price wars and launch aggressive marketing campaigns
- Effective regulation on part of regulator to avoid any conflicts in interconnection, tariff discrimination, technological solutions, allocation and transfer of costs between the operators and subscriber and educating the customer in general

These factors are relevant for India and for any country implementing Number Portability and need attention of all stakeholders.
4. TRAI’s Recommendations on MNP

In its paper dated 8th March, 2006, TRAI has come up with several recommendations for implementing MNP in India. We have already discussed the rationale given by TRAI for the implementation of MNP. A few recommendations relevant for the study are presented in this section.

4.1 Why MNP before FNP?

Most of the countries that have implemented number portability first have opted for Fixed Line Number Portability (FNP). In India, private players were allowed to provide fixed line services a decade ago but even now 85% of market share is owned by the incumbent state operator BSNL. In view of this, operators have asked for implementing FNP before MNP so as to trigger more competition in fixed line services. TRAI however feels that implementing MNP before FNP is better option. Reasons given for this are as follows:

- The main growth in the telecom market comes from the mobile segment while the fixed line segment is getting stagnant.

- The incumbent player in fixed line services has legacy network and as such have technical and feasibility limitations. Huge investment will be required to upgrade the network to make it compatible for implementing FNP

- Mobile telephony in country is well developed technologically. With the current infrastructure available, it would be easier to implement MNP in a comparatively cost-efficient manner

- There is no directory service available for mobile lines subscribers as is in the fixed line service. Mobile lines subscribers depend solely on word-to-mouth publicity of their numbers and as such portability of numbers is more pertinent in wireless services.
Moreover, TRAI defends its argument that this is not the right time for FNP by following arguments:

- Existing numbering scheme of fixed line is based on circle level and as such even if FNP is implemented, it will have to be restricted to a SDCA (state or circle)
- Not all fixed lines SDCA or circles have private players operating in them. Only the incumbent state owned player is present in all circles. As such implementation of FNP may not serve the desired purpose
- Recent trends in the industry shows that growth is in wireless sector than fixed lines and hence FNP can wait as MNP is more urgent to ensure complete competition in the fast growing wireless market

### 4.2 Why phased implementation of MNP?

TRAI has proposed for a phased implementation of MNP as compared to nationwide implementation targeting first the metros and ‘A’ circles like Maharashtra, Gujarat, Tamil Nadu, Andhra Pradesh and Karnataka. The rationale behind this recommendation is as follows:

- Metros and A circles are supposed to have higher number of business subscribers who are more likely to benefit from this facility
- It is expected that there will be more awareness in these circles about such a facility being available and hence more impact of MNP
- These circles have the best of the technology and certain advanced features like CCS 7 signaling and IN capabilities; which form a necessary requirement for implementing MNP, are available only in these circles. As such implementation of MNP will be easier in these circles
- This experience of implementing MNP in select few circles would help in smoother and quicker implementation of MNP in other circles or nationwide. Any technical glitches or issues that are revealed in this implementation can be addressed before nationwide roll out of MNP
4.3 Who will bear the cost of MNP implementation?

TRAI has provided recommendations on several technical aspects of MNP implementation. These deal with methodology of call routing (All Call Query), setting up of database of ported numbers (a neutral third party to establish a centralized database will not more than 5 local copies) and formation of a Steering committee consisting of operators, industry association and Telecom Engineering Center (TEC) to resolve any issues arising in the technical implementation of MNP. Also TRAI has kept a limit of not more than 3 days for processing a porting request and setting up of a Clearing House to electronically process all such requests.

All these directives from TRAI involve some cost to be expended. TRAI has also recommended on how these costs should be divided. It says:

- The cost of upgrading the network of an operator has to be borne by the operator itself
- Common setup costs need to be shared amongst the operators on the basis of subscriber market share of operators as of January 1\textsuperscript{st}, 2007
- While processing the porting request, only recipient operator (operator to whom the subscriber is moving to) can charge the one-time porting fee of Rs. 200/-

4.4 Changes in the National Numbering Plan

TRAI has come up with some recommendation on how the numbering plan needs to be changed in wake of MNP. The current scheme of having a unique code for each operator area-wise has introduced limitation in implementing MNP through the All Call Query method using the database of ported numbers. Also the ported number is technically not back into the pool although there is no subscriber registered by that number in the donor database. In such condition,
ownership of the number needs to be clarified. TRAI has following recommendation on this issue:

- To start with, all operators are mandated to implement MNP
- The unique code will now identify operator of the subscriber to whom call needs to be routed in the network
- The donor operator cannot use the ported number till it is in use by the ported out subscriber and there is confirmation about the number being surrendered by the ported subscriber.

4.5 What about tariff transparency?
TRAI has recommended all issues related to tariff transparency will be decided by the Steering Committee after due consultation and considering all the cost aspects of different solutions.

4.6 All Call Query Method
TRAI had considered the following three methods of implementation of MNP:
1. All Call Query Method
2. Query on Release Scheme
3. Onward Routing
TRAI has suggested the “All Call Query” Method and have given Fixed line operators, National Long Distance Operators and International Long Distance Operators the option of participating in the implementation “in agreement with the mobile network operators. TRAI has further clarified that when a call made to a ported number is routed through N operators, the “Old Serving Network” (Refer Figure 1) would be responsible for routing the call.
5. Implementation of MNP in India: Issues involved

5.1 Feasibility of Fixed line Number Portability in India

TRAI has put forth arguments in favour of implementation of Mobile Number Portability (MNP) before Fixed line Number Portability (FNP). A lot of countries Number Portability in place have first implemented FNP and then followed it by MNP. As discussed earlier, TRAI argues that since private players are not present in all the circles with the state owned incumbent player BSNL being the only fixed line (wireline/landline) operator present in all the circles; and given the legacy system incumbent possess the cost of implementing FNP is huge. Since many operators claim that FNP should be implemented first because of existing monopolistic conditions in this market, let us try to look at FNP in the fixed line telephone market alone. This would not only help in deciding whether to implement MNP ahead of FNP is good idea or not, but also may provide some pointers towards need and future of FNP in general.

“Monopolistic” behaviour of incumbent

State owned BSNL and MTNL combine hold 94% of pure landline and 86.5% share of the wireline (Landline + WLL) market [Srinivasan, Ahire & Narsimhan, 2006]. This huge market share is not surprising since the state owned incumbent has been providing service since decades. This sector was privatized comparatively late in 1999 as compared to mobile telephony in 1994 when all players including the BSNL started providing the cellular service. However this also means that there is monopoly of these state owned operators and hence the features of any other monopoly is evident over here as well. Now that mobile telephony has come up as a serious threat for landline services, efforts have been made to improve the Quality of Service provided by these players. The rapidly growing cellular market has seen relaxation of several restrictions and consequently has been slashing the tariffs by huge margin and expanding the
range of services offered. BSNL and MTNL combined had to respond to this to arrest the erosion of their subscriber base and have reduced the calling rates, introducing the group dialing facility of 95 numbers within the circle, faster clearance of applications for new installation and clearing all wait-list, etc. These concentrated and conscious efforts have paid up and subscriber base which took 5 decades to reach a figure of 20 million grew to 47.8 million by end of July 2006 [Basu, 2005]. This clearly shows the impact of indirect competition from mobile service providers on the so called monopoly in the landline market. Moreover, realizing that mobile telephones are nearly perfect substitutes for landline phones, the two markets cannot be considered separately. Hence, in the telephone market as a whole, BSNL and MTNL no more enjoy a monopoly even though they have the largest market share in the over all market.

**Broadband policy and other value added services**

According to the Broadband Policy 2004 of DoT, government is aiming to grow the broadband subscribers' number to 20 million by 2010. The technological options listed to reach this figure are Optical Fibre Technologies, Digital Subscriber Lines (DSL) on copper loop, cable TV, satellite media, terrestrial wireless and future technologies as they evolve. All these options clearly point towards upgrading the existing network with substantial contribution from the private sector.

The argument here is that to achieve the objectives as stated in the Broadband Policy of DoT and to be competitive with the private players setting up state-of-the-art infrastructure for fixed line network, it is pertinent for BSNL/MTNL to upgrade the network to world standards. The enhancement of network required for the implementation of FNP can also be clubbed in this up gradation program. If this is made feasible, the argument of legacy system not being able to handle the FNP can thus be made redundant and another hurdle in implementing FNP can be tackled.
Moreover, to achieve the objectives of the broadband policy, DoT will have to seek help of the private players to get the required network in place. Given the amount of investment required, one cannot expect private players to enter market just for the value added or data services alone. If FNP is introduced at the right time, it can serve as an incentive for private players to enter this field.

**Increasing Rural Teledensity**

Rural teledensity in India stands at a meagerly figure of 2% as compared to 31% in the urban area. DoT has set a teledensity target of 22% by 2007. To reach this target only on the basis of urban subscriber base, country needs urban teledensity of 70% which is infeasible [Singh, 2006]. Hence, rural telecom penetration is inevitable. The investment required for this is as huge as $23 billions [Basu, 2005], a figure which is certainly not possible without private players’ participation.

Private participation can surely increase direct competition as well as rural teledensity, but for that the entry barriers to the Fixed line segment (in terms of the capital expenditure) has to be much lower and/or the growth of the fixed line segment has to be attractive to the private players. Since none of the two conditions mentioned above for entry of private players exist in the fixed line market currently, private players are extra cautious before investing here. TRAI may be thus right in delaying the implementation of FNP until the segment matures and sees a few more players to compete with the incumbents. But as argued above, FNP can be used as an incentive to attract the private players if used at the right time.

**Is policy misdirected?**

It is worth noting that even after 5 years of opening up of wireline sector for private players, the state owned operators still have the lion’s share in the market. Reliance Communications does have licenses for operations in all the circles across the country (it is operational in 15 of the 21 circles). TRAI may at
this point try to investigate the reasons of why private players are not entering into a few circles. One obvious reason is the financial infeasibility, but as a regulator and promoter of better telecommunications services in the country, TRAI and DoT should find out ways to attract more operators into the circles where only BSNL/MTNL is present and try to find ways in which policy framework can open wider doors for the private players to operate here. For example, Since FNP can serve as an incentive, a phased roll out of FNP could be tried out in wireline and WLL(fixed) services, wherein, the first phase is implemented in circles where the private players do have a significant market share e.g. Delhi (Bharti and Tata), Madhya Pradesh, etc.

5.2 Impact of Phasing the Rollout of MNP

_Circles with business subscribers and high churn_

TRAI plans to implement MNP first in metros and ‘A’ circles, where it assumes that number portability will have greatest effect. This assumption looks quite valid as these are the circles with maximum number of business subscribers and also experiencing high churn. Hutchinson India operating under brand name of Hutch primarily in the metros and ‘A’ circles experiences a churn of 5.2% both in pre-paid and post-paid segments [www.htil.com] showing the possibility of movement of subscribers across the operators as the MNP is implemented. Even right now with the entry of Reliance Communication in GSM, and its cheaper offerings in CDMA segment, a lot of flux is seen in the market.

_Diversion of attention from the rural sector_

As metros and ‘A’ circles provide high revenues, it is obvious that all operators will like to have a significant presence in the market and improve it further. With the advent of MNP, switching costs for subscribers are to go down substantially and hence the operator providing best services will win over maximum number of subscribers. Hence, as discussed before, the total cost of implementation of MNP for an operator is not restricted to the direct cost of technical implementation of MNP as estimated by TRAI but also includes the investment
needed to upgrade overall technical capabilities, range of services offered and customer services. Adding other indirect costs would shoot up the bill further. This certainly will require operators to divert their resources from other circles to the metros and ‘A’ circles, and subsequently neglect or compromise on plans of establishment and/or expansion/enhancement of their network in other circles or rural areas. This comes in direct conflict with DoT’s objective of increasing overall teledensity and rural teledensity in particular.

**Isn’t there enough number of operators already?**

Another argument going against roll out of MNP in metros and ‘A’ circles is that these are the circles having maximum level of competition already in place. These circles have around 6-7 operators in place. The incremental increase in competition due to introduction of MNP may be questioned in such a scenario. However when compared to the advantages of the phased roll out like better coordination, availability of better and technologically superior infrastructure, more aware and educated subscriber base makes it a perfect launching pad for implementing MNP. Treating this as a laboratory so as to uncover any technical glitches or issues, however, may be a good idea as long as the technical infrastructure in other circles gets upgraded well in time before the introduction of portability.

**5.3 Ownership of the Number**

With the advent of Number Portability arises the question of ownership of the telephone number. Number Portability essentially translates into transfer of property rights of the telephone number from the operator to the customer. TRAI has recommended a change in the numbering plan wherein currently a unique code is used to identify the each operator area-wise. With implementation of MNP, another code-system would be required as the current system is technically not compatible to identify the ported number in an area.
**Telephone number as business identity**

The ownership of special number gives an identity to the business. Commercial establishments have been known to pay more for some special number which may be easy to remember and have been spending huge amount on advertising these numbers. This becomes especially important for businesses which are carried over on telephone like dial-a-pizza, dial-a-car, etc. Hence in such situations the value of telephone number becomes endogenous to some extent [Beuhler, Dewenter & Haucap, 2005]. An example to show to what scale these property rights might achieve can be that of the Chinese province of Sichuan, where the telephone number 8888 8888 obtained a price of 2.33 million Yuan ($282,000) in an auction in August 2003. Even in US, the issue of toll-free number starting from 800 had acquired considerable attention during the implementation of NP. The customer has an incentive to invest in the number and advertise it for business purposes he is considerably sure of having best quality service from the best operator while keeping the same number. This incentive gets boosted by availability of NP for obvious reasons.

**Possibility of a market for telephone numbers**

There is also a possibility of developing a secondary market for telephone numbers for such special numbers. Subscribers currently holding such special numbers may be allowed to claim a once-off payment from the operator. Joshua Gans, Stephen King and Graeme Woodbridge in their paper titled “Number to the People: Regulation, Ownership and Local Number Portability” talk about the possibility of customer seeking to sell their number back to the incumbent carrier even though they do not want to switch carriers which may be due to the vested ownership of the telephone number in hands of the customer. One way to do this is by providing an option to the subscriber to buy the ownership rights for the number. In case the operator values the number more, it will raise the price of option. At the same time, if subscriber values the number more, he/she shall match the offer for the number. This may set in a bargain for the number and ultimately market price is expected to prevail.
Determining the exact cost of porting

Allowing the auction of the numbers by the operators can help in determining the exact cost of porting a number. It is expected that operator is in better position to gauge the actual cost of porting than regulator and hence the price offered by the operator for ownership of number in a perfectly market driven competition will be exact price incurred by the operator due to the porting of number. This is certainly going to be better estimation of cost of porting than the fee as decided by the regulator. However, with a subscriber base of more than 90 million showing healthy growth, an operator cannot be expected to bargain for each and every number that it is issuing and hence the process is not practical.

At present, the TRAI has clarified that the ownership of the number will be transferred to the original operator once the number has been surrendered. Moreover, as the mobile telephone numbers are not currently transferable, it can be assumed that a secondary market for the numbers is unlikely to operate in India. The above mentioned paper recommends that regulator should not view NP as a problem of traditional cost-benefit analysis and technological choice only but also a clear property rights assignment issue. This can be investigated by TRAI to come up with a more appropriate costing structure for the porting fees.

5.4 Technical Solutions

AS TRAI had identified, there are three ways of implementing MNP in India:

1. All Call Query Method

   This is the solution proposed by TRAI and also supported by most of the mobile operators. In fact, it has been identified as the most suitable solution in the long term by most of the countries.

   In this method, the call is routed directly to the receiving network after the Originating network identifies the receiving network from a centralized database. It does involve higher capital expenditure but provides the most efficient routing mechanism. However, the addition of Centralized Database increases the setup times for all calls (even if the called number is not a
ported one). Hence, this solution would turn out to be expensive and inefficient if the porting volumes are less.

![Diagram of network connections and process flow](image)

**Figure 5: All Call Query Method**

2. **Query on Release Method**

In this method, the call moves to the donor network and confirms if the number is ported or not. If ported, the number’s route information is obtained from the centralized database. Though this would reduce the call setup times for the numbers that have not ported, it increases the burden on the donor network. Moreover, the setup costs of this solution are as high as the costs for “All Call Query” method.
3. **Onward Routing (Call Forwarding)**

This is considered to be the simplest solution in terms of complexity and the costs involved. Whenever a call is made, the donor network identifies the terminating network through its internal database. Moreover, it becomes the donor network’s responsibility to route the call to this terminating network.

This solution is highly inefficient and can cause network congestions. Moreover, it becomes difficult to provide value added services in this method.
5.5 The issue of tariff transparency

As discussed in the earlier section detailing the recommendations of TRAI, number portability gives rise to an important and complex issue of tariff transparency.

**How to identify the terminating network of ported number?**

Because of implementation of portability, one can no longer identify the terminating network for a call from the dialed number. As a result, the caller will no longer be certain about the tariff rate applicable for the call. This has been termed as “consumer ignorance problem” in several studies on this issue, prominently by Gans and King (2000), Wright (2002) and Stefan Buehler and Justus Haucap (2004). A ported subscriber could not be charged as he/she has fulfilled all obligations by informing both the networks and also because Calling Party Pays regime is applicable in India. On the other hand, the caller is wrongly charged for this differential tariff as he/she is not aware of the number being ported. The situation becomes complex if we apply this to location portability and service portability.

**Impact on the tariff structure**

Lack of tariff transparency can lead to skewing of tariff structure of calls spanning across networks if the operators increase the rates of calls terminating outside their network. On the contrary, the tariff structures will tend to neutralize as all players will match the tariff structures of each other bringing the industry to a market-enforced uniform tariff structure. Any operator raising the charges for calls terminating outside its network and not providing any differential and superior services, may stand to lose customers and experience heavy churn. Thus it becomes necessary to regulate the termination charges as well as the liberty given to operators to charge differential rates.
The problem of Customer Ignorance in India

As per a consultation paper released by TRAI [Consultation Paper on Admissibility of Revenue Share between Visiting Network and Terminating Network for Roaming Calls, 2006], it is opening up the debate on the possibility of letting termination charges to be negotiated between the visiting network and the terminating network. It should be observed that termination network is always a monopoly since there is only one network to which the call can terminate in the recipient network. Because of its monopolistic nature, there is a possibility that the operators could charge higher termination charges. The calling customers, however, would have no idea how much they are being charged for the calls made by them. In the Indian context, this is more likely to happen for the phones made to cells on roaming, irrespective of MNP is implemented or not, as roaming is considered a premium service (value added service). But post MNP implementation, if the termination charges are not regulated, the operators with the higher market shares would have the tendency to increase their termination charges, forcing the customers to port to their network. This tendency, as Buehler & Haucap observe, increases as the operators realize that the customers are unaware of the termination charges at the time of making a call. In such a case, the customers would base their calling decisions on average prices in the market. This would severely affect the benefits that TRAI expects out of MNP, and would be against a competitive solution.

Tariff discrimination for on-network and off-network calls

The TRAI allows for differential call charges for on-network and off-network calls. However the definition of on-net calls is not yet clear. As per the 33rd Amendment to the Telecommunications Tariff Order (TTO), TRAI has asked the operators to “define in a transparent and unambiguous manner the eligibility criteria for availing such differential tariff”. It also disallowed any differential tariff assumed as a result of the vertical integration of the operator [Consultation Paper on Differential Tariffs for On-network Calls, 2006].
However, when MNP gets implemented there would be a lot of information asymmetry in terms of the eligibility of the customers for being classified into different classes. E.g. for on-network calls within the same service area, an operator having licenses for both landline and mobile services is allowed to charge differential low tariffs to calls terminating networks owned by it. Currently the calling customer would know the network that the called party has subscribed to and hence can judge the rates charged to him/her. However, with MNP in place, the calling customers would be totally at sea. Even the regulator would have difficult time in trying to judge which calls fall under the allowable differential tariffs and which don’t.

A few options available and being exercised in other countries are having acoustic signals to alert calling party for the call being terminating into different network due to porting out of called subscriber, or verbal announcement of the tariff structure for such calls or having a toll-free enquiry number/toll-free SMS facility to get information about such ported out numbers. Belgium, Ireland and Portugal have system of having acoustic signals for placing calls to other than home network whereas Finland and Germany have facility of toll-free enquiry number or toll-free SMS service. However both these solutions entail extra direct cost which adds up to the total cost of implementation of NP and may also be considered as a nuisance by a subset of subscribers [Buehler & Haucap, 2004].

While TRAI is in the process of deciding on how to implement MNP and at the same time consulting on deregulation of termination charges, the two do not go hand in hand. Termination charges will have to be kept regulated if MNP is to be implemented [Buehler & Haucap, 2004]. Also as TRAI attempts to find an answer to the question of how to define the on-network calls, it also has to keep in mind that any differential tariffs allowed in these on-network calls should minimize the asymmetry of information for the benefit of the customers.
5.6 Initiation of porting request and delay in the process

An important decision for success of NP is who initiates the process of porting, the donor network or recipient network? The answer to this question is crucial to the efficiency of the porting process.

It is rational to expect that the donor operator will have incentives to delay the porting process and recipient operator to expedite the process. A delay in process translates into lost calls for longer duration for the subscriber willing to port out of donor network and hence discourages the subscriber from availing the NP facility. Thus the donor network operator has incentive to delay the process and dissuade the subscriber from porting out.

In case the porting request is initiated with recipient network, it has to coordinate with the donor network for completion of the process and thus again runs a risk of delay from the donor side. In a market with all operators with more or less same service offerings and with not much difference in market shares, all operators may face similar levels of churn. A possibility of collusion on parts of operators to delay the NP process and thereby reduce their churn cannot be ruled out in such condition. On the other hand, if the operators fail to collude (if an operator with better service and price equation is able to eat other operators’ market shares), such delay on part of recipient network will become intolerable for the recipient operator and may trigger several accusations or legal disputes.

Timely solution of disputes is required

TRAI’s recommendation of porting request being initiated with the recipient network and having a Centralized Clearing house for processing all porting requests attends to this concern and directs the operators to a steering committee for all operational and administrative issues in this. However TRAI has been silent on disputes arising in the porting process due to collusion of operators or dominance of a strong operator and seems to have ignored the possibility of any disputes in the process.
TRAI has also recommended that all porting requests should be completed within three working days and further upgrade this with stabilization of procedures. From the experiences of countries with number portability, maximum of 48 hrs of time span for completion of NP process is acceptable. Longer is the time span; lower is the success of NP. Automation of different procedures involved in porting process is essential to bring about efficiency in the porting process. A continuous attempt to reduce these time durations by automation is also desired.

5.7 Authentication and denial rules

The current growth in the mobile subscriber base in India is hugely driven by the pre-paid customers where authentication of the subscriber is an important issue. TRAI has postulated regulations for verification of the credentials of the applicant before providing him/her the mobile connectivity. TRAI will have to come up with regulations dealing with this authentication when a subscriber changes the operator by availing Number Portability.

Is authentication required when porting?

TRAI has not provided any recommendation on whether the authentication by the donor operator can be treated valid by the recipient operator or a fresh verification is needed. With around 40% of pre-paid subscribers without proper verification [Uppal, 2006], authentication for ported subscribers will need to be looked into in more detail. Since all operators perform authentication of subscribers as per the TRAI directions, theoretically once a subscriber is provided connection after proper verification, his/her credentials need not be verified again. This also means the recipient network should trust the donor’s verification procedure. In case TRAI postulates that the recipient network has to again verify the relevant documents of subscribers, it would become as good as providing a new connection and may entail delay in the process. Australia has mandated verification of documents by the recipient network whereas US, Netherlands, Hong Kong require donor’s authentication to be upheld. Interestingly, UK has left the choice to the recipient network. In this option the
recipient network has to do a trade-off because if it goes for verification, it introduces delay in the porting process for which it has no one but itself to blame. In Indian context, with the given loopholes in the authentication, prudence of the verification of documents in such a scheme is doubtful.

**What if subscriber and donor network have dispute?**

What happens if there is a dispute between the donor network and the subscriber wishing to port out from this network? TRAI needs to come up with regulation for settlement of such disputes and timeframe for the same. In case the donor operator has the denial right for porting out a subscriber with whom it has some dispute regarding collections or payments, there is possibility that operators may use this provision to lock-in subscribers and delay the churn. Given the time-consuming and lengthy process of dispute settlement in India, this possibility may be frustrating enough for the subscriber, that he/she drops the idea of porting. However there may be a genuine case of fraudulent subscriber and in such case onus is on the donor operator to tip-off the recipient operator about such subscribers. In US this becomes easy as the credit-worthiness of citizen can be found online through a state-managed database and this becomes part of the authentication process. However in India, detecting such fraudulent subscribers is difficult unless actual fraud happens.

**Clear regulations from TRAI needed**

Considering this, it is important that TRAI comes up with regulations detailing the authentication and denial rights and rules in relation with number portability. The conditions under which a re-authentication is required and circumstances in which the donor operator can deny a porting request needs to be specified by TRAI before going ahead with implementation. It has been found that countries with less lenient authentication and denial rules have had more extensive success of number portability. This negative correlation is more evident between the amount of leniency of denial rules and success of number portability.
5.8 Technology neutrality and Service Portability

While TRAI wishes to reduce all possible barriers to competition by means of MNP, switching costs specific to GSM-CDMA portability (here referred to as service portability) deserves its due attention.

*MNP without service portability can be discriminating*

Implementation of MNP without service portability will effectively mean that the switching cost between GSM to GSM and CDMA to CDMA becomes substantially less than that between CDMA to GSM and vice-versa because of the compatibility issues of the handsets. Effectively, if a subscriber subscribes to either of the technology service, he/she is locked into that technology and has more incentive to switch service providers within the same technology than to switch between better performing GSM/CDMA operator. This is equivalent to dividing the mobile subscriber base into two divisions as per the technology. This defeats the very purpose of NP of providing more choice to subscriber. TRAI has been conspicuously silent on the issues arising out of this.

The customers would require dual-band handsets that share data and voice services between the two technologies. Such handsets are in vogue in several countries since quite some time now [China to release GSM, CDMA compatible cellular handsets, 2004]. However, these handsets pose another issue in Indian context. Indian CDMA operators have been allocated the 800 MHz band for their operation while a frequency band of 1900 MHz [CDMA companies unhappy over frequency allocation delay, 2005] is generally used worldwide. Owing to this disparity the option of importing CDMA handsets or handsets compatible for both GSM and CDMA in India is ruled out. CDMA players have been asking for this spectrum for their service, which will enable them to import such handset from US and Europe in large volumes and hence at comparatively lower cost.

Under the Unified Licensing regime, operators like Reliance are entitled to provide both GSM and CDMA services across India and may find it worthwhile to
invest or partner with major handset producers in world for production of such handsets. Moreover, as the technology for dual-band handsets is already available and developed, and with likes of Nokia ready to start production service in India [Nokia handset unit opened in Chennai, 2006], one can in due course expect to have access to reasonably priced handsets which are compatible to both GSM and CDMA operations.

5.9 Need for location portability
NP in its ideal form should have both service portability and location portability. The arguments in Indian context for the implementation of service portability have been put forth in earlier section. Over here, the need for location portability and its relevance to Indian telecom market is discussed.

*Traveling population driving subscriber base growth and also churn*

A careful study of the growth of the subscriber base of mobile telephony in India suggests it has happened in the age-group of 15 – 25 [CUTS Comments on TRAI’s Consultation Paper on Mobile Number Portability]. Every year lakhs of students move to major cities for education or employment. The metro cities are economic hubs and are also administrative headquarters. This leads to substantial movement of people to these cities. Location portability would be highly beneficial for this migrating subscriber base. It also enhances the competition across circles for the operators. This may also lead to consolidation of market as operators would try to have a pan-India presence and may try to either partner with or acquire operators in circles they are not operational right now.

TRAI through its Consultation Paper on Unified Licensing Regime has proposed for a common license for all services (and a class license for a select few bundled services) and have left the choice of area of operation with the operators. For realizing the full benefits of this license, it is advisable for operator to have a pan-India presence through setting up operations through out the country. Location portability in such case will help the operator to reduce the
churn originating due to movement of the subscribers from one circle to other. As argued while commenting on the phased roll out of MNP, the metros and ‘A’ circles are economic hubs and also administrative headquarters. Because of this a lot of movement of people occurs between these cities and the respective states. This further strengthens the argument for the location portability.

Success of location portability will also depend on the presence of operator in the all circles. This may become detrimental for small operators operational in a few circles only. A consolidation of market or partnerships amongst the operators can be expected in such situation.

With location portability, various implementation issues are also bound to surface, e.g. tariff transparency, rising entry barriers as consolidation of operators takes place, etc. There would also be complications regarding the numbering plan and investment required for technological change. However, as it is certain that location portability further supplements the competition, it becomes an ideal case of NP and helps realizing all benefits of the feature. As recommended in case of service portability, location portability is needed to realize the complete impact of number portability and hence to move towards state-of-the-art telecommunication infrastructure comparable to world standards. Location portability is thus required for “future-proofing” the telecommunication backbone of the country.
6. Areas for further study

It is clear that the phenomenon of Number Portability has far-reaching effects on the country’s telecommunication market and can alter the contours and boundaries of market. Apart from its immediate fallout of increased competition, it has many after-effects which can create ripples in the way market functions and grows. We have made an introductory study of a few issues which may emerge in India with implementation of NP. We have restricted ourselves to the economic and regulatory aspect of implementation of NP in India. We present in this section a few more concerns which may need attention of all stakeholders in immediate or distant future.

**Technical solution for implementation of NP**

All Calls Query has been the preferred technical solution for implementing NP in India. The project restricted itself from the analysis of the various methods available and hence could not explore the option of any new solution possible.

**Factual study using data from primary sources**

All the issues have been dealt with at conceptual level in this report. The conceptual analysis was done keeping in mind the relevance to the present structure of telecommunications industry of India and can be further supplemented using the figures and data from primary sources like the telecom operators and other stakeholders. Data like cost of acquisition of new subscriber, churn level, percentage of business customers and revenues accrued from them are some figures which find direct relevance to the estimation of costs and benefits of NP. Further exploration will certainly reveal more issues for consideration.

**Expected behaviour of the operators after NP implementation**

Operators’ response to the implementation of NP has been touched in brief in sections where pricing and formalities of implementation of NP was discussed. However this can be studied in more depth by applying game theory which can
provide more pertinent clues towards the expected reaction of the these operators to the various regulatory changes and market responses.

**Other issues**

Besides the issues touched upon in the study, there are several other miscellaneous but important issues which need further quantitative as well as conceptual investigation. These are the issues in interconnection and IUC disputes, impact of costs on implementation of MNP on phasing out of ADC and USO, impact of the pricing game and hence changed ARPU and profit margins of operators, impact on the Unified Licensing and Unified Access regime and changes needed in them, if any.
7. Conclusion

Based on our discussion of the various issues on the implementation of MNP in India and the road ahead, we feel that TRAI has not been entirely wrong in timing the implementation of MNP in India. Since it can be considered as an inevitable step in the process of inducing competition, it would be better to take it up now rather than at a later stage. We also feel that a phased roll out of MNP is a good step to ensure that the learning from the initial phases gets applied in the later phases. While it may not be the right time to introduce FNP in India, TRAI has to be alert on sensing the right time to pose this as an incentive for private players to enter the fixed line segment so as to serve the dual objective of increasing competition in this field and improving teledensity. At the same time, TRAI has to rethink on how its policy initiatives can improve private participation in the fixed line segment. TRAI would also have to align its policy on Termination charges as well as identification of eligible classes for differential call charges in “on-network” and “off-network” calls. Both these factors are crucial for removing the problem of customer ignorance and hence decide the overall success of MNP.

The report also identified some crucial areas where TRAI needs to deliberate in order to ensure the success of MNP. Monitoring the porting process is one such area, as long porting times have been observed to lead to the failure of MNP in countries like UK in the initial phases. Automation of processes and continuous improvement in the porting times is thus unavoidable. TRAI would also have to ensure strict authentication and denial rules at the time of porting. This has to be supported by speedy dispute resolution mechanisms in case the blame game on delaying porting heats up between various operators.

TRAI can also deliberate on the possibility of opening up of a market for the ownership of the mobile telephone number, weighing it against the efficiency of National numbering scheme, while clearly defining the property rights. Finally, deliberation on location number portability to give the completeness to the implementation of number portability would also be beneficial.
Q: What are the advantages of using “All calls query method” of implementing the MNP?
A: The Direct routing solution / All Call Query is perceived as a long-term solution for number portability whereas Call Forwarding solution was adopted initially when the estimated number of portings are less. The key advantage of Direct routing (or All Call Query) is that it does not increase network congestion between originating operator and the donor operator as the ported calls are directly routed to recipient network. Further, this method eliminates dependence on the donor network operator, thereby providing the ability to maintain portability in the event of donor network operator's failure or exit from business. Therefore, direct routing is considered as more optimized with more efficient call routing.

Other solutions have dependency on donor operator. Such dependence creates the potential for call blocking by donor operator.

Q: For a call involving N operators carrying the call, with 1 being the originating operator, it is recommended that (N-1)th operator to be responsible for routing the call. Given the history of troubles in inter-connection between operators, doesn’t TRAI see potential interconnection and revenue-sharing issues over here?
A: No. (N-1) rule is for fixing responsibility for optimized routing to correct terminating network. Interconnection is already exists among access providers, NLDOs and ILDOs. Additional revenue share issues may not arise.

Q. “Common setup costs for Number Portability Administration Center (NPAC), Clearing House would be borne by operators based on the subscriber market share of operators as on 1st Jan 2007.” Since the objective of NP is to improve competition and reduce entry barriers, the new entrants would benefit from the costs incurred by the current operators. Will the current operators find this unfair? Is TRAI thinking of any one-time entry fee from the new operators in lieu of the investments incurred now?
A. TRAI recommended this to setup the system initially. The neutral agency in consultation with operators which administers the data base / clearing house may further frame rules for later entrants.

Q. Ownership of the number:
While the customer owns the number as long as he does not surrender it, does this give him/her the right to “sell” the number back to the original operator?

A: TRAI recommendations were the first step towards Number Portability initiative. There are several issues that will arise like the one mentioned above will need to be addressed through regulations after due consultations with stakeholders.

Q. What is the amount of churn TRAI expects after the MNP is implemented?

A: In the recommendations TRAI assumed 6% churn per month (10% porting every year)

Q. Rolling out MNP first in Metros and A circles will mean that operators will have to invest in these regions to cater to the increased competition. This may divert their attention from investing into rural areas and other circles and as such may go against the DoT’s objective of increasing teledensity in rural area. Has TRAI taken this issue into account?

A: TRAI estimated an operator will incur a cost of 14 crore in a service area for MNP up gradations. Therefore, TRAI is of the view that MNP implementations no way hamper operators to invest in rural areas.
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