

# **FEASIBILITY STUDY ON MOBILE NUMBER PORTABILITY IMPLEMENTATION IN SRI LANKA**

Chamila Buddika Hatharaliyadda

(118458H)



University of Moratuwa, Sri Lanka.  
Electronic Theses & Dissertations

Thesis submitted in partial fulfillment of the requirements for the degree Master of Science  
[www.lib.mru.ac.lk](http://www.lib.mru.ac.lk)

Department of Electronic and Telecommunication Engineering

University of Moratuwa

Sri Lanka

November 2015

## DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date:



University of Moratuwa, Sri Lanka.  
Electronic Theses & Dissertations  
[www.lib.mrt.ac.lk](http://www.lib.mrt.ac.lk)

The above candidate has carried out research for the Masters under my supervision.

Signature :

Date :

## ABSTRACT

Mobile telephone number is considered as a great asset to a mobile telephone user. Generally subscribers are reluctant to change their mobile telephone number as it requires him to communicate about his movement to each and every potential person that is trying to reach him via his mobile telephone. Mobile number portability is a network function that allows mobile subscriber to switch service provider while retaining the mobile telephone number. Many countries have implemented MNP services in their telecommunication network to date.

In this research study the necessity and subscriber willingness to accept MNP services implemented in Sri Lankan telecommunication market was tested through a mobile subscriber survey. In addition statistics on reasons for subscriber churn and some demographic aspects of subscribers those are willing to accept MNP services also analyzed through the responses collected on survey.

Different MNP implementation architectures were analyzed in detailed with call flows. Advantages and disadvantages of each implementation architectures was identified and compared. The list of modification required in mobile service provider's core network under each architecture was identified and feasibility of implementing each architecture was discussed with mobile telecom service providers in Sri Lanka.

Analysis and comparison of costs involved in each different MNP implementation architecture was performed. The recommendations on implementable MNP architecture was given based on the feasibility and cost analysis using the statistics prediction made through subscriber survey.

## ACKNOWLEDGEMENTS

It is with great pleasure I take this opportunity to convey my sincere thanks to the Department of Electronic and Telecommunication Engineering, University of Moratuwa, Sri Lanka for giving me the opportunity to participate in the Master of telecommunications course.

I would like to convey my special gratitude towards Eng. A.T.L.K. Samarasinghe (Senior Lecturer, Department of Electronic and Telecommunication Engineering) for providing me with valuable supervision and support throughout my research project.

Finally, I would like to extend my gratitude towards all the lecturers, telecom service providers, my batch mates and all the others who helped me on this research project.



University of Moratuwa, Sri Lanka.  
Electronic Theses & Dissertations  
[www.lib.mrt.ac.lk](http://www.lib.mrt.ac.lk)

## Table of Contents

Declaration.....	1
Acknowledgements.....	III
Abstract.....	II
CHAPTER 1: INTRODUCTION.....	1
1.1. Overview of Sri Lankan telecommunication market.....	1
1.2. Overview of Mobile number portability .....	2
1.3. International experience with MNP .....	2
1.4. Problem statement .....	6
1.5. Research Objectives .....	7
1.6. Organization of the thesis.....	8
CHAPTER 2: Overview of Signaling System Number 7 (SS7).....	10
2.1. Subscriber identification numbers associated with MNP.....	11
2.2. ISUP.....	13
2.3. MAP .....	15
2.4. CAP.....	15
CHAPTER 3: Implementation architectures of Mobile Number Portability.....	18
3.1. Impact of MNP on Mobile originated calls.....	18
3.2. Impact of MNP on Mobile terminated calls .....	18
3.3. Terminating call Query on Digit Analysis (TQoD).....	19
3.4. Query on HLR Release (QoHR) .....	22
3.5. Originating Query on Digit analysis (OQoD).....	25
3.6. Signaling Relay Function (SRF) .....	28
CHAPTER 4: Mobile subscriber survey.....	33
4.1. Questionnaire designing .....	33
4.2. Sample size calculation .....	37
4.3. Response collection.....	37
4.4. Survey outcome.....	38
4.5. Subscriber churn.....	40
4.6. Willing to accept MNP.....	40
4.7. Subscriber willingness to pay for MNP services.....	41
4.8. How soon MNP services should be available .....	41

4.9.	Correlation analysis.....	42
4.10.	Demographic aspects.....	44
4.11.	Predictions and calculations.....	47
CHAPTER 5: Mobile telecom service providers feedback on implementation of MNP.....		50
5.1.	Overall view on the availability of MNP.....	50
5.2.	Handling other barriers than call routing.....	51
5.3.	Direct call routing vs. routing via Donor network.....	51
5.4.	Centralized number portability database vs. Distributed database.....	51
5.5.	Regulator involvement.....	52
5.6.	Network sharing.....	52
5.7.	Timelines.....	52
CHAPTER 6: TRCSL view on implementation of MNP.....		53
6.1.	MNP implementation architecture for Sri Lanka.....	54
6.2.	Processes and procedures implementation.....	54
6.3.	Handling information requests and customer queries.....	54
6.4.	Cost recovery.....	54
6.5.	Network sharing.....	55
CHAPTER 7: Costs analysis.....		56
7.1.	Introduction.....	56
7.2.	Cost elements.....	57
7.3.	Total cost.....	62
CHAPTER 8: Recommendations.....		66
8.1.	MNP implementation architecture.....	66
8.2.	Number portability database.....	66
CHAPTER 9: List of modifications and equipments required to implement MNP.....		68
9.1.	Telecom service provider networks.....	68
9.2.	List of centralized equipments.....	68
CHAPTER 10: Conclusion.....		69
References.....		71
Annex-A: Call FLOWS.....		73
Annex –b: FORECASTs of porting rate.....		86
Annex-C: Calculation of cost of post dial delay.....		89

Annex -D: Scope of WORK (MNPDB and SRF).....	93
ANNEX-E: Comparison of CALL charges .....	101
Annex –F: QUESTIONNAIRE .....	103



University of Moratuwa, Sri Lanka.  
Electronic Theses & Dissertations  
[www.lib.mrt.ac.lk](http://www.lib.mrt.ac.lk)

## List of Figures

Figure 2. 1 : Layered architecture of SS7 protocol stack .....	10
Figure 2. 2 ISUP messages being exchanged while setup and teardown of a voice call .....	14
Figure 4. 1 : Distribution of survey response .....	39
Figure 4. 2: Necessity of MNP .....	40
Figure 4.3 : Subscriber willingness to pay for MNP .....	41
Figure 4.4: Age distribution.....	44
Figure 4.5 : Comparison age VS willingness to move under MNP .....	45
Figure 4.6: Monthly income VS willingness to move under MNP .....	45
Figure 4.7 : Educational level VS willingness to move under MNP.....	46
Figure 4.8: Education level VS willingness to move under MNP.....	<b>Error! Bookmark not defined.</b>
Figure 4.9 : Type of connection.....	47
Figure 6.1 : Comparison of total cost for 5 years under different MNP implementations – Distributed database.....	<b>Error! Bookmark not defined.</b>
Figure 6.2 : Comparison of total cost for 5 years under different MNP implementations – Centralized database .....	<b>Error! Bookmark not defined.</b>
Figure 6.3 : Comparison of total cost for 5 years under OQoD – Distributed vs. Centralized NPDB .....	65
Figure A-1: Call flow – Terminating call to a non ported number (TQoD).....	73
Figure A-2 : Call flow – Terminating call to a ported number (TQoD) .....	74
Figure A-3: Call flow – Terminating call to a non ported number (QoHR).....	75
Figure A-4: Call flow – Terminating call to a non ported number (QoHR).....	76
Figure A-5: Call flow – Terminating call to a non ported number (OQoD) .....	78
Figure A-6: Call flow – Terminating call to a ported number (OQoD) .....	79
Figure A-7: Call flow – Terminating call to a non ported number (SRF).....	<b>Error! Bookmark not defined.</b>
Figure A-8: Call flow – Terminating call to a ported number (SRF-Direct routing).....	81
Figure A-9: Call flow – Terminating call to a ported number (SRF-indirect routing) .....	82
Figure A-10: Call flow – Terminating call to a ported number (SRF-indirect routing – related to subscription) .....	84
Figure D-1: Basic Message flow .....	95
Figure D-2: SRF message flow .....	97



## List of Tables

Table 4.1: Questions added to test the correlation.....	35
Table 4.2: Demographic aspects.....	36
Table 4.3: Survey response quota allocated per each operator.....	38
Table 4.4 : Assignment of numerical values for the ordinal, nominal data.....	38
Table 4.5: Are you seriously considering moving to another mobile service provider? .....	40
Table 4.6 : If you were given a chance to keep existing mobile number and move to another service provider, will you move? .....	41
Table 4.7 : How soon MNP services should be available? .....	42
Table 4.8: Correlation analysis – satisfaction level vs. Willingness to accept MNP.....	43
Table 4.9 : Number of originated calls per day by MNP accepted subscriber.....	47
Table 4.10 : Number of terminated calls per day by MNP accepted subscriber .....	48
Table 4.11 : Number of terminated calls per day by MNP accepted subscriber .....	48
Table 4.12 : Number of terminated calls per day by MNP accepted subscriber .....	48
Table 5.1 : Segregation of telecom service providers.....	50
Table 6.1 : Costs per each database deployment option .....	57
Table 6.2 : Human resources cost.....	58
Table 6.3 : Infrastructure cost per year .....	58
Table 6.4 : Annual maintenance fee ( NPDB).....	59
Table 6.5 : Annual maintenance fee (Server hardware) .....	59
Table 6.6 : Cost of SIM Cards.....	60
Table 6.7 : Cost of additional trunk utilization and GMSC resource utilization (LKR).....	61
Table 6.8 : Cost of post dial delay – with Centralized NPDB.....	61
Table 6.9 : Cost of post dial delay – with Distributed NPDBs .....	62
Table 6.10 : Total cost for 5 years from 2016-2020 (LKR).....	63
Table B-1: Total number of porting, based on 30% porting rate assumption .....	87
Table B-1 :Total number of porting, based on 40% porting rate assumption .....	87
Table B-3 : Total number of porting, based on 50% porting rate assumption .....	88
Table C-1: Extra signaling and trunk utilization under each MNP implementation architecture.....	90
Table C-2: Total cost caused by additional post dial delay per day – Distributed database (LKR) .....	91
Table C-3: Total cost caused by additional post dial delay per day – Centralized database (LKR) .....	92
Table E-1 : Comparison of usage charges – post paid .....	101
Table E-2 : Comparison of usage charges – post paid .....	102