Forecasting mobile market share transition and effect under mobile number portability using Markov chain model

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1. Introduction

The portability of mobile numbers has been one of the main regulatory issues in mobile communications policy. In particular, Ministry of Information and Communication (MIC) in South Korea announced that mobile number portability (MNP) would be stepwise introduced to mobile communications market in January 2004 to promote efficient competitions in the industry. First step in January to June, 2004 was moving SKT subscribers to the other service providers (KT, LGU+) to be possible. Second step in January to December, 2004 was moving SKT and KT to the others to be possible. Third step starting in 2005, all subscribers were freely moving across different service providers.

The availability of mobile number portability is likely to bring substantial benefits to subscribers such as lower price, greater choice, higher quality and a greater range of services. In particular, it would allow subscribers to take full advantage of the choices that will become available in a more competitive communications market [1-3]. Also, mobile service providers' market sharing is some changing and much marketing efforts is the key to building their customers in the mobile number portability situation [4].

This paper suggests a methodology of forecasting the market share transitions across different mobile service providers (SKT, KT, LGU+) under mobile number portability. Markov chain model can be suitably applied for this purpose. Also, this model can be a useful tool for the analysis of the effects of mobile number portability (MNP) on its change on the mobile market share.

2. Methodologies

Markov chain components are composed of state, stage, transitional probability, and initial probability. Mobile number portability (MNP) is conceptualized by Markov chain characteristics [5].

For example, the following is subscriber flows by Markov chain; path, state, stage, state in Stage, cost function as Table 1.

[Table 1] Example of mobile subscriber flows

Classification	Content
Path	No sub. → SKT → LGU+ → KT
State	0 → 1 → 3 → 2 (0 = No sub., 1 = SKT, 2 = KT, 3 = LGU+)
Stage	initial(0), 1, 2, 3
Cost function	- Sub. time (month): 10 → 7 → 8 - Fee (million KRW): 40 → 24 → 28

This is the concept of subscribers group's moving flows by Markov chain model as Fig 1.
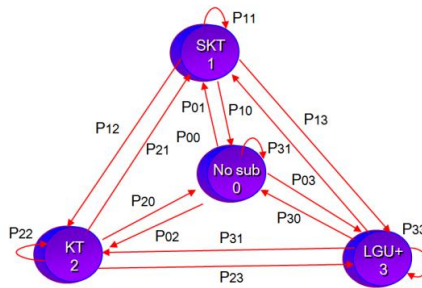
Fig 1. Subscribers Group Flows by Markov Chain

There are Markov chain model's two parameters of Mobile Number Portability (MNP). First is an initial state of the mobile service providers' market share, $I=[I_0, I_1, I_2, I_3]$, where $I_i=P\{X_0=i\}$, i=0 (no subscribed state), 1 (SKT), 2 (KT), 3 (LGU+). Second is a transition probability matrix.

$$\mathbf{P} = \begin{bmatrix} P_{00} & P_{01} & P_{02} & P_{03} \\ P_{10} & P_{11} & P_{12} & P_{13} \\ P_{20} & P_{21} & P_{22} & P_{23} \\ P_{30} & P_{31} & P_{32} & P_{33} \end{bmatrix}$$

How we can compute and forecast the market share after n-th step is as follows:

$$MS_n = I \times P^{(n)} = I \times P^{(n-r)} \times P^{(r)}$$

i.e., market share after n-transition is the initial distribution multiplied by n-th transition probability matrix.

3. Results

Markov chain model is a new and useful approach of forecasting mobile subscribers flow under mobile number portability (MNP) across different mobile service providers. This method can be applied to the various predictions, evaluations and better understandings of the effects of mobile number portability (MNP) policy and service providers' marketing activities by combining cost function, subscribing period, etc.

From reflecting mobile number portability (MNP)'s results in 2006, the market shares of three different mobile carriers (SKT a%, KT b%, LGU+ c%) in 2014-2024 can be computationally estimated to be changed some from the shares as of the end of 2006. The market shares of three different mobile carriers finally converge to SKT α%, KT β% and LGU+ γ% in the long run. Under free mobile number portability (MNP) situation, initial status is not important, but transition across different carriers is very influential in the mid and long run. So, more aggressive transition marketing is preferred to mobile carriers and many policy actions are introduced from the forecasting results.

But there may be some limitations. To achieve more prediction accuracy, we have to input the original personalized transition data when it needed. Also, an homogeneous transition ($P^n=P^{(n)}$) matrix must be extended to 2 or 3-steps non-homogeneous transitions for more prediction accuracy.

4. References

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