Forecasting of IMT-2000 subscribers of Korea

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Abstract

The mobile service providers in Korea are planning for the next generation of wireless networks to be remained profitable in the complex and competitive communications business. Those service providers realize that their existing networks should be enhanced substantially to meet the future demands of their customers. The future demands include increased IN(intelligent network) capabilities and increased utilization of ATM(asynchronous transfer mode) to support flexible bearer capabilities and multimedia services. IMT-2000(international mobile telecommunications 2000) is the solution for their future demands and for the relief of decreasing capacity of the mobile service providers. They are actively participating in the ITU to follow the directions regarding the regulations and the standards. In the year of 2002, when the World Cup soccer games will be held, the Korean mobile service providers plan to start the IMT-2000 services in testing mode. Within two to three years after initiating IMT-2000 the service, the full commercial services will be provided.

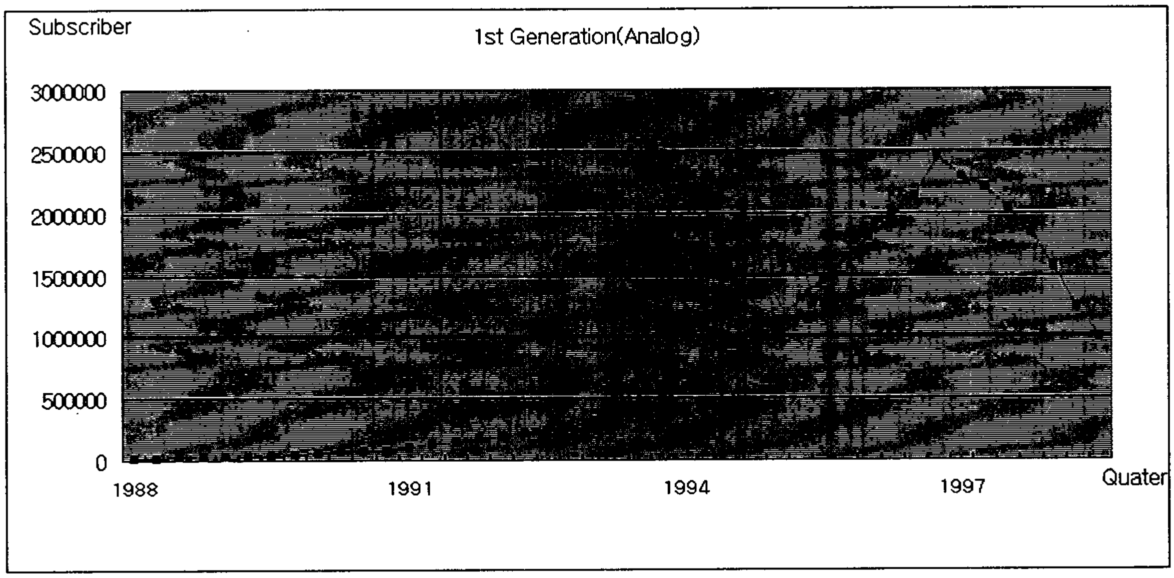
The first generation of mobile technology in Korea started with the FDMA(frequency division multiple access) in the 1980s, the second generation is TDMA(time division multiple access) and CDMA(code division multiple access) in the 1990s, currently is the 2.5 generation PCS(personal communications services). After the second generation was introduced, new subscribers for the first generation were not allowed. They consider the termination of the first generation within few years. As the mobile technology evolves to the third generation, the estimation of the IMT-2000 market size is very crucial for the mobile communication industry in Korea.

In this paper, we discuss the problems of existing forecasting models and propose a new model for the forecasting of IMT-2000 subscribers in Korea.

The original approach by Bass (1969) is a model of timing of adoption of an innovation and will be central to subsequent developments. The Bass model has a customers behavioral rationale,

which is consistent with the social science studies, and is based on the simple premise about the hazard-rate function (the conditional probability that an adoption will occur at time t given that an adoption has not yet occurred).

The Norton and Bass (1987) multi-generation model is the extension of classical Bass model to multi generation situation. In their model, the generations remain in the market and competing for the market share. After the second generation is introduced in the market, the share of first generation is keep growing by the first generations potential market and the diffusion process of the first generation to the second generation is taking place, simultaneously. The model is good for most cases if there is no exogenous impact outside the market. Since there is an exogenous impact in Korean mobile communication market, Norton and Bass model is not applicable. Figure 1 shows the growth of the first mobile generation market in Korea.



[Figure 1] Number of subscribers for the FDMA (analog)

In our modified model, the diffusion process of the first generation is terminated and the new diffusion process of the first generation to second generation starts. It can be represented as follows:

$$S_1(t) = m_1F_1(\min[t,\tau_2]) - m_1F_1(\tau_2)F_{1\to2}(t-\tau_2) \quad (1)$$

$$S_2(t) = [m_1F_1(\tau_2)F_{1\to2}(t-\tau_2) + m_2F_2(t-\tau_2)][1-F_3(t-\tau_3)] \quad (2)$$

$$S_3(t) = [m_1F_1(\tau_2)F_{1\to2}(t-\tau_2) + m_2F_2(t-\tau_2) + m_3]F_3(t-\tau_3) \quad (3)$$

where,

$S_i(t)$: number of subscribers of the ith generation until time t

$F_i(t)$: distribution function fot the number of subscribers of the ith generation until time t

$$F_i(t) = \frac{[1 - e^{-(p_i+q_i)t}]}{\left[1 + \left(\frac{q_i}{p_i}\right) e^{-(p_i+q_i)t}\right]} \quad (4)$$

$F_i(t - \tau_i) = 0 \quad (t < \tau_i)$

τ_i : time of the ith generation introduced

$F_{1\to2}(t)$: distribution function of the numbers of migration from the terminated first generation to the second generation

$$F_{1\to2}(t) = \frac{[1 - e^{-(p_{1\to2}+q_{1\to2})t}]}{\left[1 + \left(\frac{q_{1\to2}}{p_{1\to2}}\right) e^{-(p_{1\to2}+q_{1\to2})t}\right]} \quad (5)$$

$F_{1\to2}(t - \tau_{1\to2}) = 0 \quad (t < \tau_2)$

m_i : pure potential market for the ith generation

In ou $m_1F_1(\tau_2)$, $F_{1\to2}(t-\tau_2)$. $m_1F_1(t)$ $m_1F_1(\tau_2) - m_1F_1(\tau_2)F_{1\to2}(t-\tau_2)$ after the introduction of the second generation.to The number of subscribers of the first generation will be changed from becomes new potential market for r model, there is no difference until the second generation introduced compare to Norton and Bass muntigeneration model. However, after the second generation introduced, the diffusion process of the first generation is stopped and only migration to next generation is possible. The number of subscribers of the first generation when the second generation introduced,

In equation (2), the second generation subscribers can be calculated by substractly the number of migration from the second generation to the third generation when the third generation introduced from the sum of pure subscribers of second generation and the number of migration from the first generation to the second generation.

In equation (3), the number of subscribers for the third generation is the sum of pure third generation subscribers and the migration from the second generation.

Reference

[1] Bass, F. M. (1969), A New Product Growth Model for Consumer Durables, Management Science, 15, pp.215-227

[2] Norton, J. A., and Bass, F. M. (1986), A Diffusion Theory of Growth and Substitution for Successive Generations of High-Technological Products, Management Science, 33, pp. 1069-1086.