Exploring the Dynamics of Mobile Internet Service Market in Korea

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Abstract

Perhaps, the mobile Internet services would be one of the typical emerging markets drawing tremendous attention from not only business professionals but also policy-makers. In recent years many research institutes reported their predictions on the growth of the mobile Internet services, announcing that the market would show explosive growth and replace the wired Internet service market rapidly. Unfortunately, however, the reality we are facing at present is quite different from their expectations. The realized share of the mobile services in Korea last year has turned out remaining only about one percent of the total network service market. What are the reasons for the gap between the prospects and the realities?

Starting from this question, this paper attempts some reasoning about why traditional number-crunching methods are no longer appropriate for the forecast of newly emerging markets and explores their generic pitfalls. As an alternative by introducing systems thinking from the standpoints of structural perspective, this paper also presents examples of system dynamics model at meta level for the mobile Internet service market in Korea, followed by its rationale as a new tool for the forecast and the policy-making support.

Key Words : mobile Internet, system dynamics, diffusion

1. Introduction

The diffusion of new services through a market has long been a popular topic in business. Most managers want to know in advance how fast and how properly their new services will grow over certain period of time. However, ‘forecast’ is nothing but a forecast with no guarantee that things will happen as foreseen. Traditions of statistically or mathematically oriented forecasting are losing their validity, particularly for the cases of today’s emerging markets where volatility and turbulence give birth to high uncertainty.

Perhaps, one of the typical emerging markets drawing tremendous attention from not only business professionals but also policy-makers would be the mobile Internet services. In recent years many research institutes reported their predictions on the growth of the mobile Internet services market, announcing that the market would show explosive growth and replace the wired Internet service market rapidly. Unfortunately, however, the reality we are facing at present is quite different from their expectations. The realized share of the mobile services in Korea last year has turned out remaining only about one percent of the total network service revenue. What are the reasons for the gap between the prospects and the realities?

Starting from this question, this paper attempts to explore the generic pitfalls of the traditional number-crunching methods adopted thus far for the forecast of newly emerging market trends, and present an alternative by introducing systems thinking to the mobile Internet service market as an example, followed by its rationale as a new tool for forecasting and some reasoning about why traditional methods are no longer appropriate.

Most adoption models in general to forecast market trends fall into one of two categories, game theoretic models and decision theoretic models, or combinations of the two (Pardue et al, 1999). They inherently have several limitations due to their basic assumptions and prospective. First, they fail to capture dynamic interactions among the factors involved over time, with implicit assumptions of ‘unilateral causality’ in that each factor contributes as a cause to the effect, i.e., causality runs one way; each factor acts independently; the weighting factor of each is fixed, etc. Second, the number-crunching models have no way of taking into account the impact of delayed feedback often caused by introducing new policies and legislative changes on the whole system under investigation. Third, mapping only the diffusion of a single new service through the market, they fail to accommodate the multi-faucet structure of the market itself. As a result, most traditional models largely ignore the market structure, even though in many market systems, their behaviors are more determined by market structure than by changes in exogenous factors.

Believing that the limitations afore-mentioned could be overcome by introducing systems thinking from the standpoints of structural perspective, this paper illustrates how to handle these points with examples of system dynamics model at meta level for the mobile Internet service market in Korea. The reason we adopt the mobile Internet service market as an example is not only because the prospects presented by many reports in the past are quite misleading but because it is becoming the talk of all and believed by the public one of the fastest growing fields, though its history is very short in comparison with other fields.

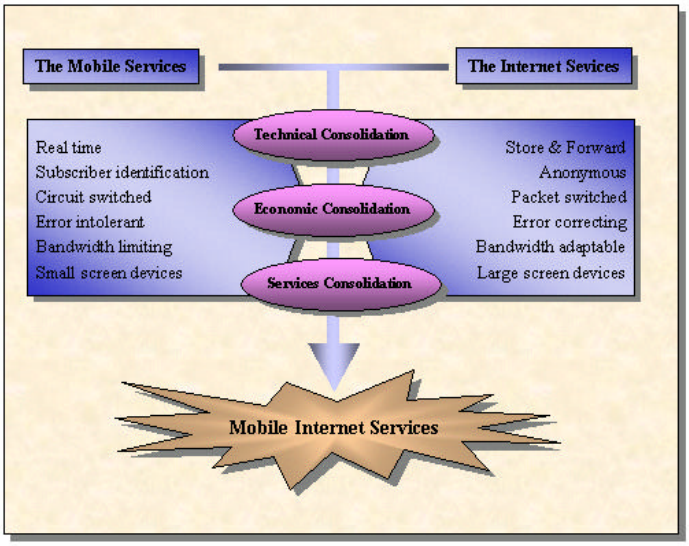

Figure 1 Concept of Mobile Internet Service (Source : Lee et al, 2000)

2. Current status in Korea

Information Communication Technologies("hereinafter referred to as " ICT ") is the fastest growing field, even though its history is very short in comparison with other industrial technologies. Furthermore, "ICT" is being widely recognized as an industry having considerable influence upon personal life as well as business activities.

Especially, it can be said that the Internet and the mobile communication are the issues becoming the talk of all mostly as two major axes in the field of information communication industries in Korea. Recently, as a result of combining the above-mentioned leading parts, mobile internet has been appeared (see Figure 1).

2.1 The Internet service

Like in other countries, the Internet service market in Korea is growing rapidly. The Internet users doubled each year during 1994-2000, reaching over ten million in 1999 and twenty million in 2002. Statistics compiled by NUA Ltd. indicate that as of November 2000 there were about 407.1 million Internet users worldwide. Twenty-one countries/territories accounted for over 25% of users, and Korea ranked 16th in number of users. Penetration rates were highest in Scandinavia and North America, but some Asian countries including Korea are also in the top group.

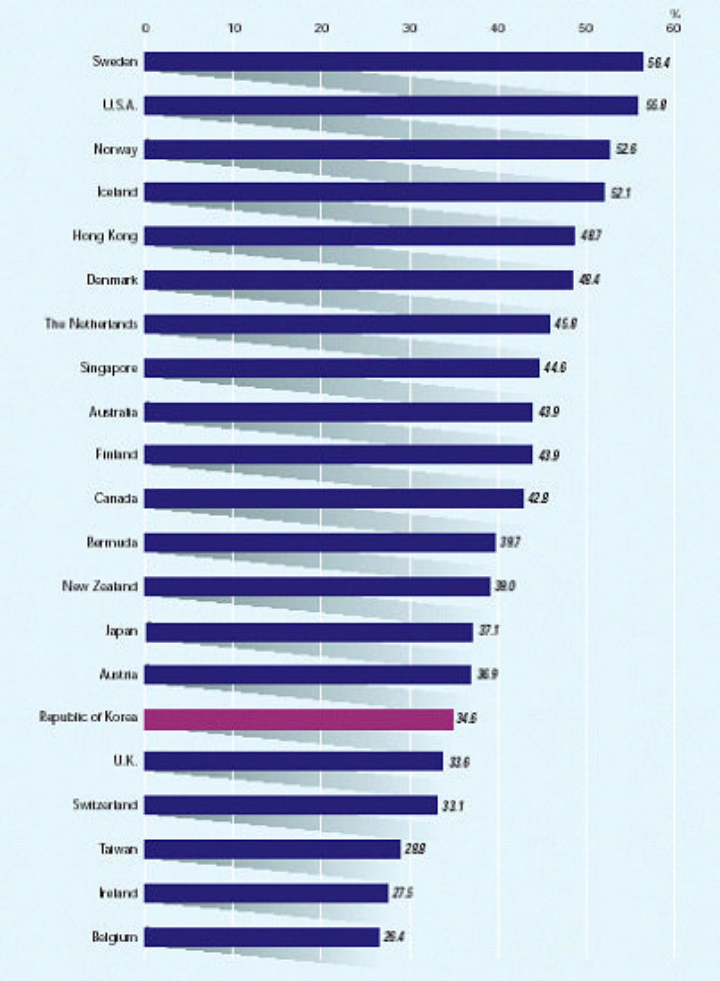

Figure 2 the Internet penetration rate in countries and territories
with rates of at least 25%
sources : Survey of info-communication usage in daily life; NUA Ltd.
(as of March 2001)

2.2 Mobile phone service

For the past three years the Korean mobile telephony market has shown a notable increase in the number of subscribers, doubling each year during 1996-1998(see Table 1). The subscription growth rate was 114% from 1996 to 1997, and 105% from 1997 to 1998(Choi et al, 2001). The explosive growth in mobile phone use as such is expected to lead the wireless market, surpassing the wired market in terms of the volume by the year of 2000(Kano, 2000). According to MIC's (Ministry of Information & Communications) market outlook, the total communications market, including both wireless and wired sectors is forecasted to reach 21.87 trillion won(US$19.88 billion) in 2000, enjoying 17.4% annual growth. The entire market volume of wireless communications, including paging services and the trunked radio system(TRS), is estimated at 11.51 trillion won(US$10.46 billion), surpassing more than that of wired communications services(Yoo et al, 2001).

Table 1
The number of mobile phone subscribers (unit: thousand subscribers)

Factors	1996	1997	1998	1999	2000	2001	2002	2003	2004
Subscribers	3,131	6,911	14,070	23,324	26,779	28,933	30,205	30,969	31,459

Source : Korea Information Society Development Institute(KISDI)

2.3 Mobile Internet service

Major stream of telecommunication has been rapidly shifting from voice towards data services, and further from fixed towards mobile services. Currently, with the mobile phone services approaching a point of market saturation, the mobile Internet sector is steadily taking on the major role of mobile communications and expected to continue to expand (KISDI, 2001).

The mobile Internet promising to provide consumers with various communication service such as information retrieval(IR), electronic commerce(EC), electronic mail(E-MAIL), and the like on the wireless terminals with web browsers is leading to a new service model which intermixes the two disciplines - "mobile" and "internet" and unite the mobility and the time compatibility of communication(It does't include wireless Internet). Now four carriers carry on business of mobile Internet service in Korea (see Table 2).

Table 2
Mobile Internet Carrier (unit : contents, thousand subscribers, %)

Carrier	SKT	STI	KTF	LGT
Brand name	NATE	i-touch017	Magic	EZ-I
Browser	WAP	UP	ME	UP
Contents	5,000	5,000	4,000	5,000
Subscribers(July. 2001)	3,986	1,194	5,949	3,132
Equity capital ratio	27.9	8.4	41.7	22.0
Service launch day	12-1999	12-1999	09-1999	05-1999

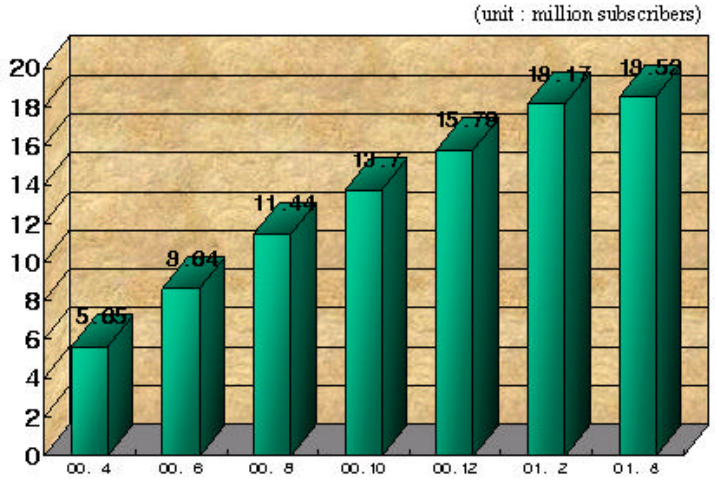

Figure 3 Mobile Internet subscribers in Korea (source : MIC)

However, it has been found from our investigation that most prior researches so far on the mobile Internet service market trends and behaviors start from the erroneous perspective that the mobile Internet is simply a combination of "mobile" and "internet", each developed from independent domain, and ignore the fact that it has a lot more complex underlying structure interacting among the various factors from the two disciplines - "mobile" and "Internet."

For the aforementioned reasons, prior predictions on the mobile Internet market growth thus far have merely relied on monotonic methods, and in result, are too optimistic and thus very erroneous in comparison with the reality. To give an example, according to the statistics of the MIC(see Figure 3), the number of mobile Internet subscribers in Korea reached at 19,520,000 as of august, 2001, whereas the KISDI

(Korea Information Society Development Institute) claims that the actual users barely hit the level of 1,900,000 during the same period. In addition, the actual profit remains at 1% of the total network business. Some rationale behind such immaterial difference between the predictions and the reality could be made as follows:

As information and communication technology (ICT) industry shows, the mobile Internet is also characterized by very low inertia, rapid technological change, and swift technological obsolescence, etc. And the rapidity and effectiveness of service diffusion is critical to the success of the market.

The only way available at present to accommodate these unique and multi-faucet features in the projection model is perhaps to use structural models by introducing systems thinking. In addition, the dominance of structure often allows structural models to produce reasonable short to mid term forecasts in the face of noise and uncertainties in the exogenous input (Lyneis, 2000). Accordingly, this paper attempts to analyze dynamic features of mobile Internet service diffusion by the system dynamics approach in order to supplement the limitations of traditional models. Throughout this analysis are explained the behavior of delayed growth, which appears in mobile Internet market, by introducing a concept of delay and moving saturation in high-order-stock structure.

3. Origins of dynamic behavior of the mobile Internet service market

Many influencing factors are involved in the mobile Internet service market, such as Internet growth and the impact of mobile phone growth, infra structure capacity(QoS), the number of contents and service providers. These factors contribute to a great variety of consequences originated from feedback, delay and moving saturation in high-order-stock structure.

3.1 Feedback structure

The first origin of dynamic behavior in high-order-stock structure of mobile Internet service market is feedback structure. The system dynamics(SD) methodology uses the concept of feedback to illustrate how complex environments behavior over time. Casual loops provide the mechanism for feedbacks within the system, where outcomes influence upon their inputs(Forrester 1961; Goodman 1989; Richardson and Pugh 1981; Senge, 1990; Sterman 2000).

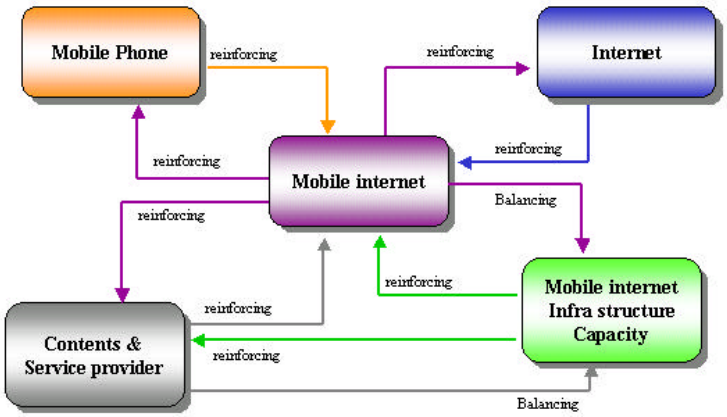

Figure 4 Casual Map diagram of mobile Internet service market

The key factors and their interactions in feedback structure are portrayed in casual map diagram (see Figure 4). To illustrate the effects of feedback in mobile Internet service market, consider a simplified model depicting the effect of mobile phone and the Internet over time (Figure 5, Figure 6). Mobile phone subscribers and the Internet users contribute to the increase in mobile Internet subscribers with a positive linkage between each other. The increase in mobile Internet subscribers in turn increases mobile phone subscribers and the Internet users over time. This reciprocal feedback structure leads to closed loops.

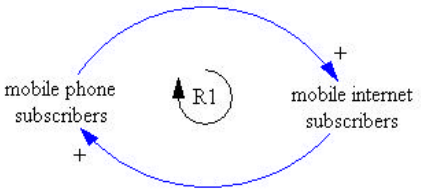

Figure 5 Feedback structure between mobile phone and mobile Internet

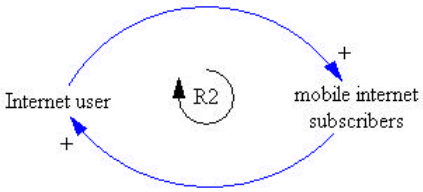

Figure 6 Feedback structure between the Internet and mobile internet

In system dynamics, this is an example of a reinforcing loop, where a positive change in one rate generates positive feedback. The figures also illustrate how the system dynamics models combine convenience of the Internet and mobility of mobile phone to represent causal feedback. The behavior represented by these single loops, however, is not a good representation of reality because mobile Internet subscribers in the real world do not continually increase over time. Perhaps one balancing factor is the capacity of infra structure making a direct impact on the quality of service(QoS).

As mobile Internet subscribers increase data traffic also increases, and as data traffic increase infra structure capacity and thus QoS decrease, which results in diminishing the

perceived usefulness of mobile Internet by subscribers (Figure 7). The dynamic behavior of this simple system varies depending upon which of these loops dominates over time. A more complete model would have to include additional structures that reflect the real behavior of the system.

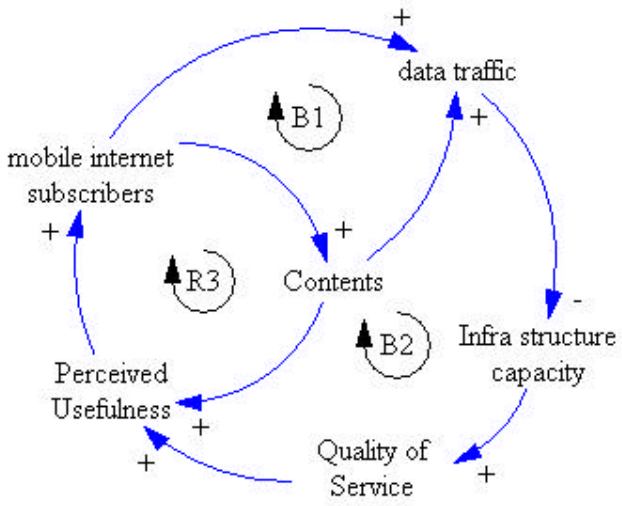

Figure 7 Balancing feedback structure in mobile Internet

3.2 Delays

The second origin of dynamic behavior in high-order-stock structure of mobile Internet service market is delays. Though delays in the system under investigation are very important, traditions of statistically and mathematically oriented forecasting ignore them because the traditional number-crunching models are very difficult to include them by their static nature. Delays however are a critical source of dynamism in nearly all of social systems in particular. Some delays breed dangers by creating instability and oscillations in the systems behavior. Others provide a clearer light by filtering out unwanted variability and enabling managers to separate signals from noise. Delays are pervasive. It takes time to measure and report information, and to make decisions. And it takes time for decisions to affect the state of a system (Sterman, 2000).

There could be many delays for mobile Internet subscribers, mobile phone subscribers and the Internet users before they become actual users of mobile Internet. For example a mobile Internet subscriber takes time to obtain mobile phone with web browsers and to learn how to handle it. Moreover, one who wants to use mobile Internet does not always buy mobile phone with web browsers and one who buys mobile phone

with web browsers does not always subscribe for mobile Internet services. It takes time from needs to decisions for buying. And it takes time from decisions to active uses.

3.3 Moving saturation point

The third origin of dynamic behavior in high-order-stock structure of mobile Internet service market is ‘moving saturation point.’ Most adoption models in the past assume fixed saturation point to explain how new products or services diffuse in the market over time. This assumption, however, is no longer appropriate for the market with complex and dynamic structure like mobile Internet service market where numerous factors from the two different domains – i.e., the mobile phone and the Internet service markets – affect one another in reciprocal manner. The saturation of mobile Internet service market, in terms of the size of subscribers, is influenced at large by mobile phone subscribers who use terminals with web browsing functions. But the number of the subscribers (2G or 3G) is not yet at its peak of congestion and keeps on as increasing as ever. One possible way to reflect this unique dynamics of the structure inherent in mobile Internet service market is to introduce a new concept of moving saturation point. In the simulation model that is illustrated in the next chapter by, the saturation point of mobile Internet subscribers is moving as mobile phone subscribers increase over time.

4. Simulation and policy leverage

Based on the analysis of the characteristics of mobile Internet market structure and the casual loop diagrams at meta level (Figure 8), a simulation model is built. Up to now numerous computer programs for the system dynamics simulation have been introduced, and this paper used STELLA which has highly sophisticated graphic generations, ease-to-use, and the facilities to compare the policy alternatives by regulating a variable among them.

In this paper the model has been simulated for ten years from 1996 to 2006 and the results is shown as in figure 9 and figure 10. Figure 9 shows behaviors that mobile phone subscribers transfer from 1G to 2G and from 2G to 3G. And figure 10 presents growth behavioral patterns of mobile Internet in terms of the number of subscribers in three different situations - fixed saturation point(graph 1), moving saturation points (graph 2), and delays added (graph 3).

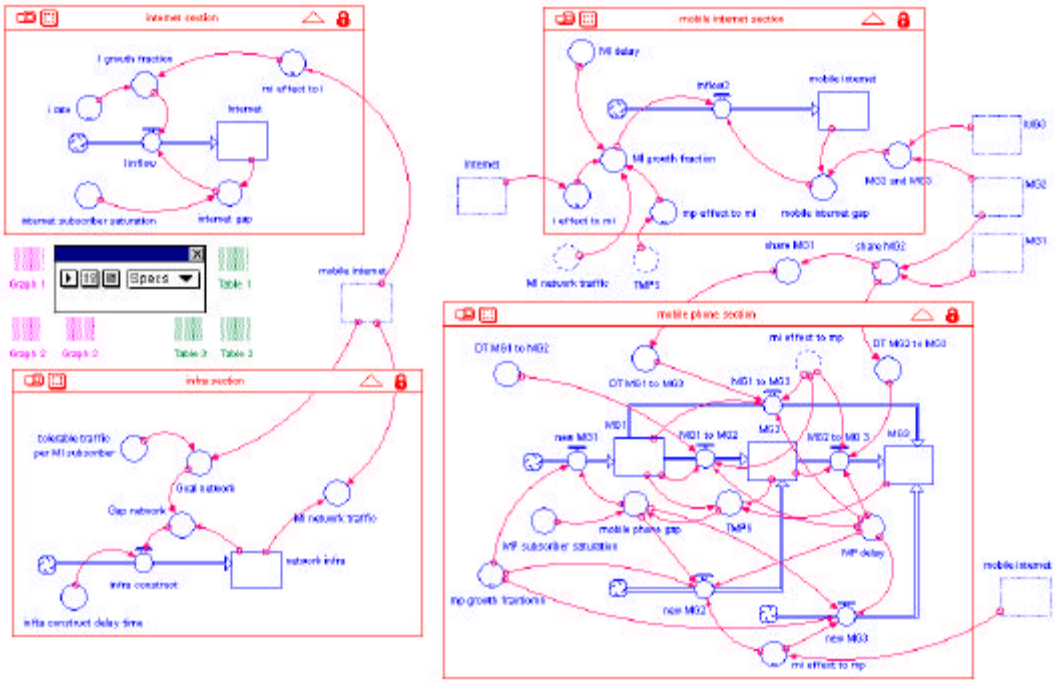

Figure 8 Stock/Flow Diagram

The results obtained from simulations make it possible to explain why the domestic market shows very slow progress in growth unlike the anticipations that mobile Internet will grow exponentially in its initial stages as the Internet did in the past (see Figure 9 and Figure 10) . The simulations also demonstrate that a forecast of the market growth by fixed saturation point is not valid and instead a forecast based on moving saturation point is more properly working particularly for the case of mobile Internet.

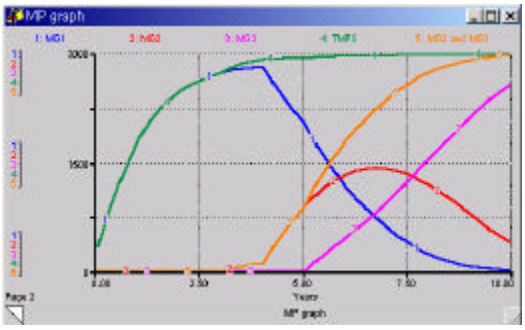

Figure 9 Mobile Phone graph

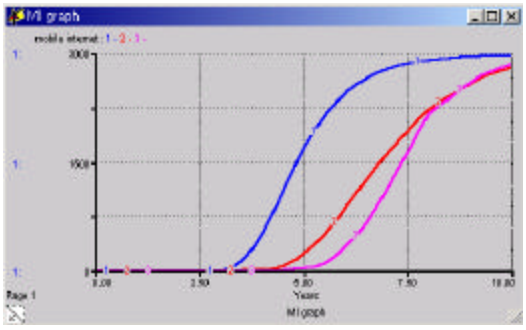

Figure 10 Mobile Internet graph

Some implications in policy-making wise from the computer simulations could be summarized as follows:

First, two conditions ought to be met in order for the mobile Internet service market to grow steadily. Above all, both the Internet and the mobile service markets should be matured enough to reach the stabilized stage as mobile Internet service market grows along with them. And reciprocal entry barriers residing between the Internet and mobile Internet, and between mobile phone and mobile Internet should be removed and alleviated, so that their network effects could be maximized and thus critical mass of community in cyber space be formed as early as possible through the smooth exchange of service and contents among them. Until now, although mobile Internet service market has grown in quantity like the number of subscribers, the qualitative growth in terms of profits, activation of utilization, etc., has appeared tardily. That's because the carriers in Korea operate their own portal sites in exclusive manner, and thus the exchange of services and contents between the Internet and mobile Internet has not been made actively as anticipated.

In building a model for forecasting the growth of a sector like mobile Internet which has a network externality, the most important components are the initial values and the fractions. If not made the smooth exchange of service and contents between the Internet and the mobile Internet, getting initial value big enough to drive market growth in several aspects cannot be possible.

Second, for speedy growth of the mobile Internet service market, popularization of handset having web browser should be progressed and some policies for stimulating the transfer of the existing 1G mobile phone subscribers to 2G or 3G which can access to mobile Internet ought to be developed and implemented as soon as possible. According to a preceding study related to the wired Internet, the demand growth rate for the Internet use at home is much higher than that for phone service was in the past, and the most of phone service subscribers are clearly prone to be the Internet users. From the fact that mobile Internet is a lot more personalized communication means than others, this trend will turn out much stronger and clearer as the handsets for mobile services are spreading to the users in one to one correspondence.

Third, in prospecting the mobile Internet service market whose growth is mostly driven by the growths of both the Internet and the mobile Internet, we need to apply ‘moving saturation point’ instead of ‘fixed saturation point.’ It should be noted that most of the preceding studies have thus far relied on the strained growth models with ignorance of the mobility of the market saturation points in predicting the mobile Internet service market, and didn’t reflect its dynamic properties.

Lastly, it should also be taken into account that delays are involved in the growth of mobile Internet service market and their lengths are affected by the degree of the related technology maturity and the policies concerned. Therefore, the efforts ought to be made from now in developing policies to minimize the delays involved in the market.

5. Conclusions and further research

By introducing the system dynamics approach, this paper tackles the problem of the gap between the reality and the forecasts mostly made by traditional number-crunching models and attempts to find an alternative to accommodate the dynamic features of mobile Internet service diffusion behavior in the model. Throughout the analysis are explained the behavior of delayed growth, which appears in mobile Internet market, by introducing a concept of feedback, delay and moving saturation point in high-order-stock structure. Hereafter, the next steps are to find more various variables and establish more refined models in details. However, the system dynamics model included in this paper is believed reasonable enough to explain approximate diffusion behaviors and find leverage points which seem important to business professionals and policy-makers as well.

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