Testing an Empirical Model for the Value Network of the Mobile Communication Industry in Korea

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Abstract. The mobile communications industry evolves into a mobile communications industry ecosystem led by new keystone players (i.e., Apple and Google) and reflects the expansion of overall industrial competitiveness in size through conversion with other businesses. In this study, the modeling was done in a systematic method to derive the answers to questions such as, which functions in the value chains of mobile communications industry contribute most to profit creation, what is the key resource, and what the new business model is. This study attempts to objectively identify derivation of factors and correlations between the configuration factors for competitiveness expansion for each industry. Specifically, we developed a dynamic model to predict the overall industry movement by theoretically establishing the modelling concept about value networking of the mobile communications industry ecosystem. Using the system dynamics methodology, coupled with professional interviews, this paper empirically tests the value network model that reflects open mobile communication ecosystem. The results show that the mobile communication industry ecosystem is evolving into an open form with the surfacing of portals and terminal production companies, suggesting the collapse of the traditional structure (Walled Garden).

Keywords: System Dynamics, Mobile echosystem, Mobile Industry

1   Introduction

For the last 40 years in Korea, in coincidence with high levels of economic development, especially after the late 1990's the IT industry had been leading the economic growth, centering on semiconductors, displays, and mobile communications industries. In 2011 the IT industry export hit 156.6 billion dollars (NIPA, 2012), accounting for 30% of all industry exports. This can be seen as the result of research and development in the information and communication industry field and government support policies in Korea that has high level of human resources. Especially, mobile communications industry is the representative IT industry that is at the top of Korean brand premium. Under these characteristics of industry, scholastically, the research about the value chain of Korean mobile communications industry have been traditionally conducted under on linear and unidirectional flow. However, due to the arrival of the age of digital convergence that include wired/ wireless convergence and broadcast/ communications convergence, the change to the

form of value network from linear value chain is being discussed (KISDI, 2010). These changes come from motives like technology evolution to new communication service, wired/ wireless convergence, service area expansion due to digital convergence, and sophistication and complexation of customer needs (Kim Mungu et al., 2001). Previous studies on overall ecosystems of mobile communication industries are generally focused on the value chain for each components that make up the industry and focuses on the analysis and key influencing factors, and analysis of trends within the industry. Recently these researches have been found to have limitations where it overlooks the holistic relevance between factors that make up the overall industrial system. Previous studies have hard time figuring out the influence of technology and product changes on industry system or other subsystems because they are related to the configuration of the whole mobile communication industry ecosystem. Therefore there is difficulty in modelling and studying mobile communication industry as a single, general system.

Based on this understanding, this study tries to more objectively identify derivation of factors and correlation between configuration factors for competitiveness expansion for each configuration factor (industry). Also the study tries to theoretically establish the modelling concept about value networking of the mobile communications industry ecosystem using system dynamics methodology, and to establish a dynamic model to predict the overall industry movement.

2 Theoretical Investigation

2.1 Value Chain

Peppard & Rylander (2006) pointed out that in a changed communication market environment the value chain analysis method focused on individual companies lack effectiveness, and suggested the perspective of a value network where various players serve unique roles and contribute to value creation. Also Peppard (2005) suggested a value network analysis for answers to such questions as where and through what cooperative system in the network the value is created, how a company′s activity affects it, and how members react to strategies. Also in this study it is difficult to analyze the dynamic relationships between them with previous linear unidirectional value chain, the study tries to do an analysis based on value network. Value creation in value network is not through a company′s individual and unique activities but through combination of core competencies of company level activity on the value of network (Applegate et al., 2003).

2.2 System Dynamics

System dynamics is used to understand how by time each system (in this study, value chain) changes, and it is a dynamic approach method that analyzes system

phenomenon and component behavior by checking the causal relationship between the basic cycles that make up the system. Therefore it is useful in analyzing how a change that occurred in a single part of the system affects the behavior of the whole system. After the 1990s system dynamics has been chosen as the main analysis tool by many consulting companies, and most of the famous consulting companies currently have composed and run system dynamics and system thinking related teams. There are many studies being done domestically using system dynamic methodology in many fields such as political science, sociology, urban engineering, and business administration. In this study to identify each configuration factors of mobile communication industry value chain the core variables will be deduced. The core variables for each value chain of the mobile communication industry will be derived through methods such as interviews with professionals and the relationships between these variables will be set to be reflected on the simulation model to verify the relationships between core variables.

3   Research Method and Data

To measure the concept used in the research model domestic and international related literature was used to create an operational definition and primary interview questions. Based on this a pilot test was conducted to modify problems and supplement inadequacies to obtain the validity of the questions and all the measurement items were written using the 5-point Likert scale used in most previous studies. The survey was done in 2013 December. The subjects for empirical analysis in this study were mobile communication industry experts and corporate pool from National IT Industry Promotion Agency (NIPA), and the questionnaires were sent by electronic mail or distributed via direct interview and then collected.

4   Results

The credibility evaluation about the 5 independent variables used in this study is accepted. The credibility coefficients for both the independent variables dependent variable showed a number over 0.6. The confirmatory factor analysis results that include all scales by concept to verify convergent validity of items removed that hinder single dimensionality through configuration concept validation is organized in the table below.The result of the AMOS analysis of the structural models are suggested in this section, as summarized in Figure 1.
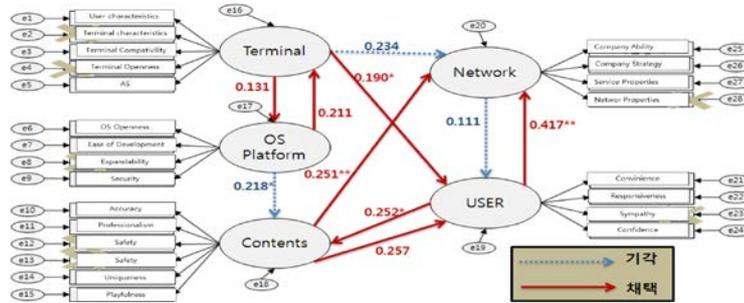
Fig.1. The result of the AMOS analysis of the structural models

4.1 Developing Dynamic Model Using System Dynamics

In this study a dynamic analysis model that has specific goals shown below was established. First, it aims to represent the interaction of reinforcement that supports continuous growth effect of industry according to mobile communication industry ecosystem evolution. Second, it is related to the competency of each company that configures mobile communication industry and it finds out the factor that limits the growth of the company. Third, it aims to reflect factors that limit growth such as market saturation to the feedback structure. Firth, it aims to aid policy decision-making to reflect the dynamic competitive situation of the company on the causal loop diagram for the evaluation of company performance. For this the mobile communication industry ecosystem that is made of a total of four core value chain areas as suggested in the research model by SutdyII was categorized in the perspective of company and customer to model. The casual loop diagram in this study was made by selecting mainly quantitative variables so that it could be simulated by past data to identify the objective system that can procure continuous competitiveness in mobile communication industry. In other words the study tried to find out the general feedback structure that derives from mobile communication industry through diverse variables that dynamically change based on past data. The flow diagram configured through the above process is as below
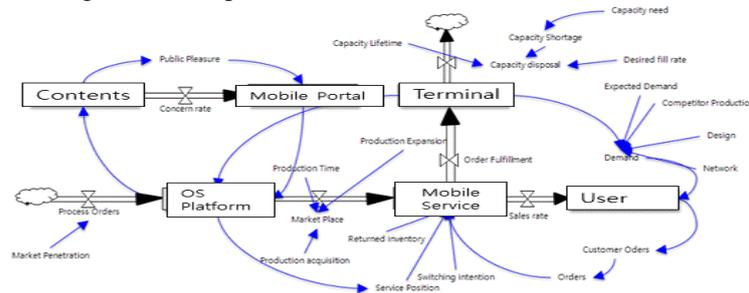

Fig.2 Stock Flow Diagram

The results of the simulation to observe the changes during hundred months based on the flow diagram configured with six level variables inserted in this study and dozens of auxiliary variables are shown in Figure 3.
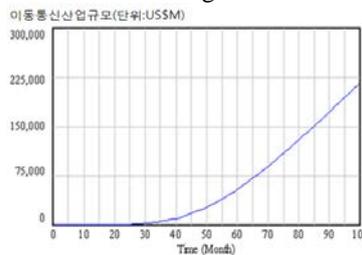

Fig.3. The basic model Simulation Result

Looking at it more specifically by configuration factors, it can be seen that mobile service agency or industry competitiveness repeatedly fluctuates and slowly shows a trend of decrease. This is analyzed that although under the traditional mobile communication value chain structure there was a vertical value chain form where the service provider (network operator) was focused (KISDI, 2010. In the case of OS platform represented by Apple′s iOS and Google′s Android, a relatively fast and continuous industrial growth was predicted. This is seen as the reflection of the phenomenon where the initiative of mobile communications service industry is being dispersed to platform or terminal manufacturing companies from being focused on service providers.
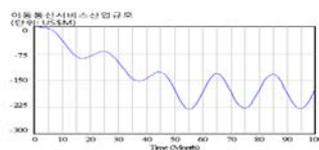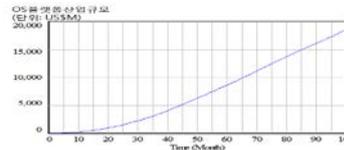

Fig. 4. Network Simulation   **Fig. 5**. OS Platform Simulation

Terminal manufacturing companies where the phenomenon of industry initiative expansion is emerging with OS platform field currently still showed industry growth potential, but it is seen that when it reaches market saturation, gradually the industry size will converge to a certain level. Lastly, in the case of mobile portals, there was detection of atmosphere within the industry of long-term growth but considering that it hasn′t reached the dominant level in wired internet yet, it is seen that there isn′t clear direction for securing future competitiveness. However the wireless Internet entry by portal services domination wired Internet market has already begun, and seeing the trend where mobile application service through portals are gradually expanding, it is expected that the influence of mobile portal industry will gradually expand.
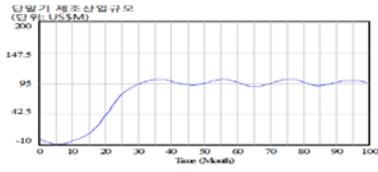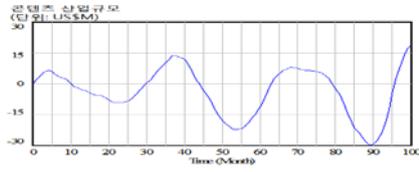

Fig. 6. Terminal Simulation   **Fig. 7**. Contents(Mobile Portal) Simulation