Market entry strategy for a digital platform provider

Junic Kim
Konkuk University, Seoul, South Korea

Received 1 May 2017
Revised 7 November 2017
Accepted 12 December 2017

Abstract

Purpose – How can a digital platform provider successfully secure users in its early stage to build an ecosystem? The purpose of this paper is to explore this issue through a case study on the deployment of the digital platform service RecordFarm and identifies the reasons behind its successful market access, overcoming the chronic chicken-egg problem in a two-sided market.

Design/methodology/approach – The study empirically analyses the core user groups' diffusion and usage rates by using a susceptible-infectious-recovery model of an epidemic based on a user survey and extensive archival data from the RecordFarm database.

Findings – The study identifies two important early stage characteristics for a business platform to be successful: the core users' activities on the platform are a critical element for the network's expansion and usage, and user relationships are more important than user contents on the digital platform.

Originality/value – This study confirms that organic interactions through active behaviours, such as visit frequency, uploading contents, and comment activities, are core elements for a successful digital platform to settle in the market early in the face of the difficulties of a two-sided market.

Keywords SIR model, Platform, Core user groups, Diffusion rate, Network distribution, Usage rate

Paper type Research paper

Introduction

Digital platforms, exceedingly important technological and strategic innovations in the new millennium, have had a significant impact on sustainable growth and have affected information and communications technology (ICT) and other industries. Companies which chose platform businesses create sustainable competitive advantage and grow in the market. For instance, according to the best global brand ranking in 2016 by Interbrand, 20 among the top 25 companies have wholly or partly adopted a platform business model. Further, among the top 15 "billion-dollar" startups (those valued at $1 billion or more by venture-capital firms), 11 are platform providers[1]. Platform-based companies can grow dramatically because building a powerful platform lets the company cultivate its own ecosystem that drives innovation, reduces risk while encouraging diversification, and creates more user bases with more products and services.

As a result, digital platform businesses, in which various stakeholders participate and innovate, have become essential industry strategies because consistent innovation is necessary in this era of limitless competition and complications (Evans and Schmalensee, 2007; Dougherty and Dunne, 2011). In its short history, the digital platform business has led to the tremendous growth of existing firms and the creation of numerous new companies, and platform providers' domination of the market is now widely accepted. As a result of network development, platform businesses hold a leadership position as gateways to the ecosystems (Leurs and Zimmer, 2017) with an important role in knowledge management and innovation. In the ICT industry, leading platform business companies are taking control over key areas, including operating systems, open-markets, social networks, and transaction systems (Kim, 2016). It is highly likely that platform-based companies have influenced people's lifestyles and changed the business thinking and delivery (Parker *et al.*, 2016).

A digital platform business can be defined as a two-sided market, which is an environment with supplier and consumer groups that engage in exchanges and transactions

This paper was supported by Konkuk University in 2017.

Baltic Journal of Management

1746-5265
DOI 10.1108/BJM-07-2017-0228

(Amit and Zott, 2001; Ceccagnoli *et al.*, 2011). The importance and usability of platform businesses increase as ICT grows and networks expand. As a result, platform business leadership is becoming more important (Gawer and Cusumano, 2002; Iansiti and Levien, 2004a; Morris and Ferguson, 1993), particularly for open platforms with stakeholders that are not constrained by contracts (Gawer and Cusumano, 2002). As such, sharing value with other participants who join a business network already on the market must take precedence in open platforms (Iansiti and Levien, 2004b), and, to this end, networks among market participants are most important. Shapiro and Varian (2013) explain these changes with the emergence of network economies. However, the most important issue in a network economy is establishing a "participants" network', which maintains a competitive edge and increases value.

Unlike past network values related to management and the competitiveness of individual contents, the role of platform business participants is key to value creation and establishing a business ecosystem. Therefore, identifying which activities are valuable for service diffusion through an empirical study of platform business participants could suggest new implications. Specifically, because of the two-sided market properties, it is difficult to build a business ecosystem spontaneously if the platform cannot surpass critical mass. That is, research on how to gather users in the early stage is important not only to academia but also for successful market access by digital platform providers. In the platform-based model, finding the right market entry strategy is a critical factor in creating a successful business (Evans and Schmalensee, 2010), and this study identifies the factors behind successful market access, overcoming the chronic chicken-egg problem in a two-sided market.

This study carries out investigations based on Reed's law, which says that the value of the network is proportional to the number of groups and the ease with which a group-forming network (GFN) is established (Reed, 2001). According to Reed's law, the value of the network is proportional to the number of generable sub-groups, and a "platform" and "network" are typical examples where the law applies (Hidding *et al.*, 2011). On the assumption that the activity of the core user group influences all users and promotes the diffusion and use of the platform network by contributing greatly to the value creation of the network, this study compares the diffusion and usage rates of entire user group and the core user group. Specifically, it explains the diffusion of the platform network with an epidemic model. Additionally, it identifies the factors that affect diffusion and usage rates through discriminant analysis and individual surveys.

The social audio platform company RecordFarm is selected as the target. After collecting the data and including the frequency and behaviour patterns of the top 1 per cent core users on the platform, this study estimates the diffusion and usage rates of the application by using the susceptible-infectious-recovery (SIR) model (Newman, 2002; Kenah and Robins, 2007), an epidemic model used to study the mechanisms by which effects spread. The study also performs discriminant analysis and an individual survey to identify the factors that affect the diffusion rate and usage rate of core users. Additionally, it compares the diffusion and usage rates of the core user group and the entire user group using discriminant analysis. Subsequently, the results are analysed and implications presented. Thus, this research tries to reveal how successful digital platform providers can overcome the difficulties of two-sided markets and establish their business in the market quickly.

Literature review

The term "digital platform" is used by industrial managers and researchers in various sectors, especially those in ICT. A platform strategy, through the interactions of two or more differently affiliated users in a two-sided market, creates value in various ways, and this value is likely to grow continually and consistently (Evans *et al.*, 2006). Platform strategy is a new and potent organisational strategy for delivering innovation and business

transactions in a number of industries. Considering recent ICT studies, the definition of a digital platform is expanding from two-sided markets to the basic structure commonly used for selling various goods or the place for trading merchandise and developing application programmes (Armstrong and Wright, 2007; Evans *et al.*, 2008; Rochet and Tirole, 2003, 2006; Rysman, 2009). Regardless of company size, platform providers build a place for transactions and provide a variety of content and services for personal computers, mobiles, tablet PCs, and other electronic devices (Gawer and Phillips, 2013).

Among the pioneers of the study of platform businesses are Cusumano and Nobeoka (1998, pp. 71-72), who assert that platforms comprise a "set" of subsystems and interfaces. From the point of view of product platforms, Robertson and Ulrich (1998, p. 6) define a platform as a "collection of assets". Bresnahan and Greenstein (1999, p. 4) argue that a platform is a "bundle of standard components that makes a connection between buyers and sellers". Platform research was increasingly carried out in the beginning of the 2000s, which emphasises its importance. West (2003, p. 1260) defines a platform as an architecture of related standards that provides a "modular substitution of complementary assets", such as hardware and software. Similarly, Iansiti and Levien (2004a, p. 149) state that a platform is a "package" through which keystones share value with their ecosystems. Eisenmann *et al.* (2006) explain that products and services that bring together groups of users in two-sided markets are platforms. Moreover, Gawer and Henderson (2007) describe a platform as "one component or subsystem" of an evolving technological system. More studies on the definition, shape, and characteristics of platforms appeared in the early 2000s. Since 2010, the focus has shifted to platform strategies such as "winner-take-all" (Eisenmann *et al.*, 2006), "direct network effects" (Cennamo and Santalo, 2013), "indirect network effect" (Zhu and Iansiti, 2012), "value creation" (Clarysse *et al.*, 2014; Pagani, 2013), and "quality management" (Kim, 2016).

However, most research on digital platforms tends to focus on existing platforms in the market from a static, and not dynamic, perspective (Gawer and Phillips, 2013). In particular, entering the market and settling down quickly is very crucial for platform businesses. However, research on platforms in the early stage is limited (Kim, 2016). Without a clear analysis of strategic elements, platform-serviced companies confront difficulties; building the business ecosystem successfully is extremely important, especially in the early stage. Therefore, this study intends to identify the critical elements for the entire platform network's expansion and the externalities in the early stage.

Considering the research objective, this study first investigates the platform through network theory to find the reasons behind its successful market access, overcoming the chronic chicken-egg problem in a two-sided market. Components and rules are generally known as the two key elements in a platform (Boudreau and Hagiu, 2009; Eisenmann *et al.*, 2008). Components consist of hardware, software, and service modules, along with their structure (Henderson and Clark, 1990). Rules are employed to manage platform business participants' activities (Baldwin and Woodard, 2009) and consist of standards, protocols, and policies. In network theory, components influence node value, and rules are the elements influencing link value. Because of increased applications, the range of activities is extending beyond nodes and links, giving rise to a growing need to focus on the new value in networks, that is, the group activity diffusion of platform business.

Generating sub-groups through the platform business affects network value (Hidding *et al.*, 2011), which can be estimated with the Sarnoff, Metcalfe, or Reed model (Reed, 1999). Each of these three major models illustrates the effect of the interaction among users on network value (Mayfield, 2005). Reed's law defines network value as proportionate to the number of sub-groups in the network, whereas Sarnoff and Metcalfe place major emphasis on node and link values. Reed (1999) defines these networks as GFNs and cites platforms such as social networks as typical examples. In GFNs, users increase value with collaboration and group formation. Therefore, they create value by forming groups and

pooling the value together (Peppard and Rylander, 2006), and this created value plays a supportive role that significantly diffuses the network (Cowan and Jonard, 2004). Specifically, major users affect group formation strongly (Kim *et al.*, 2016).

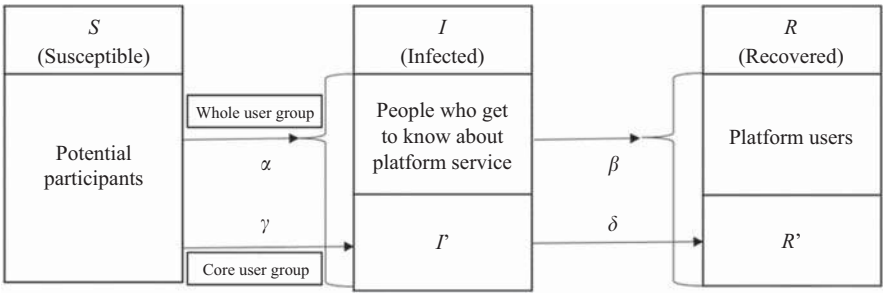
Assuming that core users are a type of catalysts for forming groups, this study empirically analyses whether promoting group activities is helpful for the diffusion and use of platform businesses, thus contributing to the formation of value in practice. High-loyalty users have a decisive effect on service quality (Flavián *et al.*, 2006), customer value (Spiteri and Dion, 2004), service participation (Zhou, 2011), and online communities (Brandtzæg and Heim, 2008). Thus, the study assumes that core users with high loyalty for the platform promote the platform service. Considering the viral effects of the platform business model (Ferguson and Brohaugh, 2008; O'Reilly, 2007; Kim, 2016), epidemic modelling is deemed suitable for this research because it explains that the spreading speed of networks is based on the existence of information on new techniques. Hazard (Felmlee *et al.*, 1990) and epidemic models (Easley and Kleinberg, 2010; Geroski, 2006; Keeling and Eames, 2005) are typically used to explain the introduction and diffusion of techniques. In particular, this study uses the SIR epidemic model (Anderson and May, 1979), which is a deterministic compartmental model and plays a major role in mathematical epidemiology. This model has been used to explain disease spreading as well as information spreading in business environments (Kitsak *et al.*, 2010) and, therefore, can be implemented as a network. Specifically, the model has three states, "susceptible", "infected", and "recovered", such that a susceptible individual comes to be infected with a certain probability when encountering an infected user, and, if infected, this individual subsequently gets well at a certain rate (Newman, 2003; Watts and Dodds, 2007). Thus, all nodes in the network are in one of three states: susceptible, infected, or recovered. At each stage, the node infected in the last time step can infect any of its neighbours. The SIR model can be mapped onto a bond percolation model on the same network (Grassberger, 2013; Kempe *et al.*, 2003; Newman, 2002; Newman, 2003). Therefore, this study estimates the diffusion and usage rates using the SIR epidemic model and investigates the interrelation between user behaviour and platform service to determine for a strategy for the business ecosystem in the ICT industry. In particular, as there is a lack of research on the initial diffusion of users to the platform, the research based on the SIR model is expected to fill the gaps in existing research.

Empirical analysis on the diffusion of core users

Analysis model

This study examines the information diffusion procedure based on diffusion simulations using the SIR diffusion model of network services (Goldenberg *et al.*, 2001; Granovetter, 1978). The SIR model can be regarded as a reference model for information diffusion considering its numerous successful applications (Newman, 2003). In the context of information diffusion, the susceptible state would display nodes that have not accepted circulating information. The infected nodes that have already received the information can transmit it to other nodes. Therefore, this study uses the SIR model to perform a two-stage analysis in order to determine the diffusion and usage rates of the core users in the platform and discover the determinants of the diffusion and usage rates. First, the pattern of the diffusion and usage rates of the core users are defined according to the SIR model of Kermack and McKendrick (1927). Second, discriminant analysis is performed to identify the factors that affect core user groups and the entire user group with the diffusion and usage rates obtained through the proposed model (Figure 1).

The above model is based on the assumption that the diffusion of core users is the result of the recommendation and promotion aspect inherent in their continued use of the platform, that is, the viral effect. Thus, in this study, the number of potential participants who do not use the platform yet, but would, is defined as S. On the assumption that there are S potential platform business participants, this study defines the number of individuals who are



(α) = The diffusion rate of the whole user group

(β) = The usage rate of the whole user group

(γ) = The diffusion rate of the core user group

(δ) = The usage rate of the core user group

(S) = Potential participants

(I) = People who get to know about platform service

(R) = Platform users

♣ (S) → (I): All (S) is infected by α rate to (I)

♣ (I) → (R): All (I) is recovered (starts to use) by β rate to (R)

♣ (S) → (I'): All (S) is infected by γ rate to (I')

♣ (I') → (R'): All (I') is recovered (starts to use) by δ rate to (R')

$N = S(t) + I(t) + R(t)$

$dS/dt = -\alpha SI$

$dI/dt = \alpha SI - \beta I$

$dR/dt = \beta I$

Figure 1.
Diffusion and usage rates of core users in the SIR model

exposed to platform services by the entire user group as "I" and "$I(t)$" at this point of time t. Therefore, $S - I(t)$ represents the potential participants, who remain unaffected. Furthermore, the number of individuals who are exposed to the platform service by the core user group is defined as I.

Additionally, α is the probability that all users have a chance to affect potential participants and γ the probability that the core users have the chance to affect potential participants, that is, the diffusion rate. Therefore, for Δt, the number of new participants (I) who are exposed to platform services for the first time can be defined as $\alpha\{S - I(t)\}\ \Delta t$.

Additionally, assuming t as continuation, one can attain $\lim_{\Delta t \to 0}(\Delta I(t))/(\Delta t) = \alpha\{S - I(t)\}$, which can also be expressed as $(dI(t))/(dt) = \alpha\{S - I(t)\}$. The number of new participants who are exposed to platform services at t can be estimated with the differential equation $I(t) = S(1-e^{-\alpha t})$. Similarly, the number of new participants (I') who are exposed to platform services by the core user group at t can be estimated with $I'(t) = S(1-e^{-\gamma t})$. This study estimates the number of specific users exposed to platform services from the number of participants who use "my page", which is a personal profile specifically created for content sharing and communication with others, the number of individuals who come into the service through their "my page", and the contents that they share on other websites.

Moreover, when the number of actual users at this point of time t is defined as $R(t)$ and the probability that users exposed to platform services can be actual service users is defined as β, then the new participants who use platform service for Δt can be defined as $\beta\{I - R(t)\}$ Δt. Assuming t as continuation, one can attain $\lim_{\Delta t \to 0}(\Delta R(t))/(\Delta t) = \beta\{I - R(t)$, which can also be expressed as $(dR(t))/(dt) = \beta\{I - R(t)\}$. This can also be expressed as a differential equation, $R(t) = I(1-e^{-\beta t})$, with which the number of platform service users at t can be estimated. Similarly, the number of platform service users (R') at t by core user group can be estimated with $R'(t) = I(1-e^{-\delta t})$. The researchers estimate the number of actual users who are exposed to and use the services concomitantly by visiting the service (Figure 2).

After obtaining the diffusion and usage rates of the platform services, this study performs discriminant analysis to grasp the elements of the determinants of diffusion and usage rates of platform businesses. In the study on the acceptance and diffusion of technology, the number and roles of existing users have a significant effect on technology acceptance (Kauffman *et al.*, 2000). Interaction among users plays a particularly important part in user retention (Mayer and Chandler, 2001). The core users not only upload and supply various contents but also lead in creating groups with other users through consistent interaction. This study, based on Reed's (2001) law, tests the assumption that the core user groups interact with not only the other core users but also other platform users, and these activities play an important role in value creation for the platform network. Therefore, the number of uploaded contents, the frequency of visits by core users, and the amount of shared contents with other services are important factors in this study. Additionally, the number of likes and comments per unit of content, albums created, users followed, and followers are all important for estimating participants' usage and interaction rates. Considering social networks or an online shopping case, these elements are critical factors when determining the diffusion and use of platform businesses (Kauffman *et al.*, 2000).

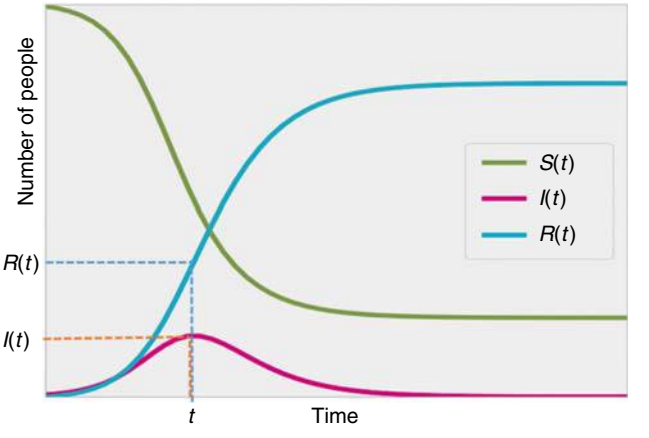


Figure 2.
$S(t)$, $I(t)$, and $R(t)$

Specifically, core platform business participants are regarded as more important and obtain higher weighted scores. Users who have attained scores in the top 1 per cent are selected as core platform business participants. Finally, these core platform business participants are compared to the average of the entire user group.

Data collection

Aggregating and collecting information from the case at different times is very crucial in terms of the case study approach, because the idea behind the studies is that the collection of past information allows for greater generalisation (George and Bennett, 2005). RecordFarm is selected for data collection for the following reasons: monthly active users reached 1 million in just one year and a half after it opened, and the platform services stabilised and reached critical mass to build the platform business ecosystem in a short period of time; it focusses on the platform business model and ecosystem form from its inception; and data obtained at the initial stage are sufficient to allow information collection at different times. This study analyses the diffusion of platform services with the equation model of core platform business participants' data (top 1 per cent) through element analysis and the average data of all users.

First, data for 20 months (from 9 November 2014, when the RecordFarm service began to 9 July 2016) were collected using a server database (see Figures A1-A2). Similar to the left hand-side of Figure 3, when the *x*-axis represents user contents, and the *y*-axis is active-passive, two elements per quadrant could be extracted in the matrix (see analysis factors of Figure 3). Accordingly, this study collected eight elements: the numbers of uploaded contents and comments in the active content-based activity, numbers of likes and shares per content in the passive content-based activity, the frequency of visits and number of those following the active and passive user-based activities, and the numbers of followers and messages left on a visitor page.

The characteristic of data collection is that users are almost inexistent in the initial stage due to the startup characteristic and their fluctuation increased rapidly since June 2015, eight months after the service opened. During the analysed 20 months (total period), the number of sessions was 47,457,326 and the number of users 5,661,698. However, with the data for the most recent six months, the average numbers are 31,213,213 and 3,101,350, respectively.

When data on core users with the top 1 per cent visitation rates are included, they register an average of 11 months since joining RecordFarm. In this period, their average monthly number of visits is 2,681.9, the number of uploaded contents is 61.6, the average number of shared contents is 1,291.3, the number of likes per content is 302.2, the number of comment activities is 2,589.7, the number of messages left on visitor pages is 21.5, the number of following activities is 61.5, and the number of followers is 491.2. In the same period, however, the average monthly visits of the entire user group are 32.6, the number of uploaded contents is 6.1, the average number of shared contents is 68.8, the number of likes

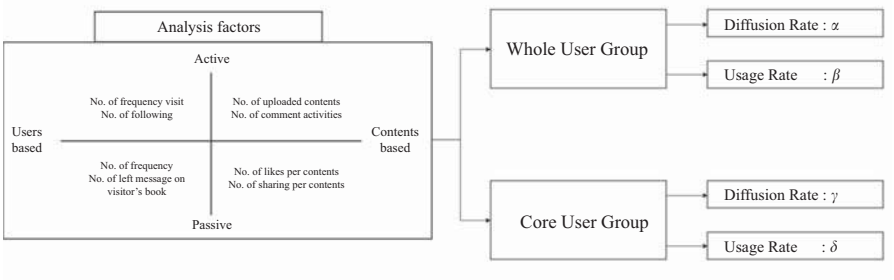


Figure 3.
Discriminant analysis framework

per content is 11.5, the number of comment activities is 38.4, the number of messages left on visitor pages is 7.1, the number of following activities is 31.4, and the number of followers is 12.8 (Table I).

Data analysis

Estimation of the diffusion and usage rates of the core and entire user groups

Estimations such as the diffusion and usage rates mentioned in subsection 3.1 are shown in Table II. The core user group's diffusion rate is 31.2901 per cent on average, with a maximum of 72.23 per cent. The entire user group's diffusion rate is 2.1038 per cent on average, with two users reaching a 100 per cent diffusion rate. To identify the reasons behind this, in-depth interviews are conducted with ten core users randomly selected from among core users who share their contents with (and promote them among) social networks or communities such as Facebook, Instagram, and blogs after uploading them. The results could explain why the diffusion rate is more than 1,500 per cent higher for the core user group compared to the entire user group (core user group: −31.901 per cent; entire user group: 2.1038 per cent). The usage rate of the core user group – on an average 6.9268 per cent – is overwhelmingly higher than that of the entire user group, at 0.4291 per cent. Interestingly, the usage rate is around one fifth of the diffusion rate for both the core and entire user groups. This confirms that the core user group has much higher usage in terms of absolute figures, although the relative amount of diffusion should achieve an increase of around 20 per cent to equal usage regardless of the group.

Discriminant analysis on diffusion and usage rates of core and whole user groups

To identify effectiveness of platform businesses from the core user group perspective, this study calculates the diffusion and usage rates to determine each dependent variable for discriminant analysis. In the discriminant analysis based on the diffusion rate, the dependent variable takes the value of 0.438 for Wilks' λ, 24.123 for F, and 0.004 for significance probability. With the usage rate, dependent variable takes the value of 0.389 for

Table I. Statistics for data on core users and the whole users

	Core users (C)		Whole users (W)	
	$E(C)$	$\sigma(C)$	$E(W)$	$\sigma(W)$
Visit frequency per month	2,681.9	1,134.8	32.6	16.1
Number of uploaded contents	61.6	19.7	6.1	3.2
Number of shares per content	1,291.3	241.9	68.8	34.1
Number of likes per content	302.2	198.1	11.5	7.6
Number of comment activities	2,589.7	1,621.3	38.4	2.7
Number of messages left on visitor's page per day	21.5	9.4	7.1	2.3
Number of following	61.5	18.9	31.4	6.4
Number of followers	491.2	347.2	12.8	8.2

Table II. Comparison of diffusion and usage rates for core and whole user groups

	Core user groups		Whole user groups	
	$E(C)$	$\sigma(C)$	$E(W)$	$\sigma(W)$
Diffusion rate (α, γ)	31.2901	13.2019	2.1038	1.7920
Usage rate (β, δ)	6.9268	5.1291	0.4291	0.3209
R^2 of equation $1(t)=S(1-e^{-\alpha t})$	0.7918	0.2912	0.7918	0.2912
R^2 of equation $R(t)=I(1-e^{-\beta t})$	0.7162	0.2829	0.7162	0.2829

Wilks' λ and 28.428 for F. This confirms that the value and significance probability from Wilks' λ could be used for discriminant analysis and the results are statistically significant.

Table III shows the results of the classification function from the discriminant analysis for diffusion and usage rates. Compared with the entire user group, the core users more loyal to platform services show an overwhelmingly higher diffusion rate. These results are characteristic of an open market, which means anyone can use and build group activity, the network organisation being changed into a form that supports Reed's law. Interestingly, the number of likes per content, shared contents, and followers do not relatively influence the diffusion rate. Moreover, this shows that the core user group is not necessarily popular or composed of famous users. In other words, although a user does not produce premium content, visit frequency and comment activities show that loyalty and maintaining interaction between users are important and have a significant effect on the diffusion and usage rates, rather than the quality of content or user popularity. In other words, it does suggest that activity is a main determinant of the diffusion and usage rates.

Regarding the usage rate, similar to the diffusion rate, continuous formation of relationships and interactions within the core user group are important factors in increasing the use of the entire platform business. This shows that, due to the activation of the network, online services are changing gradually. Previously, for network value, it was important to manage individual content and be competitive, but since the mobile revolution, extended social networks expanded their range of activity towards developing more relationships between individuals, which shows that focus on activity is growing.

Behaviour flow analysis on the re-visit rate of the core and all user groups

Here, cohort analysis is used to identify differences in the re-visit rates of the core and entire user groups. Cohort analysis, which is a method of measuring visitor retention, observes visitor group behaviour results by period. This study analyses both groups using this method for the latest three months (9 April 2016-9 July 2016), and the results show significant differences between them (see Table IV). The activities of the core user group are particularly continuous and show a 33.16 per cent retention rate over the three months.

Table III. Classification function: discriminant analysis on the diffusion rate and usage rate

	Diffusion rate		Usage rate	
	Core user group	Whole user group	Core user group	Whole user group
Visit frequency per month	3.1029	1.2101	3.2019	1.1221
Number of uploaded contents	1.0230	0.7823	0.9920	0.7121
Number of shares per content	0.2038	0.0919	0.2203	0.0191
Number of likes per content	0.1201	0.0982	0.0927	0.0602
Number of comment activities	2.2031	1.0091	2.8793	0.8291
Number of messages left on visitor's page per day	0.7292	0.3910	0.6892	0.2120
Number of following	2.9028	1.2039	2.1029	0.9812
Number of followers	0.0928	0.0892	0.1092	0.0810

Table IV. Cohort analysis of the core user group/the whole user group

	Month 0 (%)	Month 1 (%)	Month 2 (%)	Month 3 (%)
Core users: 27,961 users	100.00	38.73	29.04	33.16
All users: 2,796,054 users	100.00	18.89	5.57	1.09

On the other hand, the re-visit rate of the entire user group is high in the first month, but very low afterwards.

Figure 4 shows the outcome of the behaviour flow analysis of some core users using Google Analytics. The core users focus not only on one content on their platform service usage, but also on other contents with consistent interaction. This confirms that the next interaction shows as much as 59 per cent loss ratio compared with the previous one, an average of 10 interactions is maintained, and a significant decrease is seen after that. In other words, in the case of the core user group, they are often seen interacting (active activity), which is related to the results of subsection 4.2. Additionally, active interaction plays an important role in the network diffusion, and is also an important element in the vitalisation of the platform for organic interaction.

Findings

The research has shown the diffusion of the platform network with an epidemic model, SIR Model (Newman, 2002; Kenah and Robins, 2007) to find how digital platform providers successfully secure users in the early stage to build the ecosystem. Therefore, it explored the diffusion and usage rates of the core and entire user groups and identified the valuable activities for service diffusion. In particular, this study analyses cumulative data for 20 months, from 9 November 2014 to 9 July 2016, to improve accuracy and precision (see Figures A1-A2). Thus, this study can confirm the two important findings; first, the activities of the core user group serve as a critical determinant to diffuse and activate the entire platform network service in the early stage; second, user interaction through building

Figure 4.
Core user group's behaviour flow

relationships among individuals and creating groups is more important to the initial platform business activation than content quality. Therefore, focussing on core user groups and user interaction are more efficient and effective in diffusing the initial platform business, particularly startup companies.

Importance of core user groups activities for diffusing platform businesses

Core user groups' diffusion and usage rates are significantly higher than those of whole user groups, and they have significant effects on activating the service. This form is similar to the Pareto principle (Pareto, 1935) in manufacturing, which states that 80 per cent of the effects come from 20 per cent of the core causes. Digital platform providers are required to secure users to build the ecosystem, and to do this, network activation is important to reach critical mass using core user groups, and core user groups' interaction helps and supports network activation strongly (Del Giudice and Della Peruta, 2016). These core user groups not only expose the platform service continuously to other users on either the same platform or other online services, but also attract new users to register on the platform service (Brandtzæg and Heim, 2008; Flavián *et al.*, 2006; Landaeta Olivo *et al.*, 2016; Zhou, 2011). That is, they are active on the platform service internally, and they are also catalysts for promoting and encouraging platform businesses externally. In particular, the activities of core user groups have remained relatively similar over time, and their actions are sustained rather than having decreased dramatically. Core user groups create consistent interactions with other contents organically, as well as focus on single contents on the platform service. Compared to the entire user group, the core user group shows significant differences and conative interactions with other users. Therefore, for a new business that has insufficient resources, such as startup companies, it is important to stick to core user groups to enhance the diffusion of platform businesses and build the ecosystem.

Importance of active interaction

The research suggests that for the platform business, active interaction between users is more important than contents or users' quality because user interaction creates competitive contents naturally. Therefore, user interaction is required to be deployed first followed by quality management or user quality. This study confirmed that due to the two-sided market properties (Rochet and Tirole, 2006), the centre of value changes from content quality and management towards developing relationship with numerous individuals and building groups (Soto-Acosta *et al.*, 2017; Palacios-Marqués *et al.*, 2015).

The research findings also determined that core user groups' formation of relationships and interactions are important factors in maximising both diffusion and usage rates. This shows that the way online services are conducted is increasingly changing due to network activation. In particular, the mobile revolution has widened the scope of our network society. Because the scope of activity expanded in this widened network society, interactions such as building relationships with many users and creating groups have become more important. Active interactions, a crucial factor in diffusing platform businesses, are an important axis to activate network services.

Conclusions, contributions and further research

Considering the nature of the platform business, it is very important that the business ecosystem established achieve critical mass early. Therefore, how to secure users in the early stage is a crucial question. This study performed an empirical analysis to identify the success factors of digital platform, examine how they secure users, and confirm that the activities of the core platform business participants group are important in spreading

platform businesses. On the assumption that the activity of the core user group in platform network services affects users and the spread of the platform service, this study used the SIR model and compared the diffusion and usage rates of the entire and core user groups. From RecordFarm, a rapidly growing social audio platform, data of the core user group were collected, and the diffusion and usage rates estimated using discriminant analysis to identify their determinants.

In platform activation, the diffusion and use of the core user group is important for other users to continue participating and also attract new users to the service. Therefore, analysing and activating critical elements that affect diffusion and use – such as the frequency of visits, the number of following activities, and the number of uploaded contents – could be important to activate platforms where endemic problems occur (i.e. the chicken-egg problem from the two-sided market). Although this study sets only six elements (visit frequency, uploaded contents, shares per content, likes per content, comment activities, and messages left on visit), the elements affecting the active interaction between users are the most important and have the biggest impact on the diffusion and usage rates regardless of content-based and user-based circumstances.

From the results of this study, with the strategy of expanding platform services, core user groups' diffusion and usage rates have significant effects on activating the service. The diffusion and usage rates of the core user group are 1,487.31 and 736.71 per cent, respectively. By Reed's law, the activity of the core user group can be a catalyst for developing some type of group within the network. In other words, according to the law of network value, the activity of core platform business participants is an important factor for the diffusion and activation of the entire platform business. To reach critical mass in order to bring more users and succeed quickly in the first stage, venture businesses would find the Pareto principle more useful than the long-tail theory, contrary to the common belief, even for Web 2.0. Therefore, this would be an important consideration for the venture business, which is required to perform decision making for initial choices and focus on limited resources. Furthermore, the centre of network value is changing from personal content management and competitiveness towards developing relationships with numerous users and creating group activities. This study confirmed that the core elements are organic interactions through active behaviours, such as visit frequency, uploading contents, and comment activities.

This study has provided insight on how a successful digital platform can settle in the market early in the face of the difficulties of a two-sided market. Establishing a service where core users could attract voluntary participation from potential users and have continuing relationships with other users by actively uploading contents increases diffusion and usage rates. Therefore, a strategy to increase participant diffusion and usage rates exceeds the critical mass of the platform and plays an important role in building independent ecosystems. This would be helpful to platform service providers who consider the diffusion of services and are concerned about decision making for initial choices and focus. If future study also considers how to make lower platform business participants join faster and re-attract users who left, the early stage development problem of the two-sided market can be strategically overcome.

Note

1. "The WSJ and Dow Jones VentureSource are tracking companies that are valued at $1 billion or more by venture-capital firms. The club is becoming less exclusive as venture capitalists funnel large sums of capital in the best startups. Select the names below for company profiles, or sort by categories such as region, amount raised and valuation" (http://graphics.wsj.com/billion-dollar-club/).

References

Amit, R. and Zott, C. (2001), "Value creation in e-business", *Strategic Management Journal*, Vol. 22 Nos 6/7, pp. 493-520.

Anderson, R.M. and May, R.M. (1979), "Population biology of infectious diseases: part I", *Nature*, Vol. 280 No. 5721, pp. 361-367.

Armstrong, M. and Wright, J. (2007), "Two-sided markets, competitive bottlenecks and exclusive contracts", *Economic Theory*, Vol. 32 No. 2, pp. 353-380.

Baldwin, C.Y. and Woodard, C.J. (2009), "The architecture of platforms: a unified view", in Gawer, A. (Ed.), *Platforms, Markets and Innovation*, Edward Elgar, Cheltenham, pp. 19-44.

Boudreau, K. and Hagiu, A. (2009), "Platform rules: regulation of an ecosystem by a private actor", *Platforms, Markets and Innovation*, Edward Elgar, Cheltenham.

Brandtzæg, P.B. and Heim, J. (2008), "User loyalty and online communities: why members of online communities are not faithful", *INtelligent TEchnologies for Interactive enterTAINment Proceedings of the 2nd International Conference, ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering)*, *Brussels*, p. 11.

Bresnahan, T.F. and Greenstein, S. (1999), "Technological competition and the structure of the computer industry", *The Journal of Industrial Economics*, Vol. 47 No. 1, pp. 1-40.

Ceccagnoli, M., Forman, C., Huang, P. and Wu, D.J. (2011), "Co-creation of value in a platform ecosystem: the case of enterprise software", *MIS Quarterly*, Vol. 36 No. 1, pp. 263-291.

Cennamo, C. and Santalo, J. (2013), "Platform competition: strategic trade-offs in platform markets", *Strategic Management Journal*, Vol. 34 No. 11, pp. 1331-1350.

Clarysse, B., Wright, M., Bruneel, J. and Mahajan, A. (2014), "Creating value in ecosystems: crossing the chasm between knowledge and business ecosystems", *Research Policy*, Vol. 43 No. 7, pp. 1164-1176.

Cowan, R. and Jonard, N. (2004), "Network structure and the diffusion of knowledge", *Journal of Economic Dynamics and Control*, Vol. 28 No. 8, pp. 1557-1575.

Cusumano, M.A. and Nobeoka, K. (1998), *Thinking Beyond Lean: How Multi-Project Management is Transforming Product Development at Toyota and Other Companies*, Simon & Schuster, New York, NY.

Del Giudice, M. and Della Peruta, M.R. (2016), "The impact of IT-based knowledge management systems on internal venturing and innovation: a structural equation modeling approach to corporate performance", *Journal of Knowledge Management*, Vol. 20 No. 3, pp. 484-498.

Dougherty, D. and Dunne, D.D. (2011), "Organizing ecologies of complex innovation", *Organization Science*, Vol. 22 No. 5, pp. 1214-1223.

Easley, D. and Kleinberg, J. (2010), *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, Cambridge University Press, Cambridge.

Eisenmann, T., Parker, G. and Van Alstyne, M.W. (2006), "Strategies for two-sided markets", *Harvard Business Review*, Vol. 84 No. 10, pp. 92-103.

Eisenmann, T., Parker, G. and Van Alstyne, M. (2008), "Opening platforms: how, when and why?", working paper, Harvard Business School, Cambridge, MA, 16 October.

Evans, D., Hagiu, A. and Schmalensee, R. (2006), *Invisible Engines*, MIT Press, Boston, MA.

Evans, D.S. and Schmalensee, R. (2007), *Catalyst Code: The Strategies Behind the World's Most Dynamic Companies*, Harvard Business School Press, Cambridge, MA.

Evans, D.S. and Schmalensee, R. (2010), "Failure to launch: critical mass in platform businesses", *Review of Network Economics*, Vol. 9 No. 4, pp. 1-26.

Evans, D.S., Hagiu, A. and Schmalensee, R. (2008), *Invisible Engines: How Software Platforms Drive Innovation and Transform Industries*, MIT Press, Cambridge, MA.

Felmlee, D., Sprecher, S. and Bassin, E. (1990), "The dissolution of intimate relationships: a hazard model", *Social Psychology Quarterly*, Vol. 53 No. 1, pp. 13-30.

Ferguson, R. and Brohaugh, B. (2008), "Telecom's search for the ultimate customer loyalty platform", *Journal of Consumer Marketing*, Vol. 25 No. 5, pp. 314-318.

Flavián, C., Guinaliu, M. and Gurrea, R. (2006), "The role played by perceived usability, satisfaction and consumer trust on website loyalty", *Information & Management*, Vol. 43 No. 1, pp. 1-14.

Gawer, A. and Cusumano, M.A. (2002), *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*, Harvard Business School Press, Boston, MA, pp. 29-30.

Gawer, A. and Henderson, R. (2007), "Platform owner entry and innovation in complementary markets: evidence from Intel", *Journal of Economics and Management Strategy*, Vol. 16 No. 1, pp. 1-34.

Gawer, A. and Phillips, N. (2013), "Institutional work as logics shift: the case of Intel's transformation to platform leader", *Organization Studies*, Vol. 34 No. 8, pp. 1035-1071.

George, A. and Bennett, A. (2005), *Case Studies and Theory Development in the Social Sciences*, MIT Press, Cambridge, MA.

Geroski, P.A. (2006), "Models of technology diffusion", *Research Policy*, Vol. 29 No. 4, pp. 603-625.

Goldenberg, J., Libai, B. and Muller, E. (2001), "Using complex systems analysis to advance marketing theory development: modeling heterogeneity effects on new product growth through stochastic cellular automata", *Academy of Marketing Science Review*, Vol. 2001 No. 9, pp. 1-18.

Granovetter, M. (1978), "Threshold models of collective behavior", *American Journal of Sociology*, Vol. 83 No. 6, pp. 1420-1443.

Grassberger, P. (2013), "Two-dimensional SIR epidemics with long range infection", *Journal of Statistical Physics*, Vol. 153 No. 2, pp. 289-311.

Henderson, R.M. and Clark, K.B. (1990), "Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 9-30.

Hidding, G.J., Williams, J. and Sviokla, J.J. (2011), "How platform leaders win", *Journal of Business Strategy*, Vol. 32 No. 2, pp. 29-37.

Iansiti, M. and Levien, R. (2004a), *The Keystone Advantage*, Harvard Business School Press, Boston, MA.

Iansiti, M. and Levien, R. (2004b), "Strategy as ecology", *Harvard Business Review*, Vol. 82 No. 3, pp. 68-81.

Kauffman, R.J., McAndrews, J. and Wang, Y.M. (2000), "Opening the 'black box' of network externalities in network adoption", *Information Systems Research*, Vol. 11 No. 1, pp. 61-82.

Kenah, E. and Robins, J.M. (2007), "Network-based analysis of stochastic SIR epidemic models with random and proportionate mixing", *Journal of Theoretical Biology*, Vol. 249 No. 4, pp. 706-722.

Keeling, M.J. and Eames, K.T. (2005), "Networks and epidemic models", *Journal of the Royal Society Interface*, Vol. 2 No. 4, pp. 295-307.

Kermack, W.O. and McKendrick, A.G. (1927), "A contribution to the mathematical theory of epidemics", *Mathematical, Physical and Engineering Sciences Proceedings of the Royal Society of London, Series A*, Vol. 115 No. 772, pp. 700-721.

Kim, J. (2016), "The platform business model and business ecosystem: quality management and revenue structures", *European Planning Studies*, Vol. 24 No. 12, pp. 2113-2132.

Kim, J., Jang, A. and Lee, M. (2016), "The effects of venture companies' core competence and cooperation strategy on their business performance", *The e-Business Studies*, Vol. 17 No. 2, pp. 91-125.

Kitsak, M., Gallos, L.K., Havlin, S., Liljeros, F., Muchnik, L., Stanley, H.E. and Makse, H.A. (2010), "Identification of influential spreaders in complex networks", *Nature Physics*, Vol. 6 No. 888, pp. 888-893.

Landaeta Olivo, J.F., García Guzmán, J., Colomo-Palacios, R. and Stantchev, V. (2016), "IT innovation strategy: managing the implementation communication and its generated knowledge through the use of an ICT tool", *Journal of Knowledge Management*, Vol. 20 No. 3, pp. 512-533.

Leurs, K. and Zimmer, M. (2017), "Platform values: an introduction to the #AoIR16 special issue", *Information, Communication & Society*, Vol. 20 No. 6, pp. 803-808.

Mayer, R.E. and Chandler, P. (2001), "When learning is just a click away: does simple user interaction foster deeper understanding of multimedia messages?", *Journal of Educational Psychology*, Vol. 93 No. 2, pp. 390-397.

Mayfield, R. (2005), "Social network dynamics and participatory politics", in Lebkowsky, K. and Ratcliffe, M. (Eds), *Extreme Democracy*, Lulu Press, Raleigh, NC, pp. 116-132.

Morris, C.R. and Ferguson, C.H. (1993), "How architecture wins technology wars", *Harvard Business Review*, Vol. 71 No. 2, pp. 86-96.

Newman, M.E. (2002), "Spread of epidemic disease on networks", *Physical Review E*, Vol. 66 No. 1, p. 016128.

Newman, M.E. (2003), "The structure and function of complex networks", *Siam Review*, Vol. 45 No. X, pp. 167-256.

O'Reilly, T. (2007), "What is web 2.0: design patterns and business models for the next generation of software", *Communications & Strategies*, Vol. 65 No. 1, pp. 17-37.

Pagani, M. (2013), "Digital business strategy and value creation: framing the dynamic cycle of control points", *MIS Quarterly*, Vol. 37 No. 2, pp. 617-632.

Palacios-Marqués, D., Merigó, J.M. and Soto-Acosta, P. (2015), "Online social networks as an enabler of innovation in organizations", *Management Decision*, Vol. 53 No. 9, pp. 1906-1920.

Pareto, V. (1935), *The Mind and Society*, AMS Press, New York, NY.

Parker, G., Van Alstyne, M. and Choudary, S. (2016), *Platform Revolution: How Networked Markets are Transforming the Economy and How to Make Them Work for You*, WW Norton & Company, New York, NY.

Peppard, J. and Rylander, A. (2006), "From value chain to value network: insights for mobile operators", *European Management Journal*, Vol. 24 No. 2, pp. 128-141.

Reed, D.P. (1999), "That sneaky exponential – beyond Metcalfe's law to the power of community building", *Context Magazine*, available at: www.reed.com/dpr/locus/gfn/reedslaw.html (accessed 10 March 2017).

Reed, D.P. (2001), "The law of the pack", *Harvard Business Review*, Vol. 79 No. 2, pp. 23-24.

Robertson, D. and Ulrich, K. (1998), "Planning for product platforms", *MIT Sloan Management Review*, Vol. 39 No. 4, p. 19.

Rochet, J.C. and Tirole, J. (2003), "An economic analysis of the determination of interchange fees in payment card systems", *Review of Network Economics*, Vol. 2 No. 2, pp. 69-79.

Rochet, J.C. and Tirole, J. (2006), "Two-sided markets: a progress report", *The RAND Journal of Economics*, Vol. 37 No. 3, pp. 645-667.

Rysman, M. (2009), "The economics of two-sided markets", *The Journal of Economic Perspectives*, Vol. 23 No. 3, pp. 125-143.

Shapiro, C. and Varian, H.R. (2013), *Information Rules: A Strategic Guide to the Network Economy*, Harvard Business Press, Cambridge, MA.

Soto-Acosta, P., Popa, S. and Palacios-Marqués, D. (2017), "Social web knowledge sharing and innovation performance in knowledge-intensive manufacturing SMEs", *Journal of Technology Transfer*, Vol. 42 No. 2, pp. 425-440.

Spiteri, J.M. and Dion, P.A. (2004), "Customer value, overall satisfaction, end-user loyalty, and market performance in detail intensive industries", *Industrial Marketing Management*, Vol. 33 No. 8, pp. 675-687.

Watts, D.J. and Dodds, P.S. (2007), "Influentials, networks, and public opinion formation", *Journal of Consumer Research*, Vol. 34 No. 4, pp. 441-458.

West, J. (2003), "How open is open enough? Melding proprietary and open source platform strategies", *Research Policy*, Vol. 32 No. 7, pp. 1259-1285.

Zhou, T. (2011), "Understanding online community user participation: a social influence perspective", *Internet Research*, Vol. 21 No. 1, pp. 67-81.

Zhu, F. and Iansiti, M. (2012), "Entry into platform-based markets", *Strategic Management Journal*, Vol. 33 No. 1, pp. 88-106.

Further reading

Moore, C. and Newman, M. (2000), "Epidemics and percolation in small-world networks", *Physical Review E*, Vol. 61 No. 5, pp. 5678-5682.

Soto-Acosta, P., Colomo-Palacios, R. and Popa, S. (2014), "Web knowledge sharing and its effect on innovation: an empirical investigation in SMEs", *Knowledge Management Research & Practice*, Vol. 12 No. 1, pp. 103-113.

Appendix

Figure A1.
Audience overview data (9 November 2014-9 July 2016) from the RecordFarm server database

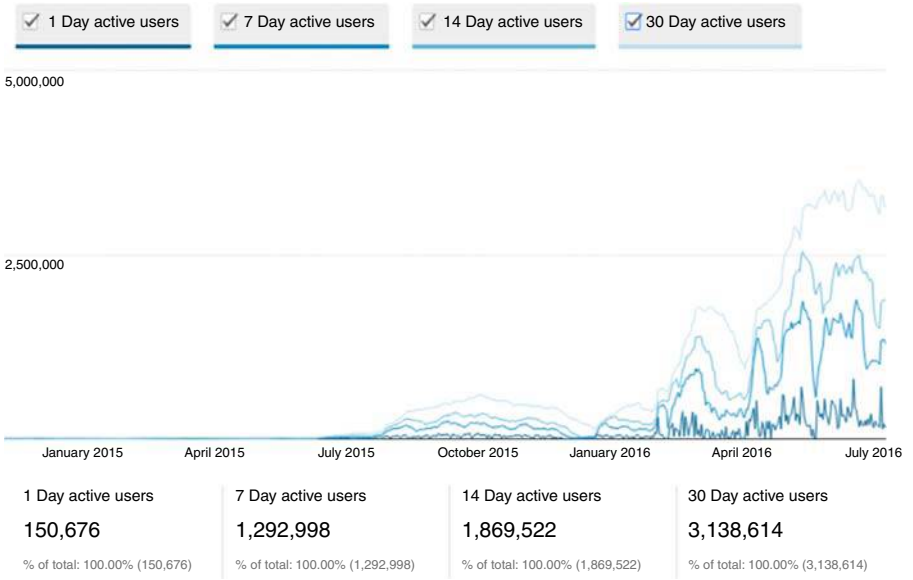


Figure A2. Active users data (9 November 2014-9 July 2016) from the RecordFarm server database

Corresponding author
Junic Kim can be contacted at: junickim@gmail.com; junickim@konkuk.ac.kr