

Key success factors for mobile app platform activation

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Abstract This study explores the key activation factors of the mobile application development platform through a comparative analysis of Apple App Store and Samsung Apps platforms based on the information and communications technologies intensive service innovations (IISIⁿ) model from the developer's perspective. We conducted intensive interviews of 14 mobile app developers who had development experiences with both Apple App Store and Samsung Apps. The study results indicate that the most important app development platform activation factors from the developer's perspective are: (1) core components of the platform and technical support; (2) policy assistance for developer work activities; and (3) assurance of adequate financial returns to developers. This study is based on grounded theory and uses the IISIⁿ model to determine the success factor of mobile app platform activation. The results of this study make contributions to both theoretical and practical aspects regarding strategies and operations of mobile app development platforms.

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1 Introduction

With the rapid advances in information and communication technology (ICT), the proliferation and sharing of information are easier than ever before. ICT refers to the technologies used to facilitate communication between information producers and consumers via various devices. Using ICT, consumers can easily participate in the activities of companies, thereby sharing ideas, information, and experience. For example, a large number of people can gather at InnoCentive, via ICT, to solve problems together (Dutton 2008). 4food, a hamburger seller, takes orders from its customers according to their preferred ingredients, thereby developing menus based on customers' preferences and then sharing the revenue with them. As a result, 4food is now providing more than 200 million hamburger menus to customers (KRX 2013). These are representative success stories of open innovation that utilizes external ideas via ICT.

Open innovation has been introduced as a new R&D paradigm; it not only utilizes the internal capabilities of the organization but proactively utilizes the external ideas and technologies as well (Chesbrough 2003). Recently, co-creation is proposed as a new strategy to create value in collaboration with customers (Ramaswamy and Gouillart 2010). For open innovation and co-creation to generate value through collaboration with interested parties, including customers, it is essential to have a platform that can facilitate easy participation in business activities. A platform is a place where many participants can co-create value according to common standards or rules. The platform supports active exploration of opportunities as the number of participants increases, resulting in a virtuous cycle effect (KDB 2012). In fact, the use of platforms has extended to all sectors of the value chain, including product development, manufacturing, marketing, and service.

Apple, which introduced a business model to generate profit through the App Store, along with sales of terminal devices such as iPhone and iPad, is one of the leading firms that pursue co-creation through the platform. The participation of application developers and users has enabled Apple to become the leader in the smartphone market through the App Store platform. Once the platform was established, the number of its users and preemptive effects increased to support its dominant market position that has made it difficult for other competitors to challenge. The competition to secure a platform is expected to become even more keen in the future. Thus, it is essential for the firm to develop a strategy for the activation of platforms.

Although previous studies discussed various firms that became platform leaders (Gawer and Cusumano 2012), platform strategies (Hirano and Hagi 2011), success and failure cases (Tee and Gawer 2009), evaluation framework for cross-platform (Ville et al. 2016), mobile app development strategies (Michiel et al. 2016), real challenges in mobile app development (Joorabchi et al. 2013), and social platforms (Cullen 2010), few studies have examined key factors for application platform

activation. This study explores this gap in the literature and investigates the key activation factors of the mobile application development platform from the developer's perspective. To this end, Apple and Samsung, both leading producers of smartphones and operators of App Stores, are compared and analyzed using the ICT intensive service innovations model (IISIⁿ model) (Tuunainen et al. 2009). Along with a comparative study of these two firms, in-depth interviews were conducted with developers who have had experiences in the development and distribution of apps to identify the key activation factors of platforms.

This paper is organized as follows. In Sect. 2, previous studies on co-creation and platforms are reviewed. In Sect. 3, using the IISIⁿ model, platform strategies are analyzed from the developer's perspective to delineate the activation factors through interviews with the developers. Section 4 presents implications based on the results of the analysis. A summary of the study, as well as its contributions and limitations, is described in Sect. 5.

2 Literature review

2.1 Open innovation and co-creation

In 1989, the Exxon Valdez, an oil tanker, spilled a large amount of oil off the shores of Alaska, causing an environmental disaster. After 17 years, the Oil Spill Recovery Institute (OSRI) solved the clean up problem through InnoCentive in 2007 (Han and Wu 2012). As with this example, in some cases, solving a current or predicting a future problem by experts in various areas or by a large number of ordinary people may be more effective than by a small number of R&D staff inside the organization. Thus, organizations tend to open the source of innovation toward employees, suppliers, users, and external experts (Surowiecki 2005). Such open innovation is defined as: "A paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough 2003).

As ICT has advanced rapidly in recent years, people have been utilizing the experiences of others, rather than only official channels, to obtain information for problem-solving. Corporations have thus sought participation, experience, and co-creation in social networks to create new value as well (Lee et al. 2012). Co-creation is an important approach to innovation that uses internal and external sources for value creation. In fact, customers have participated as co-creators in the value creation of companies (Vargo and Lusch 2004, 2008; Lusch et al. 2007; Payne et al. 2008). Gentile et al. (2007) emphasize the value of the customer's experience as it is a product of the interaction between customers and products and customers and companies.

To be competitive, as Lee et al. (2012) articulated, a firm needs co-creation-based innovation by sharing ideas with customers and other interested stakeholders based on collaborative efforts. They divided innovation into four phases: closed innovation, which depends solely on inner capabilities; collaborative innovation, which focuses on exchange of ideas with other parties; open innovation, which

encompasses a wide range of collective wisdom; and co-innovation, which focuses on value actualization through shared vision and goals.

2.2 Application platform

Many world-class firms, such as Google, Apple, Amazon, eBay, and Facebook, all strive for innovation through open and collaboration platforms. For example, in contrast to the traditional push system, Apple provides a platform where anyone can implement applications and create an app market to establish oneself as the leader in development.

As Apple created an ecosystem for app developers based on a platform, the value of iPhone sky rocketed (NIA 2011). Indeed, a platform is imperative to execute open innovation or co-creation where the experiences of interested parties are exchanged interactively through mobile networks.

In economics, a platform is called a “two-sided market” where trades are mediated between agents of two different groups. The two-sided market is where value created by the interaction of two different types of user groups on a platform is influenced by indirect network externalities (Rysman 2009). Network externalities occur when the benefits one person obtains by consuming goods or services increase indirectly, as sales of the same products or services increase (Ha and Lee 2012).

The ecosystem of smartphones is characterized by an operating system (OS) and a platform called App Store mounted inside. This platform transmits apps and contents, in addition to having direct and indirect network externalities. Specifically, this platform has the characteristic of the two-sided market where two agent groups, contents/application providers and users, are intermediated (Ju 2011).

2.3 ICT intensive service innovations model (IISIⁿ model)

In this study, the IISIⁿ model is used as the theoretical base. The IISIⁿ model, proposed by Tuunainen et al. (2009), is based on a platform that has the infrastructure and rules. The platform is connected to networks of various users, such as producers and purchasers. This model is useful for analyzing how open innovation strategies are integrated in a platform with two-sided market characteristics (Tuunainen et al. 2009).

The IISIⁿ model consists of the service innovation platform, interested parties, and the network effect, as shown in Table 1.

In this model, the network effect includes both of the cross-side effects—as the number of consumers on one side becomes increasingly larger, consumers on the other side enjoy greater benefits. Likewise, with the same-side network, as the number of consumers on one side becomes increasingly larger, consumers on the same side enjoy more benefits (KISDI 2011). Since a strong network effect is generated as a larger number of main actors participate in the two-sided market, it is important to attract many users to the platform. Specifically, since a superior platform can dominate the market, operational strategies should be to secure a sizable number of platform users through effective investment.

Table 1 Components of the IISIⁿ model Adapted from Tuunainen et al. (2009)

	Factor	Description
Innovative platform	Organizational factor	Business and organizational infrastructure, including financial, cost, and expected return structures
	Technological factor	Type of information technologies used
	Market innovation factor	Competition or clients
Stakeholder groups	Service concept	Service strategy of the firm toward stakeholder groups inside the platform
	Client interface	Interface environment of the platform for stakeholder groups
	Service delivery system	Distribution environment inside the platform (purchase, sales, etc.)
Network effect	Higher profits or utility obtained as the size of the distinct group becomes increasingly larger (the same as network externalities theory in the two-sided market)	

2.4 Grounded theory

Grounded theory is a qualitative research method developed by Glaser and Strauss (1967), which was devised to identify theories from experience data to study social phenomena (Glaser 2001). Specifically, it is a systematic and qualitative method directed toward developing theories that explain systems, processes, executions, or interactions regarding the core topics based on the collected data (Creswell 2007). As grounded theory is derived from raw data, it provides meaningful guidelines about intuition, understanding, and behavior (Park 2009). Thus, in contrast to theories inferred logically, it is used to develop theories based on empirical data.

The developer experience in app development and distribution processes through the platform discussed in this study cannot be derived exclusively from a structured survey questionnaire. Grounded theory is appropriate as the methodology of this study for the following reasons. First, the study aimed to not only provide a simple description of the phenomena revealed in the platform participation process but also determine the context of the phenomena, including the response behavior and the interactions of platform participants. Second, this study strives to discover theories regarding the platform activation factors. Grounded theory is a best option to draw these theories (Urquhart et al. 2010; Locke 2001; Strauss and Corbin 1990; Suddaby 2006).

3 Research method and contents

The objective of this study was to identify the key activation factors of mobile app platforms. To achieve this research goal, relevant previous studies were examined using the IISIⁿ model, in addition to in-depth interviews with app developers.

3.1 Selection of companies for analysis

In this study, two global smartphone leaders, Apple and Samsung, were selected as the target companies. The reasons for their selection are as follows:

Competition in the smartphone industry is currently being changed from the device to platform based. The primary reason for the market share decline of Nokia (9th) and BlackBerry (10th), despite having their own operation systems (OSs), is that they have no platform for the operation of App Stores. In particular, as Google took over Motorola, followed by Microsoft's purchase of Nokia, mobile platform companies and smartphone manufacturers began to collaborate. Accordingly, mobile phone device manufacturers started to activate their App Store (The Digital Times 2013). For instance, Samsung is using aggressive strategies such as: holding large-scale developer conferences, providing an independent Software Development Kit (SDK) unique to Samsung Electronics, reinforcing support for "Samsung Electronics Android," and developing its own OS Tizen. Thus, followers to the platform market need to develop their own strategies to compete with leading companies. In this study, Samsung which is a manufacturer with the largest market share in the mobile phone industry and the second mover in platforms is compared and analyzed with Apple which is the leader in platforms.

3.2 Analysis results using the IISIⁿ model

The interested party inside the App Store consists of: (1) the consumer group that uses applications and (2) the developer group that develops applications and creates sales. In this study, the platforms of Apple and Samsung Electronics (SE) are compared and analyzed based on the IISIⁿ model, using a variety of publicly disclosed data, such as the Internet and newspapers, with respect to application developer groups. Table 2 provides a detailed comparison of the platform operation of the two firms.

Apple started the first mobile applications through its App Store to provide applications for the iPhone and iPad. App Store currently holds the largest number of applications after opening its market in July 2008 (Müller et al. 2011). In 2009, SE released about 20 smartphone models; Nokia and Apple led the market at that time. Samsung established the Mobile Solution Center (MSC) in June 2008 to strengthen the content competitiveness of its smartphones and opened "Samsung Apps" in September 2009 to attract external application companies (Shin et al. 2011). The two corporations are competing against each other in the global market. Portio Research (2013) forecasts that the number of mobile application users in the world would increase from about 1.2 billion in 2012 to about 4.4 billion by 2017.

Regarding the service concept, all app developers who participated in the platforms for both Apple and SE share the profit with the firm with proportions of 3:7 (7 for the developer). While Apple strengthens platform control with a closed strategy, such as fee-based use of the platform for developers and single OS support, SE promotes an open strategy, with a free use of the platform and multi-OS support.

To encourage platform participation, both Apple and Samsung provide an SDK to app developers through their App Store. Regarding the service delivery system as

Table 2 Comparison of the platform operation of Apple and Samsung App Stores

	Apple	Samsung
Service innovation platform	<p>iPhone developed in 2007</p> <p>App Store started in 2007</p> <p>Business model: Apple sells terminal devices such as iPhone and iPad and revenue is created via App Store</p>	<p>The Mobile Solution Center (MSC), newly established under the Telecommunication Network in June 2008</p> <p>Samsung Apps started in 2009</p>
Technology	<p>Total business solution developed in connection with platform, devices, and App Store</p> <p>iOS single platform use</p> <p>Easier development of up-to-date version due to no fragmentation^a of iOS</p>	<p>Multi-platform use</p> <p>Provides open mobile OS platforms, Bada, and Tizen</p> <p>Customization can be done</p> <p>Due to sever OS fragmentation, test is required for a large number of devices</p>
Market environment	<p>Leading company</p> <p>iPhone applications registered in App Store as of Jan 2015 (1.2 million apps)</p> <p>The number of cumulative downloads from App Store exceeds 40 billion by Jan 2013</p> <p>Reached \$9.3 billion revenue in 2012</p> <p>Second in the smartphone market, second quarter of 2013</p>	<p>Latecomer</p> <p>Since Galaxy S was introduced in 2010, 10 M smartphones have been sold within 6 months</p> <p>Held 160,000 applications by 2012</p> <p>Top smartphone market share, second quarter of 2013</p>
Service concept	<p>Support of development only under iOS</p> <p>Entry barrier is high for developers</p> <p>Developers determine the price and sell their applications by themselves</p> <p>Profit sharing is 30% to Apple as an operator and 70% to developers</p> <p>Developers are charged for using App Store</p> <p>Strengthening control over developers for high-quality application supply</p>	<p>Multi-OS strategy</p> <p>Low entry barrier for developers</p> <p>Profit sharing is 30% to Samsung as an operator and 70% to developers</p> <p>Applied open strategy where developers use all services provided by Samsung for free</p>

Table 2 continued

	Apple	Samsung
Client interface	<p>iPhone SDK provided for free as a development tool</p> <p>Development program iPhone SDK is provided, using objective C and Xcode</p> <p>iPhone developers need to subscribe to the developer program first (yearly registration fee: \$99)</p> <p>Randomly censored according to Apple's policy</p>	<p>Free support for all information from planning to development via Samsung Developer Forum</p> <p>Provides free development tool (SDK)</p> <p>Provides a total system from development to contract, authentication, registration, and sales in the open market place</p> <p>Runs off-line space "Ocean"</p> <p>Runs developer blog, forum, and remote test lab</p> <p>Runs events such as the developers' day and developer challenge to encourage participation of developers</p> <p>Prevents illegal copy by using a License Management Program</p>
Service delivery system	<p>Anyone can develop applications and freely request for registration and sales</p> <p>Unless operating errors, copyright infringement, or inappropriate contents are found, registration and sales are approved very quickly</p> <p>No linkage service between developers and consumers</p> <p>Only distributed within App Store (closed structure)</p> <p>Payment can be done through application (In-App Purchase)</p>	<p>Advertising support (social media)</p> <p>Profitability support through the Seller Office (charged application sale, In-App Purchase, In-App Ad, and sponsorship)</p> <p>Samsung AdHub operates as an advertising tool</p> <p>Distribution support for other App Stores (open structure)</p> <p>Developers can easily register an application to Samsung Apps</p> <p>Support of App sales through users of Samsung Apps in 125 nations around the world.</p> <p>In-App Purchase</p>

^a Fragmentation: platforms are not unified but fragmented according to many different devices

a distribution channel, Apple's App Store prefers closed distribution, while Samsung uses open distribution. App developers for Apple app developers are not allowed to sell their applications themselves as Apple controls all sales activities. In contrast, Samsung supports the distribution of apps in many markets other than their own App Store.

3.3 In-depth interviews with developers

To examine the key factors of platform activation for successful open innovation or co-creation from the app developer's perspective, in-depth interviews were conducted with developers who had experience with both Apple App Store and Samsung Apps.

3.3.1 *Subjects and method of interviews*

To determine the platform activation factors for successful open innovation from the perspective of app developers, related data were collected until the data reached the level of redundancy and saturation through literature reviews, participation observation, and in-depth interviews as Glaser (2001) suggested. Fourteen app developers, with experience in Apple's app store and Samsung apps, participated in the in-depth interviews.

To understand the context of the real field, literature reviews were conducted, and to select interviewees, participation observations in the most popular app developer's community were carried out for 2 months. This procedure helped secure sensitivity data, which provided the ability to discern which data were important and not after the data collected through participation were analyzed as Glaser (1978) suggested.

Through the participation observations, data about the knowledge of app development and in-depth interviews of developers who had experience in both App Store and Samsung apps were organized. To select study subjects, top-ranked app developers in the Apple App Store and Samsung apps were contacted to obtain their input on experiences with app store platforms.

The theoretical sampling continued until the point of theoretical saturation (Goulding 2002), at which point no new findings were added. Interviewers contacted the selected interviewees to obtain cooperation and provide the consultation about the schedule, privacy, and confidentiality, since the researchers in the in-depth interview can get various pieces of information by raising a number of critical and relevant questions (Strauss and Corbin 1998; Glaser 1992, 1998).

The interview was non-structured and open-ended regarding the factors of platform activation from the developer's viewpoint, so that the interviewer could ask questions easily and the interviewees could answer the questions freely. To develop trust, the interview started with general conversation and then continued with in-depth questions until reaching theoretical saturation. The questions were about motivation to participate in the platform, the experiences of platform participation (e.g., difficulties), and personal characteristics, such as hobbies, aptitudes, and jobs.

Table 3 General characteristics of the in-depth interview participants

Participant	Age	The number of months for application development (months)	Nationality
A	33	36	Republic of Korea
B	40	33	Republic of Korea
C	27	12	Republic of Korea
D	26	12	Republic of Korea
E	47	12	Republic of Korea
F	29	30	Republic of Korea
G	45	30	Republic of Korea
H	29	24	China
I	36	36	Taiwan
J	30	20	China
K	24	18	Ukraine
L	39	16	Russia
M	27	36	Israel
N	29	36	Germany

The direct interview was done first and then the second interview was done via email; parallel telephone interviews were used to obtain answers to additional questions and resolve problems found after the first interview. At the first interview, the participant's experiences as a developer were recorded and the results of analyses on both App Store platforms, using the IISIⁿ model, were summarized to obtain more in-depth and objective information. The first expert in-depth interviews were conducted from December 1, 2012, to December 26, 2012, which was followed by the second email interview in December 2013 and January 2014. Table 3 provides the characteristics of the interviewees.

3.4 Evaluation standard of research

Numerous scholars have proposed evaluation criteria of the grounded theory-based studies: Charmaz (2005) suggested credibility, originality, resonance, and usefulness, and Glaser (1978) proposed fit, work, relevance, and modifiability.

In this study, truth value, applicability, consistency, and neutrality, as proposed by Lincoln and Guba (1985), were used as evaluation criteria. First, "truth value" was expressed by credibility, which demonstrated how accurately the study results reflect tangible reality. Second, "applicability" was a similar concept as external validity in quantitative studies. In this study, the above two criteria were verified by consulting with developers who did not participate in our study but had experience in app development and participation in platforms. They were asked to verify whether the present study results were meaningful and applicable.

Third, "consistency" refers to credibility, which can be replaced with audibility, in quantitative studies. The researchers analyzed the data and discussed the study result jointly. Fourth, the concept of "neutrality" is related to objectivity in quantitative studies. We maintained the neutrality of this study through consultation

with other researchers, experienced experts in grounded theory studies, and app developers.

We also made an effort to secure reliability and validity by using triangulation, as proposed by Denzin (1978). Triangulation is a multifaceted method, derived from geometry, which aims to increase the reliability of a study by changing the viewpoint of the researchers, time, and space. Various triangulation methods have been proposed. In this study, triangulation about data of developer participation observations, review of previous studies, and interviews were all conducted along with triangulation about researchers as an interdisciplinary research fusion between subjects of business administration and management information systems.

4 Results and discussion

4.1 Categorization through open coding

Analysis of the interview data was conducted using an iterative and comparative analysis method that was proposed by Strauss and Corbin (1998) to derive grounded theory. The iterative and comparative analysis method was used to search and generate common categories or attributes based on concepts that represent meanings of each code derived from interview data. Strauss and Corbin (1990) classified the coding process into open coding, axial coding, and selective coding. In open coding, rich information is collected as much as possible and the data are divided and assigned to have names, thereby being conceptualized and categorized. In this study, the final 77 concepts, 9 categories, and 22 subcategories were derived through processes in which the researchers of this study compared and modified them, as shown in Table 4.

4.2 Axial coding

According to Strauss and Corbin (1990), axial coding is a step for identifying a relationship between categories extracted in open coding. As an extension of open coding, this step is completed in the development process of grounded theory by deriving answers to such questions as “why, how, where, and which result.” The development of a paradigm model consists of cores of connecting coding. Axial coding classifies categories, identified in the open coding process, into a causal prerequisite condition, contextual condition, core phenomenon, intervening condition, and action/interaction strategies, thereby identifying how they are connected causally along the axis of core phenomenon (Strauss and Corbin 1990). Therefore, this study recombined the categorized data through the open coding process and conducted axial coding to construct the paradigm model.

4.2.1 Causal conditions

Causal conditions refer to “the events that lead to the development of the phenomenon” (Kim 2012). Causal conditions affect the core category, the core

Table 4 Categorization of concepts in platform participation experiences

No.	Concept	Subcategory	Category	Paradigm
1	Curiosity regarding app development	Expectation of prosumers	Motivation of platform participation	Causal conditions
2	Pride in app development			
3	Feedback from consumers after app development			
4	Interested in app development			
5	Prosumer ^a	Employment		
6	Profit seeking			
7	Works for a company			
8	Business			
9	Individual developers	Platform OS	Platform development environment	Contextual conditions
10	Single OS			
11	Multiple OSs			
12	Fragmentation			
13	OS compatibility	Platform technology		
14	Quality of SDK			
15	Ease of use of the development tool			
16	Stabilized technology			
17	A variety of open application program interfaces (APIs)	Device market	Degree of platform activation	
18	User interface			
19	Stabilized platform			
20	Device compatibility			
21	Market share of device	Profitability of the platform		
22	Various terminal devices			
23	Number of users			
24	Number of cumulative downloads			
25	Number of registered applications	Platform characteristics		
26	Sales expectations for applications in the platform			
27	Expected profitability in the platform			
28	Leading companies in the platform			
29	Latecomers to the platform			
30	Manufacturing culture of the platform			
31	Platform popularity			
32	Platform openness			

Table 4 continued

No.	Concept	Subcategory	Category	Paradigm
33	Localization			
34	Community activation	Platform community		
35	Community support			
36	Communication support among stakeholders			
37	Entry environment to the platform	Entry cost to the platform	Accessibility to the platform	
38	Initial cost for the development environment			
39	Annual registration fee			
40	Wireless connection environment	Connection to the platform		
41	Ease of access			
42	Development	Application development	Participation in the platform	Main phenomenon
43	Registration	Application sales		
44	Sales			
45	Development capabilities	Technology capability	Capabilities for participation in the platform	Intervening conditions
46	Registration capabilities	Advertisement capability		
47	Sales capabilities			
48	Advertisement capabilities			
49	Maintenance capabilities	Maintenance and settle-down capabilities		
50	Settle-down capabilities			
51	Support for developer education	Development support	Policies of platform support	Action/interaction
52	Provide off-line development space			
53	Developers' day			
54	Provide development devices			
55	Online development support			
56	Simplification of the registration process	Registration support		
57	Support for registration			
58	Support for tests			
59	Fairness in the test process			
60	Promotion	Advertising support		
61	Seller Office			
62	Developer-oriented store operations	Sales support		
63	Support for open-type distribution			
64	Support for close-type distribution			

Table 4 continued

No.	Concept	Subcategory	Category	Paradigm
65	Maintenance	Settlement support		
66	Constant profit creation			
67	Strengthening profit sharing policies	Strengthening profitability	Achievement by participation in the platform	
68	Support for various revenue models			
69	Incentive for participation			
70	Shortening the time taken to revenue creation			
71	Support for various payment methods			
72	Place of ownership for developers	Ownership		
73	Copy prevention measures			
74	Protection of applications			
75	Departure from the platform	Suspension of the participation in the platform	Continued participation in the platform	Results
76	Changed to other platforms			
77	Continued use of the platform	Continued participation in the platform		

^a Prosumer: “producer” + “consumer”

category and the contextual conditions affect strategies, and the strategies in turn affect the consequences (Moghaddam 2006). The first step of open innovation is to have all interested parties participate in a platform, a space of co-creation of value, provided by an organization (Vega-Vazquez et al. 2013). Organizations induce interested parties to participate in a platform through various methods, including advertisements. The interview results showed that app developers have the following two main reasons for platform participation: (1) curiosity created during application use and self-pride associated with developing apps themselves and distribute their work in the market; (2) financial gains from the job as a software developer.

The biggest motivation for developers appeared to be the excitement provided by others’ actual use of their apps. For example, a developer stated “It was really interesting to see when somebody purchases what I developed in a platform. I was also excited to communicate with users through their feedback to make updates, praise, or sometimes bad comments.” Another developer commented, “I was really pleased to earn my loyalty as I participated in the platform while developing applications. It was really a refreshing experience to upload applications that I created myself for the market at large around the world. I felt proud.”

4.2.2 Contextual conditions

Contextual conditions answer the question of why participants respond to action/interaction in a particular place and time. They also reveal patterns of conditions,

the reasons for the phenomenon. Contextual conditions come from causal conditions and intervening conditions. Each of them has its own properties. The grouping of the properties allows the researcher to figure out patterns of the phenomenon. In this study, whether to participate in the platforms or not was affected by the platform development environment, platform activation level, and platform accessibility.

Since Apple App Store was the first platform in operation for applications, it attracted a large customer base and paid applications and thus has attained the first mover advantage in both platform accessibility and activation. On the other hand, as app development must be in iOS, general developers must purchase Apple's devices, such as MacBook or other iOS-installed devices, to make use of the App Store. This constraint has created a high entry barrier due to the initial cost. In contrast, as a follower, Samsung has lower developer participation due to a relatively small number of purchasers and market size, as well as low profitability. However, Samsung adopted a multi-OS strategy, which is a tremendous advantage for compatibility; since existing devices can be used, which results in a low entry cost, and thus attracts amateur developers. Moreover, Samsung smartphones, in which Samsung Apps is installed on default, are now the market leader, which is expected to be a driving force for this platform in the future. In terms of profit sharing policy, both firms set the ratio between the developer and the company at 7:3. However, due to a superior development environment and larger profitability, developers preferred Apple App Store. Some of the statements made by study participants are as follows.

From the developer's point of view, the most attractive factor to application markets is how well the platform is activated. If a platform is activated well, advertisement exposure and the number of downloads for applications will increase as well. Since I don't have any experience uploading pay-required applications, I simply prefer an activated platform where the download and feedback counts are larger.

It is important for developers to have the assistance of the application development environment, such as providing Software Development Kit (SDK) in a platform. Both Apple and Samsung provide an SDK. The major difference is that Apple uses a single OS of iOS, which can be compatible with all Apple devices, thus having the convenience of using only a single development version. In contrast, Samsung Apps adopted multi-OSs, so applications should be modified to suit multiple OSs, which is inconvenient for developers. Additionally, the developers expressed the sentiment that app development over Apple's platform was easier because Xcode of iOS was simpler to use from the developer's standpoint, as attested by the following statement.

Android can run in many different types of devices whereas iOS is run only with Apple's devices. The biggest weakness of Samsung is that it is very tricky for developers to modify the code to suit different devices.

4.2.3 *Phenomenon*

Phenomenon is a kind of answer to the question of “what is happening here?” (Strauss and Corbin 1998). It seeks to find patterns among participants’ actions/interactions in dealing with problems, circumstances, happenings, and events. Participation in the platform is a main phenomenon in this study.

4.2.4 *Intervening conditions*

Intervening conditions are factors that change and release the impact of causal conditions. Intervening conditions happen in emergency or unexpected events and can either facilitate or hinder action/interaction strategies. These conditions are displayed based on the individual capabilities of platform participants during the app development process.

One example of comments we received is as follows.

From a developer’s perspective, it would be difficult to develop apps, promote sales, and advertise apps by ourselves; however, if the platform is well developed, we can sell and promote apps easily thereby having a win-win effect.

4.2.5 *Strategies of action/interaction*

Strategies of action/interaction are what participants do to deal with problems, matters, and issues. They have intended actions to shape a phenomenon. Action/interaction affects what happens in the individual, group, and organization. Strategies of action/interaction are developed as time passes because they define or give a meaning to the circumstance. Sometimes, mediation does not happen when a conflict arises and finally results in failure. For the stable platform ecosystem provided by the firm for a virtuous cycle, appropriate step-by-step support should be provided to developers.

The interview results showed that Samsung Electronics provided a variety of support to developers. However, due to the lack of localization, such as in language and policies, such service was not especially helpful for foreign developers. Furthermore, that support was not found to be important to developers who were accustomed to Apple App Store. One example comment received is as follows.

If better support for developers is provided, more developers will participate in the platform. Although Samsung provides developer training for Samsung Apps, many developers are still reluctant to participate in Samsung Apps due to lack of advertisement and limitation of training. If more developers receive development support, I think more developers will participate.

Although the development environment and easy-to-use platforms are important, the main factors that create continuous value of the platform are profitability and ownership. Thus, continuous support policies for new entry developers, from entry to settlement for self-sustaining in a platform, are critical. Such support can help

create a virtuous cycle and increase developer loyalty to both the platform and the smartphone brand. A comment we heard from a developer was as follows.

Apple App Store has many applications that require payment, so developers like it. However, because other App Stores have more free applications than pay applications, and profit is earned by advertisements, it takes a long time to earn profit.

4.2.6 Results

Results are the outcome of an issue or problem. Management decisions and/or the absence of action/interaction would lead to results. Some results are intended, while others are not. Results of an action become partial conditions of consecutive action/interaction. Since these results cannot always be predictable, researchers should analyze the conditions that influence action/interaction strategies where subsequent events occur. The results in this study were found to be continued stay and departure from the platform.

5 Implications

5.1 Platform participation behavior model

In this study, a paradigm model was derived, as shown in Fig. 1, by depicting relationships among causal conditions, phenomenon, contextual and intervening conditions, action/interaction, and results of the coding.

As shown in the model, the causal conditions of platform participation were motivated by the expectation of prosumers and employment; the contextual conditions that influence the main phenomenon of platform participation were the platform development environment, activation level, and easy entry. Thus, platform participation was the main phenomenon result.

The intervening conditions are a variety of situations that can influence action/interaction strategies as a wide range of structural contexts of phenomena. These conditions represent individual capabilities of developers demonstrated in the platform participation process, which are also regarded as coping abilities when encountering difficulties.

The action/interaction strategies are intentional and tangible behaviors for dealing with the main phenomenon as a form of strategies or tactics to manage, control, perform, and react to the main phenomenon. The results were substantiated as a form of stay or suspension of participation in the platform, or departure to other platforms.

5.2 Factors of platform activation

The most important factors for developers to participate in the platform were the core components of the platform, technical support, and accessibility. The core

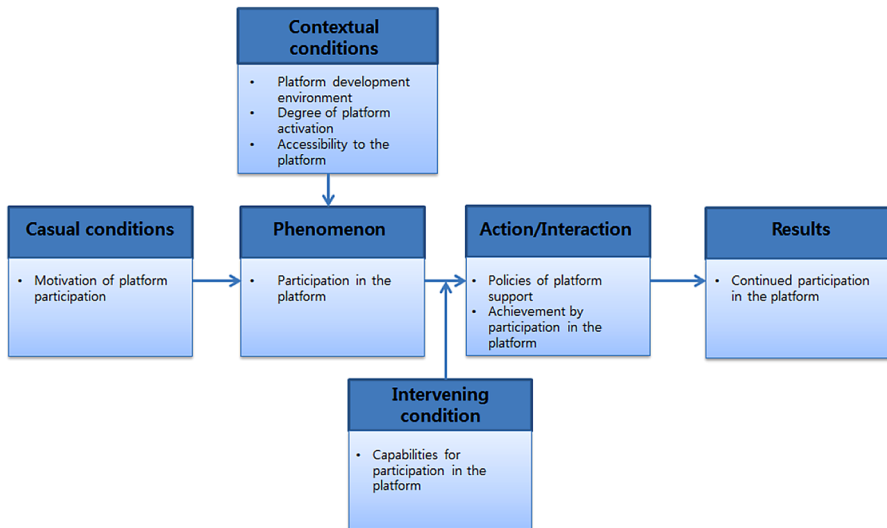


Fig. 1 Platform participation paradigm model

components of the platform are modules, interfaces, and architecture that configures a platform. Technical support for the platform provides an efficient environment for app development with stable and excellent platform technology. We also found that a support policy that facilitates easy entry into the platform was also rated as important. Even if a well-developed platform was provided, it would be worthless if no participant ever visited. To facilitate the use of the platform by interested parties, online and off-line support is necessary for easy entry, which is the first step to a virtuous cycle of platform activation. Samsung Electronics, which is an App Store late comer, provides its platform freely and actively supports convergence technology development through Ocean, its own program. Samsung also encourages new developers to participate in its platform, providing many events such as off-line support, developer day, and developer challenge to create a synergy between Samsung and app developers. However, Samsung Electronics has a platform environment that is not easy to enter by overseas developers.

An effective policy for the platform support of developers was also found to be important. It is difficult for developers to acquire an adequate return on investment, for the time and resource invested in app development in a short period of time. Thus, to attract interested parties to the platform, new entry developers and mid-to-long term developers should be differentiated to provide effective support, depending on the requirements of each developer in terms of training, development, registration, distribution, and profitability. The fundamental purpose of value creation via a platform is for revenue creation. If sustainable revenue cannot be generated, platform participants will leave for other competitive platforms. Thus, reasonable revenue sharing for participants as incentives should be provided. Since the iPhone and iPod have been successful and a loyal customer base is already established, the Apple App Store is an extremely attractive platform from the app

developers' standpoint. This means a high indirect network effect is expected, that is, as the number of users becomes larger, the benefits and utility of the platform also become greater.

While Apple's App Store has more pay applications with which it is easy to earn profits in a short period of time, SE Apps is relatively small, with more free applications and smaller indirect network effect. Therefore, developers for Samsung need to insert advertisements into their apps to earn profits, which takes more time. To circumvent this drawback, Samsung supports the profitability, by allowing developers to distribute their works through other App Stores.

6 Conclusion

In this study, the Apple App Store and Samsung Apps were analyzed using the IISIⁿ model to identify key platform activation factors for a virtuous cycle in co-creation-based open innovation. To analyze the platform use experience of developers through grounded theory, in-depth interviews were conducted with both Apple and SE app developers. The study results showed that platform activation that has a successful virtuous cycle should be approached from the perspective of openness and sharing, which is the basic concept of co-creation. Specifically, developers can create excellent apps in a platform that is easy to use. This finding can be applied to open innovation efforts in other industries as well. Therefore, companies should prepare a product or service innovation based on the co-creation platform to attract the participation of external partners, to develop a competitive edge in the market.

This study makes the following contributions. For the theoretical contribution, this study first analyzed platform participation factors of developers based on grounded theory, involving two-sided markets of two groups: producers and consumers. Second, this study contributed to enhancing the understanding of psychosocial aspects of app developers by exploring the structure of their motivation to participate in platforms.

For a practical contribution, this study identified the key factors that enhance platform activation by app developers based on a behavior model. The result of this study can be utilized as a guideline to execute platform activation strategies by mobile device companies.

This study has some limitations. This study was based on qualitative research, and thus, the process used might have cost some objectivity. To overcome this limitation and ensure the reliability of the results, a future study should undertake an empirical research of a variety of groups among the stakeholders involved in app platforms. In addition, in this study, only two leading producers of smartphones and operators of App Stores are compared and analyzed, and thus, it is interesting to study more companies such as Nokia and BlackBerry.

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