



Third-party mobile app developers' continued participation in platform-centric ecosystems: An empirical investigation of two different mechanisms



Hyung Jin Kim^a, Inchan Kim^b, Hogeun Lee^{a,*}

^a School of Business, Yonsei University 50 Yonsei-ro, Seodaemun-gu, Seoul 120-749, South Korea

^b Jon M. Huntsman School of Business, Utah State University, 3515 Old Main Hill, Logan, UT 84322-3515, USA

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ABSTRACT

Platform-centric ecosystems run by Apple, Google, Microsoft, etc. enable the companies to magnify the values of their products and services on an unprecedented scale, by harnessing third-party add-on software such as mobile apps. Despite the importance, however, there is a dearth of empirical research that investigates how third-party developers' continued participation is actually determined. This paper examined two different mechanisms increasing dedication to a platform and constraining exit from the platform, respectively. Specific factors in each mechanism and their casual relationships were tested and discussed in the context of Apple's mobile platform.

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1. Introduction

In recent years, exploitation of outside expertise and ingenuity in software development and software-based services has remarkably increased. For example, in July 2008, Apple opened its software platform to the public and launched its online application distribution system: the App Store. This strategic maneuver made it possible for third-party developers to create mobile apps and to profit by selling on the App Store. Participation of third-party developers in the platform-based ecosystem has created great value for Apple product users in terms of the variety of useful, enjoyable, continuously updated mobile apps. As of January 2015, over 1.4 million apps were available on the App Store (Ranger, 2015). This unprecedented success has translated into a significant increase in sales of Apple products and prompted other rival companies to take similar steps to provide mobile apps made by third-party developers (Kimbler, 2010; Kim et al., 2010). For instance, Google Play was launched in 2012, followed by Google's various strategies to enrich Android apps. To promote app development by third-party developers, Google once organized a \$10-million-award Android Developer Challenge, for example. In its app race with Apple, the

Google Play app store has recently reached over 1.43 million apps published (Ranger, 2015).

Central to this new trend is the shift away from the conventional notion of firm boundaries toward a platform-centric ecosystem in which a platform owner (often the hardware product manufacturer)¹ and third-party developers are interconnected and play respective roles to create competitive barriers together. In the context of software development, a platform indicates the extensible code base of a software-based system that provides core functionality used by various modules that interoperate with it. The modules are often provided by third-party developers, constitute an add-on software subsystem with special connections to the platform, and add new capabilities unforeseeable by the platform's original designers (Tiwana, Konsynski, & Bush, 2010). For example, Apple's iOS platform provides fundamental functionality common to a variety of mobile apps created by third-party developers, and the mobile apps (i.e., modules) add new capabilities to Apple products such as the iPhone and iPad. Likewise, in a platform-centric

* Corresponding author. Fax: +82 2 373 7430.

E-mail addresses: is.hyungjin.kim@gmail.com (H.J. Kim), ikim@usu.edu (I. Kim), h.lee@yonsei.ac.kr (H. Lee).

¹ In many cases, hardware product manufacturers run their own software-based platforms to leverage and harness the expertise of third-party developers and to increase value for their product users. For example, in the mobile services domain, handset manufacturers such as Apple and BlackBerry run their own platforms, and a substantial number of mobile apps are developed by and supplied from third-party developers for these platforms.

ecosystem, a symbiotic relationship exists between a platform and platform-specific software or modules produced by third-party developers (Cusumano & Gawer, 2002).

From a network perspective, a platform-centric ecosystem can be understood as a multi-sided network in which more than two parties play distinctly different roles and provide each other with network benefits (Eisenmann, 2007). For example, Apple's platform mediates between Apple product users and third-party developers; in this platform-mediated network, the supply side (i.e., third-party developers) offers goods or services (i.e., mobile apps) that the demand side (i.e., product users) may want. Therefore, from product users' standpoint, on one hand, the platform's network benefits increase when the number of developer participants increases because they provide new software. On the other hand, third-party developers find the platform-mediated network more attractive when the number of product users increases.

Hence, the fundamental reason why hardware product manufacturers such as handset vendors tend to build their own platforms and establish organic ecosystems with third-party developers is clear. Platform-centric ecosystems enable platform owners such as Apple and Google to attract new product users and retain existing users continuously through the software offerings provided by third-party developers. At the same time, their platform networks grow more attractive and appeal more to prospective third-party developers. For this virtuous circle, the participation of third-party developers is most essential.

However, in the mobile services domain, where platform-centric ecosystems for smart mobile devices have rapidly grown, scant effort has been made to better understand what leads to continued participation of third-party developers in a platform-centric ecosystem. In the current mobile industry, multiple platforms are competing with one another, trying to expand their own platform-centric ecosystems with a larger number of third-party developers. This is because the combination of a platform and third-party mobile apps is now a strong selling point for customers. Hence, competition is no longer product-based, but platform-based (Baldwin & Clark, 2000; Garud, Kumaraswamy, & Langlois, 2003). Moreover, the relationship between platform owners and platform-specific third-party developers is not the classical principal-agent relationship, because third-party developers are not hired to perform tasks specified by platform owners (Tiwana et al., 2010). Thus, continued participation of third-party mobile app developers in a platform ecosystem will be based on their exchange relationships with the platform owner such as Apple and Google.

In this study, we argue that platform owners must understand the exchange relationships from third-party developers' point of view in order to retain the services of these outside partners. Our empirical study investigates the factors that lead third-party mobile app developers to continue affiliation with a particular platform (i.e., continued participation), by focusing on the characteristics of the exchange relationship between the two parties (i.e., platform owners and third-party developers).

To ensure a systematic understanding of the issues involved in the continued participation of third-party developers, we used a *dual model framework* in which relationship continuance is predicted by two contrasting forces, in this case, dedication and constraints (Kim & Son, 2009). In our dual model, two different mechanisms affect continuation of the exchange relationship between third-party developers and platform owners. On the one hand, the developers continue to participate in a platform-centric ecosystem established by a particular platform owner, because they genuinely desire to do so for some reason. This is known as a *dedication-based mechanism*. On the other hand, they also continue the relationship because they need to do so for other reasons; this is a *constraint-based mechanism* at work. Drawing upon theories

developed in previous studies, we identified a set of key factors underlying these two mechanisms, and empirically investigated their causal relationships to understand how third-party mobile app developers' continued participation is actually determined.

2. Literature review

2.1. Existing research in the field of mobile phones and services

Mobile phones and related services have been the center of significant streams of IS research. Above all, there is ample research that examines users' adoption of mobile innovations such as mobile data services, mobile Internet, and mobile TVs. For example, Hong and Tam (2006) developed and tested a model of mobile data services adoption. Venkatesh, Thong, and Xu (2012) extended the unified theory of acceptance and use of technology (UTAUT) to study acceptance and use of mobile technology (i.e., mobile Internet). In the context of mobile TV adoption, Arbore, Soscia, and Bagozzi (2014) investigated symbolic dimensions of adoption by considering self-concepts such as self-identity.

The adoption research also spreads out to the area of *mobile commerce*. In their extensive review of existing literature, Slade, Williams, and Dwivedi (2014) found that 73 studies had been published regarding m-payment or m-banking adoption. For example, Riquelme and Rios (2010) surveyed Singaporean consumers and concluded that perceived usefulness, social norms, and risk are the main factors influencing the intention to adopt mobile banking. According to a recent analysis (Kourouthanassis & Giaglis, 2012), adoption behavior studies have been most preferred by m-commerce researchers, although in the early days of m-commerce research (i.e., before 2006), strategy and economics were the main subjects.

Moreover, ever since smart mobile devices such as smartphones became a widespread and effective personal technology, *mobile applications research* has increasingly attracted the interest of IS researchers. In this so-called "m-app era", we have witnessed a tremendous market opportunity, for which large global players are competing with each other furiously (Kourouthanassis & Giaglis, 2012). Apple, Google and Microsoft developed device and platform innovations that managed to attract and satisfy a large number of consumers with various forms of mobile applications. Our literature review suggests that the extant studies investigating mobile applications and related practices can be classified into three sub-categories in terms of whether their perspectives are relatively consumer-, developer-, or platform provider-oriented.

Firstly, scholars have investigated what leads to *consumers'* continued use of mobile applications and how to increase mobile application stickiness. For this line of research, consumers' view is critical because several industry reports indicate that consumers do not use most apps after the first 3 weeks of download (Furner, Racherla, & Babb, 2014), and that only 30% of paid apps in Apple's App Store are used the day after they are purchased (Yardley, 2009). Furner, Racherla, and Babb (2014) developed a conceptual framework to examine how various app features can eventually increase mobile application stickiness of the users. Providing a comprehensive view on mobile application usability, Hoehle and Venkatesh (2015) theoretically clarified the degree to which a mobile application can be used by specified users for their specified goals with effectiveness, efficiency, and satisfaction.

Secondly, another group of mobile application research is fairly *developer-oriented*. For example, analyzing a large-scale panel data of 711 mobile apps, Liu, Au, and Choi (2014) found that the freemium strategy (i.e., offering apps for free initially, then charging for advanced features later) contributed positively to an increase in sales of paid mobile apps. Their findings further suggest that offer-

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