



## Research Note

## Rival precedence and open platform adoption: An empirical analysis

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## ABSTRACT

Herding in open platform adoption decisions appears to prevail even when the systems adopted represent high risks with enterprise-wide impact. We present a model of organizational open platform adoption that integrates six different theoretical mechanisms based on a technology-organization-environment framework that drives herding: network effect benefits, new platform benefits, new platform risk, organizational learning, mimetic pressures, and competitive pressures. To find which mechanisms work significantly in organizational IT decision-making in accordance with IT diffusion and rival precedence, we empirically test the model by splitting the samples according to the proportion of rivals that have already adopted innovations. The empirical results demonstrate that among the six herding mechanisms, new platform risk and organizational learning drives herding in the earlier stage of diffusion and new platform benefits and competitive pressure drives herding in the later stage of diffusion. The results imply that organizations react conservatively to new platforms when they perceive less platform diffusion. However, as diffusion increases, organizations react more strategically to maintain competitive parity with rivals by imitating rival decisions.

## 1. Introduction

Open platform adoption has been a major trend in organizational computing in recent years (West, 2003). The open platform, often integrated with open source standardization (Dedrick and West, 2004) or, recently, cloud computing (Gupta, Seetharaman, & Raj, 2013; Low, Chen, & Wu, 2011), has gained a great deal of attention. With regard to server operation systems (OS), the market share of Linux, a Unix-compatible open source OS, has surpassed the proprietary UNIX systems (Dedrick and West, 2004). Drawing upon the definition of an IT platform as a general-purpose technology that enables a family of applications and related business opportunities (Fichman, 2004), open platform in this study is defined as a set of fundamental structures of enterprise IT based on open standardization shaping the way related applications integrate within a business.

Meanwhile, fierce global competition calls for flexibility and interoperability of information systems (IS) structures, which also encourage greater investment in migration to open platforms. Enterprises in South Korea are no exception in terms of such open platform herding. For example, the share taken by the IBM mainframe platform in Korea decreased to approximately half the number of firms that adopted the platform in 2003 (Kim, 2009). Meanwhile, the open software development framework has achieved widespread adoption (Kim and Teo,

2013). In addition, Kakao, a dominant social network service (SNS) firm in South Korea, recently declared its intention to launch a web-based bank using an open architecture and open application, which rival Internet firms have already adopted (Iglauer, 2015).

The adoption of an open system as a firm's IT platform, however, requires a significant investment; has widespread ramifications for the organization's computing infrastructure; and involves larger-scale IT projects whose outcomes are uncertain because of ill-defined returns, longer payback periods, and high risks (Byrd, 2001; Chau and Tam, 2000). In spite of the significance of the impact of herding for such risky large-scale IT investment decisions, there exists little empirical research to derive practical managerial recommendations for organizations that face such significant decisions.

The pattern of IT adoption has been explained through the herding mechanism, whereby social actors converge and engage in uniform behavior (Bikhchandani, Hirshleifer, & Welch, 1998; Duan, Gu, & Whinston, 2009). "Herd behavior" in IT adoption is pervasive and has been the subject of a growing body of research (Duan et al., 2009, p. 24). While there is a rich body of literature on IT adoption herding that focuses on the individual-level adoption of software applications (e.g., e-learning systems) and services (e.g., telecommunication services) (Brynjolfsson and Kemerer, 1996; Duan et al., 2009; Gandall 1994; Kim and Kwon, 2003; Lee, 2006), research on firm-level IT platform

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adoption is rare, with the exception of a few studies (Hannan and McDowell, 1987; Kauffman and Li, 2003; Teo, Wei, & Benbasat, 2003; Zhu, Kraemer, Gurbaxani, & Xu, 2006).

IT adoption herding can be influenced by possible multiple drivers in terms of organizational and inter-organizational features. Prior research on IT adoption herding has uncovered some important drivers such as network effects (Brynjolfsson and Kemerer, 1996; Duan et al., 2009; Gandal, 1994; Kauffman and Li, 2003; Zhu et al., 2006) and mimetic isomorphism (Teo et al., 2003). However, few studies have compared the relative importance of the underlying possible mechanisms that lead to IT adoption herding, and no study has compared the aforementioned mechanisms in accordance with market penetration rate. We argue that a better understanding of organizational IT adoption herding requires a holistic lens investigating the multiple causes of imitation in IT investment decisions with respect to market penetration status because of the following two reasons. First, studies that attribute IT adoption herding to a single underlying mechanism (such as network effects) without considering other drivers may overstate the impact of the observed driver (Duan et al., 2009). Second, under high competition, later adopters are likely to be influenced by early adopters; hence, the perceived market penetration rate of specific IT affects potential adopters' decisions through integration of the aforementioned cognitive factors (Gallaugh and Wang, 2002).

We aim to focus on organizational herding behavior in open platform adoption with respect to rival precedence. Given the fierce global competition in IT innovation and the nature of rapid convergence as well as the hyper cycle of its diffusion, the dynamics of organizational strategy may depend on rival precedence (Hannan and McDowell, 1987) rather than assessment of market penetration rate. In this regard, we simultaneously examine possible mechanisms of organizational herding based on a technology-organization-environment framework (Kuan and Chau, 2001; Dedrick and West, 2004) with respect to an organization's perceived market penetration through observing rival adoption.

We derive a set of hypotheses from the model and test these hypotheses on 183 firms in South Korea. The unusually high rate of open platform adoption over a relatively short period of time in the Korean market (Kim and Teo, 2013) presents a unique setting to examine how observing other organizations' adoption of open systems, among other factors, influences decisions to invest in IT that significantly affect organizational computing infrastructures.

This paper is organized as follows. Next, we present our theoretical perspectives. We then develop our conceptual model and derive hypotheses. In the section thereafter, we describe the methodology and the results of our empirical analysis. Finally, we discuss our findings, the study's limitations, and implications for future research and practice.

## 2. Herding in it adoption and rival precedence

There have been various theories explaining the diffusion of IT adoption mechanisms. From the perspective of sociology, widespread IT adoption has been interpreted as an institutional isomorphism that is intended to manage outcome uncertainty (Abrahamson and Rosenkopf, 1993; Lieberman and Asaba, 2006). Moreover, economic studies have regarded widespread IT adoption as a strategic reaction that is intended to mitigate competitive intensity (Bikhchandani, Hirshleifer, & Welch, 1992; Ordanini, Rubera, & DeFillippi, 2008; Tirole, 1990). However, any standalone analysis cannot provide a holistic view of the reasons underlying the diffusion of complex enterprise IT adoption and herding mechanisms on such investments; thus, we first need to consider comprehensively the theories and evaluate relatively their significance in developing an enterprise IT adoption model.

Further, to obtain deeper insights into IT adoption and herding mechanisms, we should go beyond the simple development of a holistic and balanced lens to view adoption mechanisms. We also need to pay

attention to the interorganizational features behind the widespread adoption of new IT and the temporal process that occurs in accordance with the diffusion stage. Enterprise IT diffusion—in other words, the adoption of the same IT platform by multiple organizations—is the result of the interorganizational influence of leaders on followers. When approaching new IT, organizations do not explore alone. Instead, they refer to predecessors' decisions and the outcomes (Gallaugh and Wang, 2002). As for such referencing, organizations determine whether the time is right to adopt new IT by measuring cognitively how many others have joined a new platform's network. This influence would be more augmented when organizations perceive any potential disadvantages from the adoption of organizations that share resource endowments and market positions (Lieberman and Asaba, 2006)—namely, rivals. Hence, in the context of open platform adoption, interorganizational influence might start from observing rival adoption and capturing the related opportunities or threats of new open platforms. Practitioners may ask the following questions when facing investment decisions: (1) How many rivals have already adopted this technology? (2) What gains or losses might we experience from adopting it?

Along with the degree of rival adoption, organizations might also evaluate their differing motivations. Thus, although it seems to be merely an imitation behavior of leaders, each organization's decisions are made by different temporal processes according to the organization's perception of innovation diffusion through recognizing rival precedence (Hannan and McDowell, 1987). However, as Still and Strang (2009) point out, there is a scarcity of innovation diffusion studies that deliver specific explanations about diffusion mechanisms based on an interdependent organizational context, and as Hannan and McDowell (1987) lament, little attention has been given to the process in which firms react to the observed behavior of rivals in most adoption studies.

In sum, the aforementioned theoretical perspective raises the following critical questions that previous studies have overlooked: Does rival precedence, measured using the proportion of rivals that already have adopted an innovation, increase or decrease herding mechanisms on adopting? Does the perceived risk and benefits from the technology adoption influence decision-making differently in the presence of rival adoption? Does the nature of these rival interactions differ systematically with the context (organization or environment) of adoption mechanisms in which they occur?

Based on the above argument, this study focuses on previously studied major herding on IT adoption mechanisms and the impact of organizational cognition on the progress of open platform adoption. In the next section, we identify the main drivers of open systems adoption in accordance with the organizational observation of diffusion progress.

## 3. Research model for open platform adoption based on a technology-organization-environment framework

Based on the works by Dedrick and West (2004), Iacovou et al. (1995), Kuan and Chau (2001), and Zhu et al. (2002), a conceptual model for open platform adoption using a technology-organization-environment framework is developed and depicted in Fig. 1. There are three contexts in shaping drivers of open systems adoption. The technological context refers to perceived platform-specific benefits and risks, the organizational dimension refers to organizational learning, and the environmental context refers to perceived environmental pressure. Each of these three contexts and hypothesis development incorporating the impact of organizational cognition on the progress of open platform adoption is discussed below.

In our conceptual model, we specify the degree of IT platform adoption as the dependent variable. We specify three adoption drivers in the context of technology as expected benefits derived from network effects, expected direct benefits from the platform, and expected risks associated with IT platform adoption. As for organizational context, we

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