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Can we ask you to collaborate? Analyzing app developer relationships in commercial platform ecosystems

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ABSTRACT

Previous studies have emphasized the necessity for software platform owners to govern their platform ecosystem in order to create durable opportunities for themselves and the app developers that surround the platform. To date, platform ecosystems have been widely analyzed from the perspective of platform owners. However, how and to what extent app developers collaborate with their peers needs to be investigated further. In this article, we study the interfirm relationships among app developers in commercial platform ecosystems and explore the causes of variation in the network structure of these ecosystems. By means of a comparative study of four commercial platform ecosystems of Google (Google Apps and Google Chrome) and Microsoft (Microsoft Office365 and Internet Explorer), we illustrate substantial variation in the extent to which app developers initiated interfirm relationships. Further, we analyze how the degree of enforced entry barriers to the app store, the use of a partnership model, and the domain of the software platform that underpins the ecosystem affect the properties of these commercial platform ecosystems. We present subsequent explanations as a set of propositions that can be tested in future empirical research.

1. Introduction

In the last decade, software ecosystems have gained increased attention (Manikas and Hansen, 2013b). The lens of a software ecosystem shifts the traditional perspective of software engineering, where a single company used to develop and commercialize software systems (Bosch, 2009). In the context of a software ecosystem, companies need to focus on inter-organizational collaborations involving several players such as platform owners, app developers, and customers (Jansen et al., 2010). Managing the multi-faceted relationships among these parties is a key success factor for the healthy evolution of a software ecosystem (Iansiti and Levien, 2004b; den Hartigh et al., 2013).

We adopt the definition of a software ecosystem by Jansen et al. (2010, p. 35), who define the concept as *"a set of actors functioning as a unit and interacting with a shared market for software and services, together with the relationships among them"*. Examples of software ecosystems are manifold, but perhaps most illustrative is the ecosystem that emerged around mobile operating system iOS. Shortly after the launch of the first iPhone in 2008, Apple introduced the Apple App Store as a distribution platform for third party software applications for its new mobile device running on the iOS operating system. Inspired by the merits of open innovation (Chesbrough, 2003), Apple cultivated an ecosystem of app developers. The number of applications in the Apple App Store quickly grew from 500 in 2008 to over 1.4 million applications in 2015.[1] Reaping benefits from ready-to-use extension architectures, substantial software reuse, and existing distribution channels app developers adopted the iOS platform en masse. Other prominent examples of *platform ecosystems* include desktop operating systems (e.g., Windows 8, OS X), web browsers (e.g., Google Chrome, Firefox), and business platforms (e.g., Salesforce.com, Google Apps).

The fast-paced advent of platform ecosystems brings several challenges to their owners. Platform owners have become dependent on the extensions and applications built within their ecosystem to maintain their success, while app developers also depend on the size of the installed base of the software platform to thrive. Albeit that the members of the ecosystem share success, not all members carry equal responsibility for the creation and governance of the network (Iansiti and Levien, 2004b; Gawer and Cusumano, 2008; Boudreau and Hagiu, 2009; Jansen et al., 2012; den Hartigh et al., 2013). Hence,

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[1] http://www.apple.com/pr/library/2015/01/08App-Store-Rings-in-2015-with-New-Records.html (accessed May 8, 2015).

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prior empirical research has explored such questions as how and when to open up an ecosystem to increase the involvement of app developers (Jansen et al., 2012), how to maintain persistent software development activity among app developers (Gawer and Cusumano, 2008), and in what ways can a platform owner manage competition among its app developers (Boudreau, 2012). However, underlying many of these issues is a lack of understanding of how – and the extent to which – app developers collaborate, such as through alliances, shared research and development, and less formalized means of interfirm collaboration including mutual product certification and technological partnerships. It is important to understand the ways in which a platform owner can foster collaboration among app developers because the firm directly benefits from co-creation (Gawer and Cusumano, 2008). These questions are particularly relevant for commercial platform ecosystems that, to date, have barely been investigated in previous studies. Notable exceptions include visualizations of alliance networks of IBM, Microsoft, and SAP between 1990 and 2002 (Iyer et al., 2006), visualizations of the mobile and ICT ecosystem (Basole, 2009; Basole and Karla, 2011; Basole et al., 2014), and a qualitative study of the SAP partner ecosystem (Rickmann et al., 2014).

To increase the understanding of governance of commercial platform ecosystems, we explore and compare four ecosystems that emerged around software platforms of Google and Microsoft. In particular, we aim at investigating the relationships among app developers in these ecosystems. We address two research questions

1. *What are the characteristics of interfirm relationships in commercial platform ecosystems?*
2. *How do governance mechanisms such as entry barriers to the app store, partnership models, and the domain of the underpinning software platform affect the initiation of interfirm relationships among app developers in commercial platform ecosystems?*

We investigate the Google Apps, Microsoft Office365, Google Chrome, and Internet Explorer ecosystems. The first two ecosystems are canonical for an emerging set of business productivity platforms whereas the latter two platforms compete in the web browser domain. We study the ecosystems of Google and Microsoft because both firms adopt distinct governance philosophies – Google and Microsoft embody the traditional tension between *'open'* and *'closed'* strategies in the software industry, respectively. Therefore, the analysis of these ecosystems provides a rich context to explore variations in network structure. We analyze the ecosystems on dimensions such as size, network density, and others. In doing so, we illustrate that there is substantial variation in the network structure of the ecosystems that we studied. We assess the extent to which ecosystems that are governed by the same platform owner exhibit similar structural properties. Further, we compare the structure of ecosystems that are underpinned by comparable software platforms.

Our study aims to make several contributions. The research presented in this article builds on a series of studies that aims to investigate the structural properties of commercial platform ecosystems. In particular, our work advances previous studies that explored the structures of the Google Apps (van Angeren et al., 2013a) and Microsoft Office365 (van Angeren et al., 2014) ecosystems in isolation. In this article we examine the differences between these ecosystems that are governed with distinct strategies. We extend the prior exploration of commercial ecosystems by Iyer et al. (2006). The authors call for a 'networked scorecard' to evaluate how managerial decisions can impact the ecosystem at large, but such a method lacks practical applicability without a proper understanding of the factors that underlie interfirm network structure. This article also provides two key contributions to the software ecosystems field. First, we provide an in-depth analysis of interfirm relationships within commercial platform ecosystems, a perspective that to date has remained deficient. Second, we compare the network structures of the four studied commercial platform ecosystems to understand what factors affect the initiation of interfirm relationships among app developers. In their systematic literature review, Manikas and Hansen (2013b) signal that the vast majority of studies focus on open source ecosystems, thereby neglecting the distinct characteristics of commercial ecosystems. In addition, previous studies have mainly focused on the single perspective of platform owners (e.g., Gawer and Cusumano, 2008; Eisenmann et al., 2009; Boudreau, 2012; Ghazawneh and Henfridsson, 2013; Jansen and Cusumano, 2013). Our research complements this line of research by taking a more holistic perspective of app developer relationships within commercial software ecosystems.

The remainder of this article continues with an outline of the extant literature relevant to our study in Section 2. Section 3 outlines our research method. It describes the context of the platform ecosystems of Google and Microsoft that we studied, and it explains how we extracted and analyzed data. In Section 4, we describe each commercial platform ecosystem by providing elementary descriptives and visualizing the interfirm relationships among principal app developers. Section 5 presents a comparison among the four studied ecosystems. This comparison is followed by Section 6 in which we outline both theoretical and practical contributions, and limitations of our study. Finally, we summarize our main findings and provide directions for future research in Section 7.

2. Background

The interconnectivity of the software industry has increased dramatically over the past few decades. Product development has moved from the internals of an organization through supply chains and software product lines to software platforms that are now omnipresent in various segments of the industry (Gawer, 2009). Simultaneously, software ecosystems emerged as the software industry-specific lens of the business ecosystem concept (Moore, 1993). Software ecosystems research is largely interdisciplinary, it encompasses studies from software engineering, innovation, and management (Manikas and Hansen, 2013b). In its most simple form, a software ecosystem involves groups of actors that collaborate around a common technology, such as a software product line or a software platform (Hanssen, 2012).

Presumably fueled by the widespread availability of software repositories (Kagdi et al., 2007), extant empirical research on collaboration in software ecosystems has mostly focused on open source communities (Manikas and Hansen, 2013b). For example, Kabbedijk and Jansen (2011) visualized the relationships among developers of the Ruby on Rails community and found that much of the coordination effort within the ecosystem was carried out by a limited number of committed developers. Moreover, the authors found that approximately 90% of the activity in the ecosystem was generated by 10% of the ecosystem members. In similar vein, a number of studies illustrates the great degree of decentrality in open source ecosystems (e.g., Madey et al., 2002; Crowston and Howison, 2005; Grewal et al., 2006; Lungu et al., 2010). Madey et al. (2002) studied open source projects that were maintained in the SourceForge repository. The authors argued that two open source developers are related if they contributed to the same open source project. Madey and colleagues (2002) found that most developers were involved in a limited number of projects, mutually connected to the greater developer community through a couple of developers that contributed to many projects at the same time (i.e., 'linchpins'). Contrary to Madey et al. (2002); Lungu et al. (2010) investigated both project (i.e., technical) dependencies and developer (i.e., collaboration) interdependencies in open source ecosystems. By means of an exploratory case study, the authors illustrated that around half of developers were not connected to any other developer, yet some of their projects were principal to the software development in the ecosystem.