

Contents lists available at [ScienceDirect](#)

Telecommunications Policy

URL: www.elsevier.com/locate/telpol

Android and the demise of operating system-based power: Firm strategy and platform control in the post-PC world

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ARTICLE INFO

Available online 30 June 2014

Keywords:

Smartphone
Platform
Bottleneck

ABSTRACT

The emergence of new mobile platforms built on Google's Android operating system represents a significant shift in the locus of the platform "bottleneck," or control point, in the mobile industry. Using a case study approach, this paper examines firm strategies in a market where the traditional location of the ICT platform bottleneck—the operating system on a device—is no longer the most important competitive differentiator. Instead, each of the three firms studied has leveraged different core competencies to build complementary services in order to control the platform and lock-in users. Using platform theories around bottlenecks and gatekeeper roles, this paper explores these strategies and analyzes them in the broader context of the changing mobile industry landscape.

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1. Introduction

The concept of technology "platforms" has emerged as a popular construct for understanding industry dynamics and firm strategy, especially in the information and communications technology (ICT) sectors. Drawing primarily from the literature on standards (David, 1985; Farrell & Saloner, 1985; Katz & Shapiro, 1985), network economics (David & Bunn, 1988; Katz & Shapiro, 1985, 1994), and multi-sided markets (Evans, 2003; Rochet & Tirole, 2003); researchers have developed an explicit platform theory to explain how some technology firms can control an industry's value chain and capture a disproportionate share of the total value, despite an interdependence in technologies and complementary assets (e.g., Gawer, 2000; Gawer & Cusumano, 2002).

While other ICT industries with strong platform dynamics, such as the PC industry (Cusumano & Yoffie, 1998) and video game console industry (Clements & Ohashi, 2005), have established relatively straightforward industry structures and firm roles within the ecosystem, the mobile telecommunications space is still in flux. One reason for this dynamism is that the mobile sector represents a large-scale industry convergence, with firms from the telephony, computing, and internet industries all trying to position themselves in a complex multi-layered technological space with different core competencies and platform strategies (Kenney & Pon, 2011). As a result, vectors of competition are multiple and varied, and smartphone platform firms that are competing head-to-head have very different business models (Ballon & Van Heesvelde, 2011). Another key distinction that has emerged in the smartphone industry is the apparent evolution of the technology platform

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itself. While the industry is currently dominated by two platforms, Apple's iOS and Google's Android, the recent emergence of two new platforms built on top of the Android operating system complicates our understanding of the nature of the smartphone platform, and may foreshadow similar developments across other ICT sectors.

In the smartphone industry, the major platforms from Google, Apple, and Microsoft are complex ecosystems that include a mobile device, operating system, online marketplace for apps and content, and a range of complementors such as app developers, network operators, and device manufacturers. As in many other ICT industries, the smartphone platforms have traditionally been defined and controlled by ownership of the respective operating systems (Kenney & Pon, 2011). In the platform literature, the operating system is the "bottleneck": that critical resource or position in the platform ecosystem which enables the firm to establish and sustain competitive advantage (Jacobides, Knudsen, & Augier, 2006; Tee & Gawer, 2009). However, the relative open-ness of Google's Android operating system—which has become dominant, with over 80% market share worldwide—has enabled two other firms, Amazon and Xiaomi, to build their own proprietary platforms on top of Android, thereby directly appropriating the extensive ecosystem of Android complementors, and indirectly, Android end-users. This development has implications for platform theory, as it represents a fundamental shift in industry structure and the basis for competition. When multiple firms can create proprietary platforms based on the same underlying operating system, that operating system is changed from a bottleneck to a commodity, and is no longer a competitive differentiator. Instead, these firms must look beyond the operating system to establish new bottlenecks that can control the ecosystem and deliver value to users.

This paper explores how firms are navigating this transition, using a comparative case study of the three platforms involved: (1) the official Google-sanctioned platform with Google-certified devices (e.g., Samsung Galaxy S5) and the Google Play online marketplace; (2) the Amazon platform, with the Kindle Fire tablets and the Amazon Appstore for apps, content, and other digital goods; and (3) the Xiaomi platform, with a number of smartphones, smart TVs, and a robust app market, MIUI. There is at least one other firm that has built a proprietary platform on top of Android, CyanogenMod, but at the time of this study it was considered too nascent to include. To give structure to the comparison we employ the concept of "gatekeeper roles," which has been used in the platform literature to describe and categorize the strategic operations of mobile platforms (Ballon, 2009; Ballon & Walravens, 2008; de Reuver, Bouwman, Prieto, & Visser, 2011). Applying the gatekeeper roles framework to each case, we explore the question, "Which services and roles do firms try to control in order to build a successful platform when the operating system is no longer the key competitive differentiator?"

Our analysis shows that all three firms have moderate to strong competencies in service provisioning and transaction processing roles, including online marketplaces and complementary cloud-based services for end-users. In addition, both Google and Amazon exert control and support their services through strategic management of the application programming interfaces (APIs) that enable external apps to connect with the operating system. The results suggest that in ICT platform industries without operating system differentiation, firms wanting to establish bottlenecks for platform control will focus on providing user-based services, and may incorporate interface control as part of that strategy.

The structure of the paper is as follows. First we review the relevant literature on platform theory, including bottlenecks and gatekeeper roles. Subsequently, we provide background on the Android operating system and the general context of the mobile industry. The next three sections are case studies of Google, Amazon, and Xiaomi, detailing the business model and relative strengths in the gatekeeper roles. We conclude with an analysis and discussion in the final sections.

Given the global penetration of mobile technology, the decisions, strategies, and successes of the smartphone platform firms are likely to frame the ecosystem for all other constituents, not only of the mobile communications industry, but for the entire ICT sector. For scholars interested in the transformation of economic spaces, platform competition, and industry convergence, the dynamics in this technological space can provide important contributions to theory building.

2. The nature of smartphone platforms

Technology platforms are generally defined as comprising three elements: a core technology that serves as a foundation, additional modular technologies that integrate or connect with this core, and the interfaces in-between (Baldwin & Woodard, 2009; Tiwana, Konsynski, & Bush 2010). The core technology is typically formed around a specific standard (e.g., VHS, Ethernet) or arrangement of standards compiled into an operating system (e.g., Microsoft Windows, Sony PlayStation, Symbian) (see, e.g., David, 1985; Farrell & Saloner, 1985; Von Burg, 2001). Some technology platforms, including the smartphone platforms described here, also function as multi-sided markets (Economides & Katsamakas, 2006; Parker & Van Alstyne, 2005; Rochet & Tirole, 2003), where the platform serves as a marketplace or forum for distinct user groups to transact (Baldwin & Woodard, 2009; Eisenmann, Parker, & Van Alstyne, 2006). The presence of multiple user groups that transact with each other leads to indirect network effects, whereby the value of the platform increases for each user group when the number of users in the opposite group increases (e.g., if there are more buyers, ideally the platform should attract more sellers). Similarly, the smartphone platforms demonstrate same-side or direct network effects, whereby the value of using the platform increases for each additional user in the group (e.g., because they can better communicate or share similar experiences) (Katz & Shapiro, 1985; Shapiro & Varian, 1998). These network effects result in increasing returns to adoption of a technology platform, which can lead to self-reinforcing cycles of adoption and winner-take-all markets (Arthur, 1989; David & Bunn, 1988).

The literature suggests that platform owners face a key challenge in designing the structure of their platform such that they maintain ownership and control over the critical elements that deliver value. For example, platform owners must

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