



Economic and business perspectives on smartphones as multi-sided platforms



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ARTICLE INFO

Available online 7 December 2014

Keywords:

Smartphones

Consumer behavior

Mobile operating systems

Multi-sided platform markets

ABSTRACT

We interpret mobile operating systems such as iOS and Android as multi-sided platforms that serve a variety of “customers,” including consumers (users), handset makers, network operators, app developers, advertisers, and chip manufacturers. After reconstructing the history of smartphones, we explore the variety of business models that operating system owners or sponsors have implemented, and highlight their implications for the relationships between platform owners/sponsors and customers. Next we focus on those dimensions of the smartphone experience that consumers declare they value the most, namely network quality, the features of the operating system itself, and the selection of apps available for each platform. We study how different mobile operating-system owners or sponsors have managed to innovate in these various dimensions, often by engaging other customer types. In the concluding section we rely on the insights derived from multi-sided platform theory to analyze the reasons why two mobile platforms—Apple’s and Google’s—have been able to displace various incumbents.

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1. Introduction

In recent years a rich academic literature has developed on markets with multi-sided platforms. These are platforms that connect two or more distinct types of customers and that are characterized by the existence of indirect externalities—an extra customer on one side generates benefits for customers on the other side. Multi-sided platform models have been applied to a wide variety of markets, including real estate brokerage and matchmaking. Among the empirical studies of multi-sided platforms are Rysman (2004) on the Yellow Pages directories, Kaiser and Wright (2006) on German magazines, Landsman and Stremersch (2011) on game consoles, and Seamans and Zhu (2012) on the impact of Craigslist on newspapers.

In this study we apply the multi-sided platform model to understand the evolution of the smartphone industry. We focus on smartphone operating systems, such as Apple’s iOS and Google’s Android, as multi-sided platforms that connect different types of customers that demand the services of the platform, including users, application developers, handset manufacturers, network operators, advertisers, and even chip makers. (We refer to the operating systems that are at the core of our study as “mobile operating systems,” “smartphone operating systems,” or simply “operating systems.”)

Even though by their very nature mobile operating systems connect a variety of customers, their ultimate goal is to attract consumers (users). Thus, we focus on the strategies that mobile platforms have resorted to in order to achieve this

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objective. We examine how different smartphone operating systems have addressed the chicken-and-egg problem that all multi-sided businesses must face—that is, the problem of getting traction at the starting point. We also analyze how they have attempted to maintain momentum with consumers. By the very nature of the business, we argue, the owners or sponsors of mobile operating systems have had to rely often on the contributions of other customer groups—handset manufacturers, network operators, third-party app developers, and even advertisers—to keep users engaged with the platform. Thus, in order to grow their user base mobile operating systems have had to develop successful strategies to attract other customer types.

There are a few other studies that apply the multi-sided platform model to the smartphone business. [Holzer and Ondrus \(2011\)](#) look at smartphones from the perspective of developers who are considering creating applications for a mobile platform, and suggest eight propositions “as starting points for future empirical research.” Our study goes beyond the [Holzer and Ondrus \(2011\)](#) analysis in a number of ways. For one, we provide empirical evidence on mobile app developers that is relevant to assess the accuracy of the Holzer–Ondrus predictions. More importantly, Holzer and Ondrus concentrate on developers whereas our focus is on users and on how platforms have engaged a wide variety of customers—including app developers—in order to continue to attract users.

[Unno and Xu \(2013\)](#) study the optimal strategies of a platform owner vis-à-vis third-party application providers and end users, and derive sufficient conditions for the existence of an optimal revenue-sharing strategy (which affects app providers) and an optimal app-purchasing support strategy (which affects end users). Our study is radically different from the [Unno and Xu \(2013\)](#) study in that their analysis is fundamentally theoretical, whereas our study attempts to provide a systematic empirical examination of the evolution of the smartphone industry within the framework of multi-sided platform theory. For the same reasons our study is different from that by [Lin, Li, and Whinston \(2011\)](#), which provides a theoretical examination of a mobile platform owner’s optimal two-sided pricing strategy taking into consideration the innovation decisions of application developers.

In terms of style our study is more closely related to those of [Gawer and Cusumano \(2002\)](#), [West and Mace \(2010\)](#) and [Kenny and Pon \(2011\)](#). [Gawer and Cusumano \(2002\)](#) use the platform concept to study the evolution of the Palm platform, which in their view encompassed the PDA device and its operating system. Although our analysis relies on a platform model that is closely related to theirs, we examine the smartphone industry as a whole whereas their study concentrates on the strategies followed by one player (Palm) in a market that preceded smartphones (PDAs). [West and Mace \(2010\)](#) focus specifically on the iPhone: they argue that what explains its success is “Apple’s conception of the mobile Internet as being another modality of the existing wired Internet, and its leveraging of existing system competencies.” In their view, the iPhone quickly gained market share because of Apple’s capacity to deliver the “real Internet.” They examine the evolution of the iPhone’s business strategies and present some adoption statistics through 2008–2009. [Kenny and Pon \(2011\)](#) offer a more comprehensive view: using the conceptual framework of platform theory they analyze “the actions and strategies of four major competitors, including Apple, Google, Microsoft, Nokia, and, more briefly, Research in Motion and HP/Palm.” They conclude that, at the time when their study was prepared, some competitors were following traditional platform strategies but Google and Apple appeared to have departed from some of the key tenets of the theory. They present some historical perspectives on the key players and compile market share statistics through 2009.

How does our study differ from those of [West and Mace \(2010\)](#) and [Kenny and Pon \(2011\)](#)? First, our analysis attempts to be more comprehensive than that of [West and Mace \(2010\)](#) since they focus on the iPhone only. Second, whereas both studies concentrate on the early period of the smartphone industry, we cover the evolution of smartphones through 2013. We attempt to provide insights not only on how various mobile platforms addressed the take-off problem but also on the strategies they have adopted to sustain momentum with users—strategies that usually involve interactions with other customer types.

Our paper is organized as follows. [Section 2](#) provides a brief history of smartphones and their operating systems. [Section 3](#) interprets mobile operating systems as multi-sided platforms, and offers an analysis of their business models and their take-off strategies. Since consumer surveys reveal that smartphone users care fundamentally about network quality, operating-system features, and the availability of third-party apps, the next three sections concentrate on these issues—that is, on the strategies that platform owners or sponsors have adopted to sustain momentum with consumers. [Section 4](#) focuses on innovation in hardware and operating-system software, [Section 5](#) on innovation in network technology, and [Section 6](#) on innovation in third-party apps. [Section 7](#) considers third-party developers and [Section 8](#) concentrates on advertisers. The final, concluding, section addresses the success of Apple’s iPhone and Google’s Android, and their different approaches to the organization of the multi-sided mobile platform.

2. Historical background

The mobile phone emerged as a consumer item in the early 1990s, in effect riding on the technology and infrastructure that had been developed earlier to satisfy the corporate communications market and elite customers. The second half of the 1990s saw a wave of new single-function consumer devices, such as media players, digital cameras, and GPS systems, and infrastructure to support them. For a small increment to manufacturing cost, it became feasible to incorporate audio players and digital cameras into the mobile phone, which thus became a “feature phone”—an integrated bundle of special-purpose devices with capabilities that were frozen at the time of manufacture.

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