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# Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems

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## ABSTRACT

For firms at the center of platform-based ecosystems, Teece (2018) argues that dynamic capabilities can enable the firms to create and capture value by building ecosystems and designing appropriate business models. In line with the original Profiting From Innovation (PFI) framework, Teece (2018) also argues that complementary asset providers may be able to capture substantial value. Here we provide a theoretical analysis that explains the ways in which dynamic capabilities underpin not only value creation but also value capture by platform leaders. We propose that three types of dynamic capabilities at a minimum are critical for platform leaders: innovation capabilities, environmental scanning and sensing capabilities, and integrative capabilities for ecosystem orchestration. We further argue that integrative capabilities play a key role in improving the ability of platform leaders to capture value.

## 1. Introduction

In broadening the Profiting from Innovation (PFI) framework, Teece (2018) devotes substantial attention to digital platform-based ecosystems. He also highlights the importance of dynamic capabilities for firms at the center of platform-based ecosystems, often termed ‘platform leaders’ (Gawer and Cusumano, 2002). Teece (2018) claims that dynamic capabilities can enable the firms to create and capture value from innovation by building ecosystems and designing appropriate business models. Additionally, in line with the original PFI framework, Teece (2018) argues that complementary asset providers may be able to capture substantial value. In making these general points, Teece (2018) does not go into any detail regarding why dynamic capabilities are important for platform leaders, the specific types of dynamic capabilities that platform leaders require, or how dynamic capabilities may enable these firms to both create and capture value. Here we build on Teece (2018) to provide a theoretical analysis that explains the ways in which dynamic capabilities critically underpin value creation and capture by platform leaders, focusing on digital platform-based ecosystems.

Business models for digital platform-based ecosystems rarely

emerge fully formed. As the architects of these ecosystems, platform leaders must design, manage, and alter ecosystems as conditions change – extremely complex tasks given the number of actors involved, the multi-faceted characteristics of these ecosystems, and high uncertainty. Platform leaders operate in a world of market failure characterized by imperfect information about relevant choices and the outcomes of making them, in a setting that calls for highly interdependent decisions due to the frequent presence of cross-side (or indirect) network effects. Cross-side (or indirect) network effects arise when the value to a party on one side of the platform depends on the number and quality of the parties on the other side(s) of the platform.<sup>2</sup>

Bringing about and sustaining cross-side network effects is neither easy nor automatic. Although digital platform-based ecosystems are generally characterized by modular interfaces for the provision of products by different parties, in much the same way as some products consist of modular components or subsystems (Baldwin and Clark, 2000; Henderson and Clark, 1990), it is the platform leaders who bear primary responsibility for designing and altering the architectures of these ecosystems. Beyond these challenges, as a consequence of the pace of change and the pressure of competition, platform leaders must continually innovate and redesign their business models, often through

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<sup>1</sup> The views expressed are not purported to reflect the views of the U.S. Department of Justice.

<sup>2</sup> Hagiu and Wright (2015) distinguish between cross-group (i.e., cross-side) and indirect network effects, arguing that indirect network effects refer to effects that flow in both directions among any two parties affiliated with a platform but cross-group network effects are unidirectional. For ease of exposition, we use the term ‘cross-side network effects’ to refer to both unidirectional and bidirectional effects. In addition, Evans and Schmalensee (2016: 29–30) note the importance of not only the number of participants but also the quality of participants on different sides of the platform.

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what we have previously termed a process of ‘product sequencing’ (Helfat and Raubitschek, 2000). Here we argue that specific types of dynamic capabilities can help platform leaders make decisions and take actions more effectively under these challenging conditions. We further argue that some dynamic capabilities can help firms to not only create value, as is generally the focus of research on capabilities, but also capture value.

More specifically, we propose that three types of dynamic capabilities at a minimum are critical for platform leaders: innovation capabilities, environmental scanning and sensing capabilities, and integrative capabilities for ecosystem orchestration. In the face of near constant change and innovative pressures in the current business environment in which digital platforms operate, capabilities for innovation and for sensing of opportunities and threats are essential. Integrative capabilities for platform ecosystem business model design and orchestration also play a central role because many platform-based ecosystems are multi-sided, and cross-side (or indirect) network effects create high interdependencies among complementary asset providers and users on different sides of the platform. In addition, integrative capabilities help to create value by reducing the transaction costs to a platform leader of contracting with complementary asset providers, while at the same time helping the platform leader to capture value by putting itself in a more indispensable position – a general lesson originally highlighted by Teece (1986) that is also central to the concept of added value (see e.g., Brandenburger and Stuart, 1996; Brandenburger and Stuart, 2007).

To begin, we briefly elaborate on the characteristics of digital platform-based ecosystems, particularly with respect to cross-side network effects, and make the case that continual innovation is part and parcel of these ecosystems in the current business environment. Then we bring in dynamic capabilities and their importance for designing and transforming business models in digital ecosystems. This leads to a discussion of three dynamic capabilities that we see as critical, namely, innovation capability, environmental scanning and sensing capability, and integrative capability. Throughout the analysis, we use short examples to illustrate key points. We conclude with broader implications for ecosystems and the PFI framework.

## 2. Digital multi-sided platform-based ecosystems

As Teece (2018) and others have argued, the world is undergoing a digital revolution at a new frontier of knowledge. Technology that underpins physical devices is changing from analog electronic and mechanical to digital, and content is transferred by digital rather than physical means. Teece (2018) focuses on digital platform-based ecosystems at the forefront of this change, and specifically on platform leaders, as we do here. To set the stage for our analysis, we next define terms and briefly summarize key characteristics of these ecosystems.

Digital platforms are often multi-sided, providing interfaces with and among two or more groups of economic actors on different ‘sides’ of the platform, including providers of complementary assets. In line with Teece (2018), we use the term ‘platform’ in the sense that it is used in the economics literature as mediating transactions between groups of actors, rather than in the sense used in the engineering design literature that focuses on product architectures and components (for a detailed discussion of this distinction, see Gawer, 2014). Given their growing importance, we focus on multi-sided rather than single-sided platforms (Rochet and Tirole, 2003; Hagiu and Wright, 2015).<sup>3</sup> We use the term

<sup>3</sup> Cross-side network effects differ fundamentally from the single-sided network externalities that the age of computers made especially salient, although the phenomenon has been with us for far longer (see Rohlfs’ (1974) early work on single-sided network effects, followed by Farrell and Saloner (1985), Katz and Shapiro (1985), and other research, which is reviewed by Katz and Shapiro, 1994). In the early 2000’s, economists began to pay more attention to network externalities in markets with multiple ‘sides,’ as has the management literature. Rochet and Tirole’s (2003) article on two-sided markets is

‘complementary assets’ to refer to products and services complementary to those provided by the platform leader, and to complementary technologies used by the platform leader to commercialize an innovation (e.g., software). A digital multi-sided platform-based ecosystem (henceforth referred to as a ‘digital MSP ecosystem’) includes: the platform leader; actors on different sides of the platform including complementary asset providers (or ‘complementors’ in the terminology of Brandenburger and Nalebuff, 1996); and input suppliers to the platform leader. Other entities and institutions that interact with or affect the value and development of a multi-sided platform can be viewed as part of a broader ecosystem beyond that considered here.<sup>4</sup>

As noted earlier, digital MSP ecosystems are characterized by cross-side (or indirect) network effects, in which the value to a party on one side of the platform depends on the number and quality of the parties on the other side(s) of the platform. Cross-side network effects are often positive. As an example, the restaurant reservation platform OpenTable brings together diners who make reservations and restaurants who offer them, providing an innovative service that reduces the transaction costs to both parties (Rosenthal and Rachleff, 2011). The more restaurants that use OpenTable, the greater the value of the platform to diners who therefore make more reservations using it, which draws even more restaurants who place a greater value on the platform. Cross-side network effects can also be negative; too many or low quality providers on one side can degrade the value of the platform to the other side(s).

Digital MSP ecosystems do not automatically generate positive cross-side network effects without purposeful action by platform leaders. In particular, a platform leader must carefully design the governance structure of its ecosystem. The governance structure includes rules that specify which parties can access the platform and how they can do so. These rules determine how open the platform is to external providers and the number of providers on each side, and influence the nature and quality of complementary products. In addition, the governance structure includes the rules for how parties can interact, thus determining the structure of interactions among parties on different sides of the platform. The governance structure of a digital MSP ecosystem further encompasses incentives given to parties on different sides of the platform to participate, including which customers the various parties will have access to and under which conditions (for additional discussion, see Hagiu, 2014; Parker et al., 2016). Because the pricing structure also provides incentives for complementary asset providers to participate in the ecosystem, the pricing structure is intertwined with the governance structure – an issue that prior literature has generally not addressed.

As Teece (2018) notes with respect to platform ecosystems in general, platform leaders face the broad challenge of designing and orchestrating digital ecosystems. Because cross-side network effects in digital MSP ecosystems entail especially strong interdependence among different parties, platform leaders in these ecosystems face heightened challenges of ecosystem design and orchestration relative to other types of ecosystems. This argues for greater attention to the capabilities of platform leaders.

Platform leaders face other challenges as well. Although multi-sided platforms are often viewed simply as matchmakers that bring together different parties (Evans and Schmalensee, 2016), a platform leader generally produces a core product or products. As an example, consider Yelp, a digital multi-sided platform that offers a core product of business reviews, which provides the basis for advertisers (often the businesses being reviewed), reviewers, and readers of reviews to affiliate with the platform (Piskorski et al., 2013). A core product may also be a

(footnote continued)

generally considered the canonical piece in economics.

<sup>4</sup> In this analysis, we rely on the way in which the term ‘ecosystem’ is used in the management literature. Adner (2017, p. 40) defines a ‘business ecosystem’ as the “alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize” (see also Jacobides et al., 2018).

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