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A multi-level perspective on innovation ecosystems for path-breaking innovation

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ABSTRACT

Path-breaking innovations are increasingly developed and commercialized by networks of co-creating actors, called innovation ecosystems. Previous work in this area demonstrates that the 'internal' alignment of actors is critical to value creation in the innovation ecosystem. However, the literature has largely overlooked that the success of an innovation ecosystem also depends on its 'external' viability, determined by the broader socio-technical environment. That is, path-breaking innovations inherently challenge the prevailing socio-technical regime in a domain (e.g., established rules, artifacts and habits) that tends to be resistant to change. Overcoming this resistance is a major challenge for ventures pioneering path-breaking innovations. The paper contributes to the literature on innovation ecosystems by explicitly considering the socio-technical viability of the innovation ecosystem around a path-breaking innovation. In particular, we theorize about the objects of manipulation in an innovation ecosystem and discuss the strategies that a focal venture, orchestrating the innovation ecosystem, can employ in manipulating these objects so as to increase the socio-technical viability of the ecosystem. We arrive at a multi-level perspective on innovation ecosystem development that integrates internal alignment and external viability and informs a research agenda for future studies in this field.

1. Introduction

Across industries, there is an ongoing transformation from separate products and services toward complex value propositions which are accomplished by integrating complementary products and services of different actors (Adner, 2006, 2012; Podoynitsyna et al., 2013). Referring to such a network where actors collectively create, deliver and appropriate value as an *innovation ecosystem* (henceforth: ecosystem) (Adner, 2012; Nambisan and Sawhney, 2011), innovation research has emphasized the importance for firms to consider an explicit ecosystem strategy (Adner, 2012, 2017). Correspondingly, in addition to managing their own technological and commercial challenges, an innovating venture needs also to consider how to align the different and often diverse actors supplying the complementary offerings toward accomplishing an integrated value proposition (Adner, 2017; Adner et al., 2013; Koenig, 2012; Williamson and De Meyer, 2012). Previous ecosystem research has identified several strategies that a focal venture can pursue in creating such an alignment, including defining the respective modularity in the ecosystem (Nambisan and Sawhney, 2011), coordinating value creation activities across actors (Williamson and De Meyer, 2012), establishing technological standards (Koenig, 2012), and creating mechanisms for fair value appropriation (Iansiti and Levien, 2004). We refer to these activities of the focal venture toward aligning the different actors as the *internal development* of the ecosystem.

However, consider Better Place, the technology venture that developed a network of smart charging stations and battery swapping facilities, enabling a unique switchable battery electric car service (Shankar, 2009). The venture took the lead in developing an ecosystem that integrated, among others, a battery manufacturer, a car producer, a network of switching stations and the software and hardware elements needed to enable that network. In the process, they successfully engaged a relevant set of highly diverse parties into an ecosystem wide value proposition of revolutionary electric mobility (Ofek and Wagonfeld, 2012). As such, the strategies and operations applied by Better Place have been used as state-of-the-art examples of effective ecosystem (internal) development (Adner, 2012; Johnson and Suskewicz, 2009). Yet, in 2013, the venture filed for bankruptcy, due to disappointing sales of just under 2000 of the initially planned 100,000 cars (Kershner, 2013).

Indeed, many ecosystems seeking to introduce *path-breaking* value propositions fail in the market place, even when technological chal-

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lenges are overcome and alignment of key actors is achieved (cf. Adner, 2012). A key reason why these systems nevertheless fail is that path-breaking value propositions often meet strong societal resistance, as they conflict with the prevailing *socio-technical regime*—the rules, artifacts and habits that structure economic viability and social life in a particular domain (e.g., city transportation, home heating) (Geels, 2004; Geels and Schot, 2007; Nelson and Winter, 1982). Typically, large incumbent actors combined with strong social networks sustain the socio-technical regime, by carrying the dominant elements that keep a domain on a certain developmental path (Geels, 2004; Kemp et al., 2007). A path-breaking value proposition tends to challenge (at least some of) the elements underlying a socio-technical regime and can thus only become successful if relevant societal subsystems adapt or transform to accommodate it (Nelson and Winter, 1982; Raven, 2007).

The complexity and nature of the broader socio-technical setting therefore gives rise to specific challenges for those ventures pioneering a path-breaking value proposition. These pioneers need to adopt particular strategies that increase the likelihood of societal stakeholders accepting and adopting the ecosystem's value proposition. Yet, to date, the literature on innovation ecosystems has not explicitly considered the socio-technical viability of the ecosystem around a path-breaking innovation; and whether and how the venture orchestrating the ecosystem can influence such viability.

In this paper, we draw on a quasi-evolutionary perspective, and in particular on the literature on transition and strategic niche management (e.g., Kemp et al., 1998; Schot and Geels, 2007), to develop a framework of ecosystem development for path-breaking innovations. We contribute to the innovation ecosystem literature by introducing the concept of *external development* of the ecosystem, alongside its internal development, which refers to deliberate efforts directed to enhance the viability of the ecosystem in its broader socio-technical environment.

To this end, we first identify the ecosystem-level objects, that is the 'ecosystem's value proposition' and 'ecosystem model', which a focal venture can 'manipulate' in developing their innovation ecosystem. Previous research argues that a focal venture can manipulate these objects to improve the internal alignment of the ecosystem—which then determines the extent to which the ecosystem is able to create and deliver its value proposition (Adner, 2017; Adner and Kapoor, 2010; Iansiti and Levien, 2004). We draw from research on socio-technical transitions to detail how manipulating the ecosystem's value proposition and/or the ecosystem model based on feedback from the socio-technical environment can also be used to improve the ecosystem's external viability. As such, by explicating the objects and the basis of manipulation, we link together the internal and external development of the ecosystem as performed by a focal actor. The resulting framework informs a research agenda for future work in the area of innovation ecosystems and ecosystem strategy.

2. Innovation ecosystems

2.1. Conceptualizing innovation ecosystems

In view of resource constraints and the need for specialization, it is difficult for any single firm to develop and commercialize a (technology-based) offering from start to finish (Clarysse et al., 2014; Kapoor and Furr, 2015). This is especially the case if the intended innovation disrupts the existing development path in a socio-technical domain. Thus, increasingly complex constellations of organizations have been emerging, in the form of *innovation ecosystems*, in which actors interact with each other to create, deliver and appropriate value.

In this study, we apply the 'ecosystem as structure' conceptualization of innovation ecosystems as suggested by Adner (2017), Adner (2012) and Gulati et al. (2012), rather than the broader 'ecosystem as affiliation' conceptualizations proposed elsewhere (e.g., Autio and Thomas, 2014; Iansiti and Levien, 2004; Moore, 1993; Rong and Shi, 2015). Accordingly, the defining element of an innovation ecosystem is a system goal in the form of an overarching common offering, which we refer to as the *ecosystem's value proposition* (EVP). Similar to the value proposition at the individual firm level, the EVP can be viewed as a statement about the deed (to be) performed, or the performance that is achieved for the end users when the contributions of the actors in the ecosystem network are successfully combined (Ulaga and Reinartz, 2011). The EVP as defining element of an ecosystem has the following implications.

The notion of a system goal suggests that meaningful boundaries for the ecosystem arise from those elements of the system that in interaction (are likely to) accomplish the EVP (Adner, 2017). These elements can only be identified from the viewpoint of an *end user* (Clarysse et al., 2014). For example, a carmaker can integrate the entire vertical value chain in producing an electric vehicle. However, the perspective of the end user serves to reveal that, no matter how advanced the car is, a sustainable mobility experience (as EVP) is only achieved when the users can also conveniently charge it, for instance, via the infrastructure provided by local grid companies. In creating and delivering the EVP, the grid company is therefore a critical actor, even though it may have no direct transactional links with the value chain that produces the car. Such interdependencies can only be identified through considering the viewpoint of the end user, for whom the electric car and the ability to charge it are necessary *complementarities* (Nambisan and Sawhney, 2011).

The boundaries of the ecosystem are thus determined by the EVP to include such elements that are required to achieve the intended EVP. Consequently, any change in the EVP is likely to give rise to changes in the elements and/or the interactions of the elements of the ecosystem, and vice versa. In this respect, ecosystems can be understood as networks in which actors are co-evolving (Li, 2009; Moore, 1993). As such, the typically specialized actors in an ecosystem are *interdependent* in their efforts to accomplish the EVP (Adner, 2017; Adner et al., 2013; Gulati et al., 2012). However, interdependence also means that failure of any key actor to successfully contribute to the EVP negatively impacts the success chance of the whole ecosystem and thus every actor partaking in it (Brusoni and Prencipe, 2013). Furthermore, the embeddedness of actors in an ecosystem network implies that the ability of any particular actor to appropriate value for itself is influenced by the other actors (Nambisan and Sawhney, 2011). A defining element of ecosystems is thus also the distribution of appropriated value among its actors (Autio and Thomas, 2014).

We therefore define an *innovation ecosystem* as a network of interdependent actors who combine specialized yet complementary resources and/or capabilities in seeking to (a) co-create and deliver an overarching value proposition to end users, and (b) appropriate the gains received in the process.

2.2. Objects of manipulation

A common understanding, or alignment, among ecosystem actors about how to accomplish an intended EVP is a key condition for success of the ecosystem (Adner, 2012; Williamson and De Meyer, 2012). Yet, and especially for path-breaking value propositions, reaching alignment provides a serious challenge due to, for instance, differences in industrial contexts (Autio and Thomas, 2014; Moore, 1993), conflicting cultural backgrounds of the parties involved (Lavie et al., 2012), and initial misalignment in terms of the goals and intentions of key actors (Casadesus-Masanell and Yoffie, 2007; Kapoor and Lee, 2013; Sharapov et al., 2013). As such, despite the possibility that an ecosystem can be self-organized (Autio and Thomas, 2014; Williamson and De Meyer, 2012), most path-breaking innovation ecosystems need an entity that *orchestrates* the process of integrating the ecosystem and realizing its EVP (Iansiti and Levien, 2004; Nambisan and Sawhney, 2011). Such an orchestrating position is often assumed by a central innovator in the ecosystem—the so-called *focal* actor (Adner, 2012; Clarysse et al., 2014). Accordingly, we focus in this paper on innovation ecosystems