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How entrepreneurs manage collective uncertainties in innovation ecosystems

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ABSTRACT

Radically innovative products and services are frequently developed and commercialized by new ventures. In this context, entrepreneurs may face the challenge of coordinating a complex network of actors in the presence of individual and collective uncertainties. Previous literature on entrepreneurship has focused on how entrepreneurs manage individual uncertainties (those that affect a single firm) rather than collective uncertainties that also affect members of the innovation ecosystem, which in turn may fundamentally affect the survival and growth of new ventures. Drawing on five longitudinal, inductive, in-depth case studies of start-ups and their innovation ecosystems, we find that current approaches for coping with individual uncertainties do not consider the impacts of uncertainties and actions on the innovation ecosystem partners. In that sense, entrepreneurs themselves may contribute to the propagation of uncertainties in the innovation ecosystem. We also identify processes by which entrepreneurs manage collective uncertainties in the innovation ecosystem, i.e., perceiving collective uncertainties, bridging uncertainties, conducting collective learning experiments and building a common template. This study improves understanding of how entrepreneurs act in uncertain environments.

1. Introduction

Radically innovative products and services are frequently developed and commercialized by new ventures, not by established companies (Ferriani et al., 2012). These radical innovations may generate profound and substantial transformations in existing value chains and, in some cases, may require the creation of new ones (Geels, 2004). In this situation, new ventures and other counterparties may face a number of high uncertainties over a prolonged period (Knight, 1921; Derbyshire and Garnsey, 2014). For example, suppliers may face uncertainties related to the development of technology or components. Complementary innovators are responsible for offering products and services that complement a given innovation (Gomes et al., 2016) and may encounter difficulties when selecting the best set of services or products that will allow customers to benefit from all the potential provided by the innovation. Customers may be unable to fully understand the true value of an innovation and, in some instances, may need to develop new capabilities to exploit it. In such contexts, Li and Garnsey (2013) suggested that the uncertainties that influence an entrepreneurial firm's performance could affect other partners, and vice versa. Theorizing and

building on Li and Garnsey's insights, we argue that entrepreneurs and their partners may experience both individual uncertainties (e.g., those that affect a particular actor) and collective ones (i.e., those that affect a group of actors). In this context, a crucial question faced by many ventures involved in developing and commercializing radical innovations is how to coordinate a complex network of actors in the presence of individual and collective uncertainties.

Indeed, the entrepreneurial journey of transforming a business idea related to a radical innovation into a feasible business might be characterized by individual and collective uncertainties. The following examples illustrate situations in which entrepreneurs face individual and collective uncertainties. A start-up "A" is engaged in the development of a new radical innovation product. The entrepreneur faces a critical uncertainty related to the technical specification of the product. Because the components and materials required to produce such product are already available in the market, potential suppliers do not need to engage in product development. In this case, this technical uncertainty is an individual one: it is not interdependent (i.e., it affects only start-up A), and it is perceived only by this start-up. The following example in turn refers to a collective uncertainty. A start-up "B" is

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involved in the co-development of a complex piece of equipment with three different suppliers (each one responsible for different parts of such equipment). This start-up and its partners have a common technical uncertainty related to a key technical aspect. Because this group perceives and is affected by this uncertainty, this uncertainty is a collective one. Certainly, collective uncertainties are not confined to technical aspects; they also concern customer requirements, regulations, and business models, among other aspects. In addition, in many cases, the collective uncertainties do not necessarily involve only entrepreneurs and suppliers, going beyond a production chain, including potential clients, investors, regulators, and other complementors that comprise an innovation ecosystem.

Although a substantial, long-standing scientific debate widely recognizes that the decisions and actions of entrepreneurs occur in the presence of uncertainty (e.g., Engel et al., 2014; Meijer et al., 2007; McMullen and Shepherd, 2006; Bhidé, 2000; Knight, 1921), the debate focuses on the antecedents and consequences of entrepreneurial decision-making and action under uncertainty in new venture developments (e.g., Podoyntitsyna et al., 2013; Mckelvie et al., 2011; Sarasvathy et al., 2014; Sarasvathy, 2001) and proposes tools for the management of uncertainties in start-ups (e.g., Loch et al., 2008). Notwithstanding, the literature has remained largely mute on the question of how entrepreneurs cope with collective uncertainties that affect different actors in the innovation ecosystem.

The management of collective uncertainties is critical for the survival of a new venture. In start-ups, which demand the creation of a network of co-development and complementors, the success of the entrepreneurial innovation relies on how the partners, not only the start-up, overcome their uncertainties. An illustrative example can show how entrepreneurs and partners may cope with a given collective uncertainty and the potential impacts on the development and commercialization of an innovation. First, the entrepreneurial firm and each partner may try to mitigate singly the uncertainty each one perceives, and such uncoordinated actions may lead partners to non-convergent results, such as fragmented and disperse learning, delays, and loss of resources. Some partners can decide to prematurely abandon the business due to this uncertainty. These possibilities may generate negative effects on the business, affecting not only the entrepreneurial firm but also other partners. Otherwise, the entrepreneur can perceive this collective uncertainty, detect the actors affected by such uncertainty, and act proactively to manage it.

Although some studies have suggested that uncertainties can have a systemic nature (e.g., Lange et al., 2013), there is the conceptual need to be much more precise. For instance, it is not clear what defines the systemic nature of uncertainties and the implications it brings to the development of a new venture. To date, prior literature on entrepreneurship (e.g., Sarasvathy, 2001) and uncertainty management (e.g., Rice et al., 2008) do not formally distinguish between individual uncertainties and collective uncertainties. However, such distinction is relevant for theory and practice. A growing body of research recognizes that many start-ups and their partners are interdependent, notably in high technological businesses, such as advanced materials, biotechnology, IT, or solar energy (Lubik and Garnsey, 2016). In these situations, the success of an entrepreneurial innovation not only depends on how the entrepreneurs overcome their own individual uncertainties but also - and sometimes, moreover - on how they overcome the uncertainties that affect their partners. If the entrepreneurs focus only on individual uncertainties (e.g., selection of the entrepreneurial opportunity, definition of the entrepreneurial team) and ignore the collective uncertainties (e.g., common technological or market uncertainties among partners), the new venture could fail to bring the innovation to the market or the customers may have a limited experience using the innovation. This possibility of failure also applies to situations in which the entrepreneurs and their partners do not properly address some relevant collective uncertainties (e.g., without a coordination of efforts). Therefore, managing collective uncertainties

might improve the likelihood of success for a new venture.

Mckelvie et al. (2011) warned that treating the concept of uncertainty broadly, without depicting its characteristics, might make the interpretation of studies and their findings difficult. In this vein, the construct of collective uncertainties represents an analytical development that aids to improve and expand the current understanding of entrepreneurial action. While the current approaches for managing individual uncertainties focus on the entrepreneurs' stand-alone perceptions as implicit in studies on the management of uncertainties, exemplified by Maine et al. (2015) and Rice et al. (2008), coping with collective uncertainties implies dealing with the heterogeneity of perceptions among their partners. In this way, Hall et al. (2014) noted that the traditional approaches to uncertainty management focus on the manner in which a single firm addresses the uncertainties that might affect its own performance. However, external actors may perceive uncertainties differently and act in divergent ways, affecting the coherence of the entire process of value co-creation in which the new venture and its partners are engaged. Although the existing literature indicates how entrepreneurs employ their networks to access resources (e.g., information, funds) to cope with entrepreneurial uncertainties (e.g., Kim and Vonortas, 2014), these studies provide few insights into how entrepreneurs cope with uncertainties that also affect their partners. Therefore, the distinction between individual and collective uncertainties enlarges the understanding of entrepreneurial action and resource allocation. The logical deployment of the concept of collective uncertainties is to understand why, when, under which conditions and how entrepreneurs decide to spend their scarce resources on the management of collective uncertainties for the benefit of the business. Moreover, such distinction also allows better addressing the uncertainties that affect interdependent actors: how a particular uncertainty becomes collective, how to identify the number of actors affected by a particular uncertainty and how actors interact to cope with such uncertainty.

Despite the fact that scholars have attributed great importance to external partners for new venture creation and development, notably in circumstances in which they are engaged in co-creating value, surprisingly, scholars have not dedicated attention to developing the collective dimension of uncertainty and exploring how entrepreneurs manage uncertainties that affect their partners. Based on a literature review, Sydow et al. (2013) found that studies on uncertainty at the network level do not focus on the management of uncertainties that affect the network. Salerno et al. (2015) and Gomes et al. (2016) noted that the manner in which entrepreneurs cope with uncertainties in the innovation ecosystem remains an important gap in the literature. We address this specific gap. The following research question guided our analysis: how do entrepreneurs manage collective uncertainties in the innovation ecosystem?

To approach our research question, we build upon the innovation ecosystem construct, which offers a useful theoretical perspective for investigating the phenomenon of managing uncertainties that affect external interdependent actors in a network of value co-creation. Overholm (2015) defined an innovation ecosystem as a network of counterparties connected to jointly create value. Adner and Kapoor (2010) argued that the innovation ecosystem construct is intended to make explicit the interdependence between two groups of actors: the first consisting of partners dependent on one another for survival (e.g., suppliers, buyers, focal firm) and the second comprising actors that are less closely attached, but are fundamental to the successful development and commercialization of a complex innovation (e.g., regulators). In this way, the innovation ecosystem approach allows addressing actors' interdependence (Adner, 2012; Adner, 2006; Li and Garnsey, 2013), including in relation to uncertainties, that is, when entrepreneurs and their partners face collective uncertainties (those that affect a group of actors). Therefore, the innovation ecosystem concept provides an appropriate level of analysis for entrepreneurial action in such conditions and allows us to address the management of collective

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