



University capabilities in facilitating entrepreneurship: A longitudinal study of spin-off ventures at mid-range universities

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ABSTRACT

This paper investigated how universities facilitate the process of spin-off venture formation based on academic research. Building on a capability perspective, we add to the literature on university characteristics and resources by exploring how the university context impacts the entrepreneurial process. We based our study on two mid-range universities and followed the start-up process of four spin-off ventures. Based on the results of our longitudinal study, we propose a set of three university capabilities that facilitate the venture-formation process: (1) creating new paths of action, (2) balancing both academic and commercial interests, and (3) integrating new resources. Each capability is particularly important for specific phases in the venturing process. Our findings suggest that these capabilities are dependent on prior spin-off experience and reside within several actors both inside and outside of the university. Furthermore, universities with weaknesses in the identified areas can take strategic action to develop these capabilities to some degree.

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1. Introduction

Many countries are undertaking university reform with a view toward increased commercialization of the results of public research (Wright et al., 2007). Universities are setting up institutional arrangements such as technology transfer offices (TTOs), incubators, entrepreneurship centers, and internal seed funds to increase the commercialization of research (Rasmussen et al., 2006). In particular, many countries and universities have emphasized the creation of university spin-off firms (USOs) as an important tool for the commercialization of research (Shane, 2004; Wright et al., 2007). The growing interest in USOs among policy makers and the large amount of resources used to support USOs (Lockett and Wright, 2005) call for more research to better understand how universities can facilitate the creation of new research-based ventures (Markman et al., 2008). In this paper, a USO is defined as a new venture initiated within a university setting and based on technology derived from university research. By following four start-up processes longitudinally, this paper seeks to elucidate the types of capabilities in the university context that promote the initiation and early development of USOs.

University characteristics leading to USO formation have been extensively studied. For example, it has been found that higher R&D

expenditures (Lockett and Wright, 2005), intellectual eminence (Di Gregorio and Shane, 2003), specific research fields (O'Shea et al., 2005), older TTOs (Powers and McDougall, 2005), more resources invested in TTO personnel (O'Shea et al., 2005), and having a culture that supports USOs (Franklin et al., 2001) all make a university more likely to have a high USO rate.

Most of these factors explain the characteristics of environments that facilitate USOs but provide little information about how such environments are created. As several studies have pointed out, the ability of universities to create USOs is path dependent (Kenney and Goe, 2004; O'Shea et al., 2005) and is likely to be a result of a historically high USO rate (Shane, 2004) and favorable regional conditions (Roberts and Malone, 1996). Thus, the characteristics and conditions of successful universities such as MIT (O'Shea et al., 2007) may be impossible for other universities to emulate. Still, USO activity does take place in less-developed regions (Benneworth and Charles, 2005; Degroof and Roberts, 2004) and mid-range universities (Wright et al., 2008). Consequently, we propose that despite having unfavorable characteristics, many universities may be able to develop capabilities that increase their spin-off rate. More specifically, we investigated the following two research questions: *What are the university capabilities that facilitate the process of USO firm formation?* and *How can universities develop such capabilities?*

This knowledge is highly relevant for universities and policy makers seeking to increase the rate of USO formation. Most universities are not situated in a region with a strong entrepreneurial community for high-technology ventures and thus need to play

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a proactive incubation role by supporting USOs throughout their stages of development (Clarysse et al., 2005; Degroof and Roberts, 2004).

The identification of these university capabilities presents a significant methodological challenge. Several studies have provided important insight by using the university as the unit of analysis (Lockett and Wright, 2005; O'Shea et al., 2007), but how the universities actually contribute to the new-venture-creation process of USOs has been understudied. By using the venturing process as a unit of observation, this study keyed into the capabilities of universities and how they actually influence the initiation and early development of USOs. Prior studies have typically relied on cross-sectional data and retrospectively deduced the factors leading to the creation of new USOs. To observe this process more closely, our study followed the entrepreneurial process longitudinally. We analyzed the initial phases of the USO process from the recognition of the emerging business idea up to the launch of an independent new firm. These initial phases are crucial for the further development of USOs (Heirman and Clarysse, 2004) and are highly influenced by the university context from which they emerge (Moray and Clarysse, 2005).

In responding to the request for more fine-grained qualitative studies of the mechanisms leading to USO firm formation (O'Shea et al., 2005), we have made several contributions to the academic entrepreneurship literature. We looked beyond specific university characteristics and resources and identified a set of university capabilities that are likely to increase USO firm formation. Using a capability framework to guide our study, we developed a theory that improves the understanding of how specific university characteristics and incubation strategies are linked to university spin-off activity. Moreover, by using the USO-formation process as a unit of observation and collecting longitudinal data at both the firm and university levels, we have responded to the recent calls for more multi-level and holistic perspectives on university entrepreneurship (Mustar et al., 2006; Rothaermel et al., 2007). Our longitudinal study of emerging USOs contributes to our understanding of the role of different capabilities related to different phases and activities in the USO process. Finally, by studying four USOs from two European mid-range universities (Wright et al., 2008), we add to those empirical studies that focus on USO activity from strong research universities typically situated in high-technology regions in the US.

The next section outlines the capability perspective as a theoretical framework for analyzing the challenges of USO development within a university organization. The development processes of four USOs were analyzed to reveal how the university context influenced their development. Based on these cases, we propose three university capabilities that facilitate the process of creating USOs and derive propositions related to how universities can develop these capabilities. Finally, implications for further research and practice are provided.

2. Theoretical framework

2.1. The rationale for a capability perspective

A large share of the studies of entrepreneurial activity at the university level is based on cross-sectional data linking university characteristics with USO creation. Such studies imply that an increase in these characteristics should lead to the creation of more USOs. This knowledge is useful in predicting USO formation and gives important insight into favorable conditions, but it does not explain how USOs are created. USOs are heterogeneous (Mustar et al., 2006), and a too-static view of the factors influencing the USO process seems to put limitations on the development of theories explaining USO firm formation.

An expanding research stream has relied on resource-based perspectives (Penrose, 1959; Wernerfelt, 1984) to examine why some universities create more USOs than others (Druihe and Garnsey, 2004; Heirman and Clarysse, 2004; Lockett and Wright, 2005; O'Shea et al., 2005; Powers and McDougall, 2005; Vohora et al., 2004). These studies have provided important insights, but the static conceptualization of resource-based theory tends to be equilibrium oriented (Lewin et al., 2004; Lockett et al., 2008) and may not be fully able to explain how universities deal with idiosyncratic and dynamic processes such as USO formation. According to Lockett and Wright (2005), there is a need for more research showing the relation between the activities within the commercialization process and the university capabilities or routines needed to facilitate USO formation. As a result, there is a need for a more in-depth understanding of the organizational capabilities (Dosi et al., 2000; Teece et al., 1997) that facilitate the commercialization of research and new-venture creation within a university setting (O'Shea et al., 2008).

Organizational capabilities can be seen as an extension of the resource-based view, in which not only an organization's assets but also its capabilities lead to organizational performance (Wernerfelt, 1984; Winter, 2003). A resource can be defined as an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis (Helfat and Peteraf, 2003). Furthermore, "an organizational capability refers to the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result" (Helfat and Peteraf, 2003, p. 999). We thus propose that universities that have the appropriate capabilities to facilitate USO formation will be more successful in doing so.

2.2. The role of university capabilities

A university's capabilities that facilitate the creation of USOs are related to the university's ability to initiate and promote the venture-creation process. Arguably, these capabilities are most important during the earliest phases of the entrepreneurial process, when the university serves as an incubator organization for the nascent USO (Clarysse et al., 2005). When the new firm becomes an independent entity and has managed to reach the initial threshold of credibility (Vohora et al., 2004), the university becomes one of many stakeholders that influence the USOs further development and growth (Wright et al., 2006). Therefore, a key element of university capabilities for fostering USOs is related to the ability of the university to enable the initiation of entrepreneurial activities. Entrepreneurial activities can be defined as activities that center on the identification and exploitation of opportunities (Zahra et al., 2006).

To develop commercial opportunities based on university research, both the creative ability to explore new business opportunities and the ability to exploit these concepts through transformation into a viable business are important (March, 1991; Rosenkopf and Nerkar, 2001). Exploration may be defined as the pursuit of new knowledge (Levinthal and March, 1993) such as the experimental process of searching for new commercializable ideas. During the exploratory opportunity-seeking process, the research-based knowledge of the university faculty must be transformed into commercial models showing how resources can be linked to form a new venture and meet market needs (Shane, 2003). University inventions are often far from market ready but may have significant potential. For instance, Shane (2000) showed how the same university invention formed the basis of eight different business ideas depending on the situation and prior experience of the entrepreneurs.

One of the major challenges for new ventures is to identify and acquire an initial resource base (Brush et al., 2001; Penrose,

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