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Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size?

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ABSTRACT

While prior studies recognize the importance of knowledge accumulation capabilities in innovation performance, current research has still failed to empirically identify its role with regard to different types of innovation performance. The objective of this paper is to address this knowledge gap and to explore the relationships between internal knowledge creation and absorptive capabilities, and incremental and radical innovation performance. The study also contributes to analyzing the complex effect that organizational size has in the whole innovation process, influencing its antecedents (internal knowledge creation capability and absorptive capability) as well as its outputs (incremental and radical innovation performance), as the literature has produced inconsistent results and the issue is subject to continuing debate. This study demonstrates that incremental innovation performance is positively affected by both knowledge accumulation capabilities and size. However, results show that only absorptive capability has a positive direct effect on radical innovation performance, whereas size has a negative non-significant effect on it. The effect of size on knowledge accumulation capabilities also turns out to be mixed. It appears to increase internal knowledge creation capability, but it does not affect the absorption of new external knowledge.

1. Introduction

The literature demonstrates that a firm's survival and generation of economic rents is explained by its ability to obtain both incremental and radical innovation performance, for which a balance between the two is required (Farjoun, 2010; He & Wong, 2004; March, 1991; Probst & Raisch, 2005). Although a high level of efficiency can be achieved with incremental innovation performance, radical innovation performance is needed to avoid generating competence traps (Levinthal & March., 1993). However, obtaining radical innovation performance is inherently more uncertain, involves higher levels of risk (Chandy & Tellis, 1998), and requires a long time period, and more intangible assets and tacit knowledge (Nonaka, 1994; Teece, 2007).

Innovation performance is studied in many disciplines and has been defined from different perspectives (Damanpour & Wischnevsky, 2006). This has led to a somewhat confusing definition of innovation performance in the literature, which mixes elements such as capabilities and attitudes with outcome elements. From the Competence-Based Approach, in the present paper the definition of innovation performance is limited to outcomes or consequences.

The dynamic aspects of the competence-based approach covered by the dynamic capabilities approach (e.g., Cepeda & Vera, 2007; Teece, 2007) shift the focus of analysis to the study of the processes of knowledge accumulation to obtain innovation performance, as there seems to be some consensus in the literature that innovation is an outcome of new knowledge (Cohen & Levinthal, 1990; Kim et al., 2012; Tödtling et al., 2009). However, the literature identifying the key aspects to develop innovation performance based on knowledge accumulation capabilities (Jiménez-Jiménez & Sanz-Valle, 2011) requires additional conceptual and empirical research (Kim et al., 2012; van Wijk et al., 2008). Firms can accumulate new knowledge by generating it internally, through a process of internal knowledge creation grounded on the skills, knowledge and experiences of their employees (Smith et al., 2005), by acquiring it from external sources through the development of their absorptive capability (Cohen & Levinthal, 1990), or by implementing a strategy to accumulate new knowledge that combines both these options.

Prior studies in the literature focus on the antecedents of radical innovation performance (e.g., Herrmann et al., 2007). Numerous theoretical studies have analyzed the impacts that each of these knowledge accumulation capabilities has on innovation performance (e.g., Howells et al., 2003; Lichtenthaler & Lichtenthaler, 2009; Zahra & George, 2002). Recent empirical research analyzes the influence on innovation performance of different sources of knowledge, both internal and external to the firm (e.g., Cassiman & Veugelers, 2006; Vega Jurado et al., 2008). However, few empirical studies analyze the interrelationship between the different processes of knowledge accumulation in the firm and innovation performance from a perspective of capabilities (Jiménez-Jiménez & Sanz-Valle,

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2011). Advances in the study of the impact and the relationships between a firm's different knowledge accumulation capabilities and its innovation performance have been truncated, mainly due to the lack of consensus and rigor in the conceptualisation and measurement of these capabilities, particularly absorptive capability (Camisón & Forés, 2010).

The lack of a direct empirical measurement for these knowledge accumulation capabilities has yielded divergent and sometimes contradictory results. If the literature analyzing the effect of knowledge accumulation capabilities on innovation performance is scarce and inconclusive, attempts to analyze the specific influence of each one of these knowledge capabilities, and their interrelationships, on different types of innovation performance according to their degree of radicalism are even more so. Most studies examining the effect of knowledge accumulation capabilities on innovation performance do so with regard to technological innovation (e.g., Darroch, 2005). Furthermore, almost all studies analyzing radical and incremental innovation performance focus on the effect that a specific knowledge source (internal or external) has on both innovative outputs, without adopting a capability-based approach that allows the conceptual distinction to be made between the different constructs (e.g., Cantner et al., 2011; Forsman, 2011; Ritala & Hurmelinna-Laukkanen, 2013; Soosay et al., 2008; Tödtling et al., 2009), thus hindering research from focusing on identifying the structures and processes through which they are developed.

Premised on the dynamic capabilities approach, this study attempts to analyze the extent to which different types of innovation performance rely on specific knowledge accumulation capabilities and the complex links among them. In other words, we attempt to study how different modes of knowledge accumulation can facilitate innovation performance with different levels of radicalness. This study also tries to clarify and extend the evidence on the effect of one of the most extensively analyzed organizational characteristics in the innovation field, namely organizational size (Camisón et al., 2004; Damanpour, 1992; Damanpour & Wischnevsky, 2006).

The literature demonstrates that the explanatory power of the organization members' capabilities and attitudes on innovation performance (e.g., Chandy & Tellis, 1998) is higher than that of certain organizational characteristics such as size. However, the effect of this variable on innovation performance is not altogether clear. While a number of studies have analyzed the direct effect of size on the degree of innovation (e.g., Arias-Aranda et al., 2001), and on innovation in terms of R&D, new products and processes or patents (e.g., Cáceres et al., 2011; Laforet, 2008), less attention has been paid to controlling for this effect on different types of innovation performance. Moreover, the evidence of size on incremental and radical innovation performance reports contradictory results; although knowledge accumulation is one of the antecedents of innovation performance that, along with size, has been most widely studied, relatively little empirical research has been reported on the effect of size on internal knowledge creation capability and absorptive capability. The studies that assess the effect of size on knowledge management capabilities focus on knowledge transfer, also reporting inconclusive results (van Wijk et al., 2008). For this reason the present study aims to unravel the impact of organizational size on both radical and incremental innovation performance, and on the main knowledge accumulation capabilities that determine them, which will reveal in greater detail the complex antecedents and their interactions that intervene in the development of the innovation process.

The next two sections explain the theoretical framework and hypotheses. The methods and results are then reported. The final section discusses the main implications for theory and practice, the study limitations and future research avenues.

2. Theoretical framework

The dynamic capabilities approach emphasizes that to succeed, or even survive, firms must be able to continuously develop, improve and renew their products and processes, which protect them against imitation by their competitors and against the technological obsolescence resulting from the life cycle of the industry in which they are competing (Teece, 2007; Teece et al., 2007). Teece (2007: 1319) defines dynamic capabilities as those that "enable firms to create, deploy, and protect the intangible assets that support superior and long-run business performance".

The benefits and tangibility of dynamic capabilities depend on the underlying knowledge accumulation processes that allow firms to develop, gain, reshape and put into use new internal and external knowledge (Lichtenthaler, 2009). Analysis of the knowledge accumulation process (Jiménez-Jiménez & Sanz-Valle, 2011) should pay attention to two sub-processes: internal knowledge creation and external knowledge absorption. The interplay between these two capabilities and innovation performance is the central point on which the exploratory model is built. The differentiation between the two knowledge accumulation capabilities is based on the nature of the sources of knowledge—internal or external to the firm—used to generate new knowledge (Denford, 2013; Zott, 2003).

Internal knowledge creation capability involves sustaining a continuous internal system for the creation, processing, dissemination and embodiment in the firm of new knowledge that increases the existing knowledge stock. According to Bierly & Chakrabarti (1996), internal knowledge creation occurs when members of the organization generate, transfer and integrate new knowledge within the boundaries of the firm. Internal knowledge creation capability entails the addition of new components in the firm's knowledge base through organizational creativity, experience, apprenticeship, experimentation, R&D, and problem solving (Bontis et al., 2002; Nonaka, 1994; Smith et al., 2005). It also covers renewal of the knowledge stock through firm's employees exchanging their existing knowledge and combining it in new ways (Danneels, 2008; Helfat & Peteraf, 2003; Rosenkopf & Nekar, 2001; Zollo & Winter, 2002). As Smith et al. (2005) point out, implicit in the notion of exchange is the assumption that individuals hold different levels and types of knowledge and they will engage in teamwork and communication to learn from one another.

Internal knowledge creation is, fundamentally, generated by R&D investment and internal problem solving (Grant, 2000). However, firms—particularly those belonging to low- and medium-technology industries—can create knowledge through other innovative activities that are not based exclusively on formal R&D (Santamaría et al., 2009), mainly through creativity and experimentation. In the context of organizations as open systems, *teamwork* enables continuous internal knowledge creation by exploring complex and difficult issues from many points of view. It facilitates the sharing of strategies, ideas, and knowledge among members and across units and reduces misunderstandings, thereby enabling a common language, cognitive maps and a shared vision to develop (Nonaka, 1994). Teamwork is also considered a powerful tool to help integrate new knowledge within the organization that can subsequently be applied to different situations, guaranteeing the firm's constant strategic renewal. The firm's directors can also collaborate in the amplification and crystallization of new created knowledge (Nonaka & von Krogh, 2009) by developing an appropriate structure, an organizational culture to attract and retain qualified human capital, a climate that favors risk taking, a leadership focused on knowledge creation and learning objectives, as well as a clearly recognizable mission to foster employees' identity and alignment with the firm's strategy (Nonaka, 1994; Smith et al., 2005).

Internal knowledge creation is usually a reaction to a perceived need for that knowledge which depends on the firm's experience and knowledge base (Smith et al., 2005). However, it should be recognized that as agents in constant contact with their external environment, members of a firm can create knowledge internally in the firm from external ideas or *information*. The contribution of both sources of knowledge to internal knowledge exploration is considered in the definition of the 'inventive capability' by Lichtenthaler & Lichtenthaler (2009). However, this internal knowledge creation derives from a latent internal need that is developed

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