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Openness and management systems integration: Pursuing innovation benefits

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ABSTRACT

In a global and highly competitive environment, innovation is becoming riskier and costlier. Against this backdrop, firms are challenged to allocate their innovation resources efficiently to obtain the most benefits. To this end, integration of management systems and open innovation are internally- and externally-oriented managerial practices, respectively, that may foster innovation efficiency. However, they have been scarcely researched jointly. Based on longitudinal analyses of 220 Spanish firms, this study concludes that integrating management systems could foster innovation efficiency. Conversely, open innovation might hinder it. It is also evidenced that innovation efficiency is relevant to boost the sales productivity of new products.

1. Introduction

In a challenging world dominated by fast changes, firms are pushed to innovate efficiently, optimizing their limited resources to benefit their stakeholders through new products or processes (West and Anderson, 1996; Wong et al., 2009). It is thus a primary managerial challenge to attain an efficient innovation process so that firms can keep growing. Stated differently, firms should adopt the accurate managerial practices that boost innovation efficiency and consequently, expect to grow sustainably.

Guided by efficiency, firms should produce the appropriate outputs that pay off the resources used in the innovative process (Fichman, 2004). Not only the firms' internal trade-offs are important in this process, but also their own performance compared to their key competitors'. In this line, innovation efficiency is defined as the relative efficiency of firms for transforming resources (inputs) into innovations (outputs) (Deprins et al., 1984), so firms that are more efficient innovating might achieve more internal and external benefits as follows. Firms innovating efficiently use less resources to innovate (Cruz-Cázares et al., 2013; George et al., 2002; Greco et al., 2017) and create a stronger innovative basis due to their learning capabilities (Weerawardena et al., 2006). Once firms increase their innovation efficiency (i.e., the process of transforming resources into innovations), they might enhance their performance due to the commercialization of such innovations, which occurs in a second stage (Guan and Chen, 2010; Wang et al., 2016; Wang and Wang, 2012). Therefore, firms innovating efficiently might also achieve better sales productivity results when commercializing their new products (de Leeuw et al., 2014).

The OECD (2008) highlights that organizations operate within a global and highly competitive environment so innovations are becoming riskier and costlier. This challenging landscape has led firms to increasingly open their innovation processes to collaborate with external partners, including suppliers, customers, universities, among others (OECD, 2008). This paradigm, referred to as open innovation (OI), describes how firms interact with external organizations to attain their innovation goals using less resources and

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exploiting those new outcomes in the market (Chesbrough, 2007, 2003). OI is therefore aimed to improve innovation efficiency. More specifically, a firm can be defined as more efficient in its OI approach than another if it obtains better innovation outputs starting from similar OI inputs (Greco et al., 2017). Although the existing literature about OI is very extensive (Lopes and de Carvalho, 2018), the concept of innovation efficiency in the OI literature is surprisingly an under-researched topic (Greco et al., 2017).

Besides seeking innovation efficiency through OI, firms should also focus on their internal procedures. Management systems (MSs) describe such procedures, which are aimed to enable the fulfillment of specific objectives related to quality, environment, among others (ISO, 20178). In the innovative process, these aspects should be considered and integrated for achieving the requirements of the new developments (von Ahsen, 2014). Since each individual MS is very specific and narrow in scope, their integration is a primary managerial task to optimize resources and results (Bernardo et al., 2009; Jørgensen et al., 2006; Salomone, 2008). Therefore, this research focuses on the role of IMS as a potential driver of innovation efficiency, which relationship in literature remains scarcely explored (Nunhes et al., 2016). Due to their relevance to this topic, this study focuses on Quality MSs (QMSs) (Palm et al., 2016), and its integration with Environmental MSs (EMSs) (Simon et al., 2014; von Ahsen, 2014).

This research aims to study the roles of IMS and OI in pursuit of innovation efficiency, so firms can attain a better performance. In this effort, firstly innovation efficiency is analyzed in the context of IMS. Secondly, the relationship between innovation efficiency and firm performance is analyzed from the viewpoint of innovative sales productivity. Finally, this study analyzes the role of OI in the relationship between innovation efficiency and firm performance.

2. Theoretical framework

Since efficiency was proposed as a relevant measure to assess how resources are optimized to produce outputs (Deprins et al., 1984), its application on innovation has become increasingly important to countries (Acs et al., 2002; Drivas et al., 2018; Guan et al., 2016; Guan and Chen, 2010; Liu et al., 2017) and firms (Cruz-Cázares et al., 2013; Hashimoto and Haneda, 2008; Wang et al., 2016). These studies highlight the need of measuring innovation efficiency in order to optimize firm performance, but few have focused on the implications of implementing both managerial practices, IMS and OI (Hernandez-Vivanco et al., 2016).

2.1. The integration of management systems as a driver of innovation efficiency

In pursuit of innovation, the knowledge-based view theory (Grant, 1996) postulates that firms must stablish the necessary coordination links that enable the specialists' knowledge integration. Nonetheless, this task involves several challenges, and minimizing goal conflicts between the different actors is critical. From a complementary perspective to deal with this challenge, MSs are defined as "the way in which an organization manages the inter-related parts of its business in order to achieve its objectives" (ISO, 20178). Thus, MSs should facilitate the links that enable knowledge integration through the accurate management of the different, but still inter-related parts of the business. Moreover, MSs are focused on achieving the business objectives, so they are intended to optimize firms' resources, which should enhance innovation efficiency (Matias and Coelho, 2011). However, this relationship remains unclarified for QMSs and EMSs, as discussed next.

Several studies have found that a positive relationship between QMSs and innovation is conditioned to factors such as: i) the cultural changes achieved through its implementation (Moreno-Luzon et al., 2013), ii) only specific dimensions of the MS including leadership and people management (Hoang et al., 2006; Prajogo and Sohal, 2004), and iii) firms' openness (Hoang et al., 2006), among others. Others state that virtually every dimension of QMSs is positively related to innovativeness (Kim et al., 2012; Perdomo-Ortiz et al., 2006) whilst a final trend is opposite, and suggests they are detrimental to innovation (Prajogo and Sohal, 2001).

A similar scenario can be found in the EMSs literature. Radonjič and Tominc (2006) suggest EMSs are catalyzers of technological innovations, in accordance to Wagner (2008). Other studies suggest positive associations with certain types of innovations (Wagner, 2007, 2008), although such relationships could turn into negative if EMS is not diffused across the organization (Prajogo et al., 2014). Lastly, Ziegler and Seijas Nogareda (2009) found no clear causality.

Despite the lack of consensus of the existing literature analyzing QMSs and EMSs independently, there seems to be less disagreement about the positive relationship between their integration and innovation (Bernardo, 2014; Nunhes et al., 2016). Thus, the role of IMS in the innovative performance is further developed based on the knowledge-based view theory.

IMS intends to unify several function-specific MSs (Jørgensen et al., 2006) into one system (Karapetrovic, 2003). The derived integrated control allows firms to increase their competitiveness focused on their performance (Renzi and Cappelli, 2000). In this process, firms should first integrate the individual MSs' goals (Bernardo et al., 2009; Jørgensen et al., 2006; Nunhes et al., 2017; Salomone, 2008), which is also one of the most complex management issues according to the knowledge-based view. By this means, IMS contributes to the optimization of resources (Abad et al., 2014; Salomone, 2008; Santos et al., 2011) and, analogously to the enhancement of 'organizational' efficiency (Nunhes et al., 2016; Simon and Douglas, 2013), it could boost 'innovation' efficiency. Such benefits would become more noticeable as IMS levels increase; i.e., when firms integrate their most strategic goals, which leads to the extensive implementation of IMS across the firm, including operations and tactics. Thus, firms that integrate all the aspects of the individual MSs are fully integrated as opposite to those that manage each MS independently, called non-integrated (Bernardo et al., 2009).

Regarding the relationship between IMS and innovation efficiency, Matias and Coelho (2011) showed preliminary empirical results about the critical role of IMS as the starting point of innovating with added efficiency. The authors support that through IMS, firms take advantage of the compatibility of the individual MSs. As a result, they reduce the amount of resources needed to pursue the goals of each of the systems, which are also closely related between them since all MSs pursue continuous improvement (i.e., promote