THE DETERMINANTS OF INNOVATION PERFORMANCE: ANALYZING ORGANIZATIONAL CAPABILITIES.

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Abstract

Absorptive capacity theory has been central in understanding the importance of internal capabilities in taking advantage of external sources. This has driven multiple studies to consider firms internal capabilities when elaborating their empirical models. However, despite the number of studies carried out on this topic, the majority has focused on technological activities (mainly R&D) and has said little about the firm’s organizational capabilities. In this paper we highlight not only the relevance of technological capabilities but also the role of organizational capabilities in this process. The organizational dimension is analyzed by taking into account formal coordination mechanisms, that is to say, decentralization in decision-making and formalization in processes. The research draws on survey data from the Spanish Ceramic Tile Industry. The main results suggest that the effect of external knowledge acquisition on innovation is not only contingent on technological capabilities as advanced by previous literature, but also on certain organizational capabilities. In particular our study reveals formalization as an important attribute, which tends to exert a detrimental effect in transforming external knowledge into innovation results. Lastly, our results further suggest that the effectiveness of external knowledge exploitation can be contingent on the nature of the innovation (exploitative and exploratory).

Keywords: External knowledge sourcing, formalization, decentralization, R&D, exploratory and exploitative innovation.

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1. INTRODUCTION

A broad range of approaches have highlighted the necessity of studying innovation as a phenomenon taking place beyond the boundaries of the firm. Evolutionary (Lundvall 1992; Breschi & Malerba 1997) and innovation network theorists (Haakansson 1987; Baptista & Swann 1998) underscore the increasingly importance of interactions between organizations and external agents in the achievement of innovative results. Open innovation theorists have also analyzed how firms look toward the exterior in order to leverage useful knowledge when pursuing innovations and have even emphasized that external knowledge has gained importance in contrast to more traditional knowledge created through internal research and development (Chesbrough 2003; Laursen & Salter 2006).

Following this line of inquiry several empirical studies have analyzed the effect of external knowledge sourcing on innovation by taking into account the conditioning effect of factors such as industrial dynamics and the employment of different sourcing strategies. However the influence of relevant theories such as absorptive capacity theory (Cohen & Levinthal, 1990) have been central in understanding the importance of internal capabilities in taking advantage of external sources, particularly, technological and organizational capabilities. This has driven multiple studies to consider firms internal efforts when elaborating their empirical models. However, despite the number of empirical studies carried out on this topic, the majority has focused on technological activities (mainly regarding to R&D) and has said little about the role of firm’s internal organization in this process. Our aim is to contribute into this area of research by analyzing not only the technological capabilities of the firm, but also the role of organizational capabilities. In particular we will study formal coordination mechanisms.

Within organization theory coordination mechanisms have been advanced as fundamental in the alignment of the multiple activities taking place within the organization. Two main characteristics defining the firm’s coordination mechanisms are formalization in processes and decentralization of decision-making (Jansen, Van den Bosch, & H.W. Volberda, 2006). In this study we argue that these two elements exert a moderating effect between the sourcing of external knowledge and the attainment of innovation results because of the power they have in integrating the different parts conforming organizational knowledge. In the presence of high decentralization, employees are empowered to search beyond the internal boundaries of the firm thus identifying and assimilating external knowledge. Moreover, the broader space left for participation also encourages employees to be outward oriented, thus influencing positively the effect of external knowledge sourcing on innovation. Formalization, also aids in the coordination between different parts of the organization by facilitating knowledge exchange due to its efficacy in setting clear procedures. However, this positive effect has become questioned by some authors who defend that the implementation of formalized procedures will hamper the generation of new solutions because of the creation of inflexible structures and the reduction of employees motivation. Our purpose in this study is to deepen in the functioning of formalization and decentralization, and understanding if they are really acting as coordinating mechanisms.

In this respect we enrich the theoretical discussion involving the effect of organizational capabilities in the effectiveness of external knowledge exploitation and also, provide empirical evidence based on the Spanish Ceramic Tile Industry. This sector is of
particular interest because it tends to be geographically concentrated in industrial districts and most of the firms are considered to be small and medium-sized firms.

The paper is organized as follows: Section 2 presents the theoretical framework underlying this investigation and the proposed hypotheses. Section 3 establishes the basis of the empirical investigation, justifying the sample chosen and the measurements that have been used. Section 4 describes the analysis undertaken and presents the results. Section 5 puts forward the main conclusions extracted from the study and finally, section 6 presents the limitations of the study and possibilities for further research.

2. THEORETICAL AND EMPIRICAL BACKGROUND

2.1. External knowledge sourcing and innovation

Recent trends reflect the exposure of firms towards the exterior, and the progressive opening of more traditional hermetic organizational boundaries. Within this context, many current economic theories on innovation stress the role of external knowledge as an increasingly essential factor in the pursuit of innovations. For instance, the theory of open innovation has analyzed how firms look toward the exterior in order to leverage useful knowledge when pursuing innovations and has even emphasized, that external knowledge has gained importance in contrast to more traditional knowledge created through internal research and development (Chesbrough, 2003; Keld Laursen & Salter, 2006). Similarly other researchers, such as evolutionary theorists (Lundvall, 1992; Breschi & Malerba, 1997) or innovation network theorists (Haakansson, 1987; Baptista & Swann, 1998) underscore the increasingly importance of interactions between organizations and the various agents found in the environment. In summary, the bulk of research on this literature emphasizes that firm’s can and should use external knowledge sources for their innovation processes (Vega-Jurado et al. 2009).

Following this line of inquiry, several studies have made an effort in analyzing empirically the effect of external knowledge sourcing on innovation performance. However, results have showed that the effect is far from direct, but instead contingent on several factors such as the characteristics of the industry, the nature of external knowledge source and even the technological capacity of the firm. Industrial dynamics has been advanced as one essential factor exerting influence on organizations actions involving the use and the exploitation of external knowledge (Vega-Jurado et al. 2008a). For instance, in their study of UK manufacturing firms Laursen and Salter (2006) demonstrated that the chemical and the electrical industry exhibited the highest levels of external search, while low technology sectors such as paper and printing displayed lower levels. To this respect several studies showed that incentives for searching beyond organizational boundaries could vary across heterogeneous industries and their corresponding levels of technological opportunities and appropriability conditions among other characteristics (Levin et al., 1987; Klevorick, Levin, Nelson, & Winter, 1995).

Studies in this tradition have not only considered factors related with the external environment, they have also paid attention to the effect of choices shaping the firm’s sourcing strategy. Within this perspective it has been basically underscored that external knowledge sourcing can follow divergent patterns according to the strategy pursued,
including for example the choice involving the degree of exploration of new knowledge and the degree to which existing knowledge is reused or exploited (Katila & Ahuja 2002; Laursen & Salter 2004). Within this framework, the diversity, the intensity of the interactions and the type of partners has been considered (Chen et al. 2011). In this sense it has been observed that different strategies can have different effects on innovation. For instance, the use of a few new sources of innovation could be more important for more novel innovations whereas interacting with a broad variety of sources could be more relevant for incremental innovations (Laursen and Salter 2006). Also, in relation to the differences concerning the type of knowledge absorbed it has been advanced that as scientific partners such as universities are more oriented towards the development of new technologies, customers and suppliers have been characterized as optimizers of existing core competences (Brown & Eisenhardt, 1995; Faems, Van Looy, & Debackere, 2005).

Moreover, in the last years absorptive capacity has emerged as a valuable conceptual approach complementing studies analyzing external knowledge sourcing and its effect on innovation results. Absorptive capacity has recognized that organizations knowledge base is determinant in facilitating learning from external sources (Cohen & Levinthal, 1990). Moreover, this theory has been central in understanding the importance of internal capabilities in taking advantage of external sources, particularly, technological and organizational capabilities. This has driven multiple studies to consider the firm’s internal resources and capabilities when elaborating their empirical models. Regarding this last point, studies considering the combined strategy concerning internal and external technology sourcing have produced mixed findings.

In this sense, some authors have found that internal R&D and external knowledge acquisition are complementary in affecting innovation performance (Cassiman & Veugelers, 2006) while other scholars find a substitution effect between internal and external knowledge sourcing (Laursen & Salter 2006; Vega-Jurado et al. 2009). However, most of these studies have focused only on knowledge content (primarily technological knowledge), neglecting the important role of organizational capabilities in this process. This is surprising because even though Cohen and Levinthal’s analytical model considered R&D as a proxy of the knowledge base of the firm, in their theoretical framework organizational capabilities were fundamental in facilitating the transfer of external knowledge.

We argue that the introduction of organizational capabilities in these models could contribute to a better understanding of this phenomenon. In this sense, we consider that technological capabilities are not enough in understanding the process in which external knowledge is ultimately exploited and that organizational capabilities should be taken into account. Thus, in this study we aim to extend the literature on external knowledge sourcing and innovation by acknowledging the contingent effect of not only the firm’s technological dimension but also the organizational capabilities enabling the transfer and ultimate exploitation of external knowledge.

### 2.2. Deepening on organizational capabilities

The classical theory on organizational design hearkens back to the 40’s (Burns & Stalker, 1961; Weber, 1947) and over the last two decades this stream of the literature has flourished. Moreover, studies analyzing the effect of divergent organizational capabilities on innovation performance have become increasingly important
However, this research has focused on the role of organizational capabilities in leveraging internal knowledge towards innovation results and has neglected the relevance of external knowledge in this process. Only recent studies studying the different components of absorptive capacity have approximated our research question (Van Den Bosch et al. 1999; Jansen et al. 2005; Foss et al. 2010). Thus, we will draw on these studies in developing our arguments.

In this study we will study formal coordination mechanisms, which is one of the most important ways of integrating activities by directing attention and grouping together key resources and interdependent functions needed to develop innovations. Concretely we will study two main elements of firm’s coordination mechanisms: decentralization of decision-making and formalization in processes (Jansen et al., 2006).

Decentralization of decision-making indicates the extent to which subordinates are empowered to take part in higher-level decision-making processes (Jansen et al., 2005). A high degree of delegation reflects a low degree of centralization within an organization. To this respect the locus of authority and decision-making is moved from higher hierarchical layers downward in the organizational structure (Damanpour, 1991). The first studies anchored in the classical organizational theory described decentralization of decision-making as a practice, which principally enhanced efficiency in the decision-making process especially in fast moving environments (Galbraith, 1974). In this sense, as firms progressively face more complex environments transmitting, receiving and processing external information efficiently becomes highly relevant (Foss et al., 2010).

Moreover, as employees are empowered to take decisions and become in charge of additional responsibilities communication becomes more fluent and the quantity and quality of knowledge necessary for problem solving is enhanced (Jansen et al., 2006). Following this line of thought, this empowerment will provide employees with specific knowledge enabling the absorption of valuable external knowledge and a higher possibility of discovering more novel solutions (Cohen & Levinthal, 1990; Foss et al., 2010). Furthermore, participatory work environments also enhance organizational members’ awareness, commitment and involvement in the search for knowledge (Damanpour, 1991). This motivational element is again fundamental in the engagement of employees towards the search for knowledge outside and inside the organizational boundaries and ultimately facilitating innovation.

Bearing in mind the benefits of delegating responsibility we pose that the active participation of employees in decision-making facilitates the process that enables external knowledge to be exploited.

Hypothesis 1: Decentralization in decision-making exerts a positive moderating effect between acquisition of external knowledge and innovation performance.

Formalization describes the degree to which behaviors are programmed by formal explicit rules (Khandwalla, 1977). That is, the behavior of participants is predictable, thus, they know what to do and they react very quickly (Van Den Bosch et al., 1999; Jansen et al., 2005). Building on these attributes, formalization has been described as acting as a facilitator of knowledge exchange due to its efficacy in setting clear procedures, thus eliminating the need for further communication and coordination among subunits and positions (Van Den Bosch et al., 1999). In this sense, some scholars
argue that formalization and thus, codification is potentially important as a supporting mechanism for the entire knowledge evolution process (Zollo & Winter, 2002). It is argued that codified knowledge is easier to be retrieved in the appropriate time and increases the likelihood that firms’ members will identify opportunities for the transformation and exploitation of new external knowledge (Jansen et al., 2005).

However opposing this line of thought, other studies posit that a high level of formalization will have a negative influence on the flexibility of the firm and the spontaneity of its workers to respond to crisis situations, and tends to reduce creative input and discourage innovation (Vega-Jurado et al. 2008b). Similarly, Benner & Tushman (2003) argue that process management practices (i.e. TQM, ISO 9000 or Six Sigma) as an expression of formalization, generate organizational inertia not only through manufacturing but also by directly applying TQM in R&D settings, resulting in decreasing capabilities of the firm to experience and obtain disruptive results.

To this respect, formalization appears as a more controversial theme in the literature. In the one hand, it can be considered a mechanism enhancing coordination, and in the other hand; it inhibits knowledge flows because of the creation of rigidities within the organization and the possible loss of motivation among employees.

**Hypothesis 2a:** Formalization exerts a positive moderating effect between acquisition of external knowledge and innovation performance.

**Hypothesis 2b:** Formalization exerts a negative moderating effect between acquisition of external knowledge and innovation performance.

### 3. RESEARCH METHODOLOGY

In this research we conducted a 2011 survey focused on the firms belonging to the Spanish ceramic tile industry. Spanish ceramic tile firms play a relevant role in the international ceramic industry. Concretely, exports rates between 15 and 18% of international commerce have placed Spain as the third country worldwide in the sector (ASCER, 2011).1

The ceramic tile industry in Spain tends to be geographically concentrated in industrial districts. In particular, this tied network of actors is located in the province of Castellón, where 81% of the firms in the sector are located and approximately 94% of the Spanish production in the sector takes place (ASCER, 2011). For this reason there is a close link between firms and the following research institutes and universities: Technological Institute of Ceramics in Castellón, the Jaume I University, the University of Valencia and the Polytechnic University of Valencia among others. Moreover, the ceramic tile suppliers, such as manufacturers of equipment and frits and glazes producers, are also found in the province (Alegre, Lapiedra, & Chiva, 2004). Moreover, most of the firms are considered to be SMEs.

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1 ASCER is the Spanish association of ceramic tile producers.

2 Especially in the area delimited by the north of Alcora and Borriol, the west of Onda, the south of Nules and the east of Castellón de la Plana.
In general innovative behavior among Spanish ceramic tile producers is significant (Alegre & Chiva, 2008). Features of the ceramic tile industry suggest it belongs to the supplier-dominated trajectory of Pavitt’s taxonomy (Pavitt, 1984). Suppliers of equipment have been essential in the processes involving the production of ceramic tiles, reflected by the huge investments made by ceramic manufacturers in equipment during the last years (Flor & Oltra, 2004). Moreover, producers of frits and glazes framed in the chemistry industry represent a fundamental material supplier for ceramic manufacturing firms.

3.1. Sample selection

Our target population comprises around 132 ceramic tile manufacturers in Spain and the questionnaire was sent to all of the population. Thank you to the business association ASCER, we had access to the firms and our response rate was of 105, reflecting a very high representative sample according to previous respondent patterns of other studies focused in the same sector (Alegre and Chiva 2008). Our sample was composed of 105 final producers. After eliminating the cases in which missing data was detected the final sample raised to 98 firms.

3.2. Measures

3.2.1. Innovation performance

Innovation performance has been captured by scholars in multiple ways. Among these definitions the most popular have been the classifications distinguishing between product and process, incremental and radical and marketing and organizational innovation (Damanpour, 1991; OCDE/Eurostat, 2005). However, numerous studies have deepened in the understanding of multiple shades of innovation by using other more elaborated typologies. Concretely, since the seminal article of (March, 1991) exploration and exploitation innovations have been widely employed to capture two differentiated strategies in pursuing innovative results. In this sense, exploitative innovations are principally based on highly related firm’s knowledge and are directed to meeting current market demands while exploratory innovations are built on more distant knowledge and aim at meeting future market demand (Benner & Tushman, 2003; Jansen et al., 2006; Greve, 2007).

The study of a single industry makes very useful the distinction of exploration and exploitation in the sense that more simple classifications of innovation do not fully capture the multiple features of innovation outcomes. Following measurement scales based on this stream of the literature (Jansen et al., 2006) we constructed our dependent variables: Exploratory and exploitative innovations. Exploratory innovation captured ideas such as the degree in which the firm had identified and penetrated in new markets or explored new technological areas, while exploitative innovation captured ideas such as the intensity in the improvement goods and services and the reduction in the costs of production (For a detailed enumeration of the measures and items see the Appendix). The Cronbach’s alpha (α) for both constructs was of 0.74 indicating that the items forming this index were reliable. According to these results we created a construct by calculating the mean of the corresponding items, which ranged between 1 and 3.

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3 We estimated the population by considering the final producers firms’ belonging to the business association ASCER that comprises 132 firms.
3.2.2. External knowledge sourcing

In conceptualizing external knowledge sourcing studies perspectives have been twofold, one stream of the literature has discriminated between cooperating and buying external knowledge (licensing, contracting R&D...), and other studies have focused on analyzing external sourcing according to the partnering with the agents (suppliers, clients, competitors, universities...) involved in the process. However, usually these studies have used general questions informing about the existence of a relationship with external agents or through the involvement of the firm in particular governance modes. However, in this study we follow a more integrative perspective considering the different types of innovation activities involving the acquisition of external knowledge during the last three years (OCDE/Eurostat, 2005). Specifically we considered if the firm realized external R&D, acquisition of machinery and equipment, acquisition of hardware and software, acquisition of additional external knowledge, training or consulting. The Cronbach’s alpha ($\alpha$) of the scale was of 0.85 indicating that the items forming this index were reliable. According to these results we created a construct integrating the questions related to the sum of the different activities. The final variable was calculated by grouping the value of external sourcing into three groups: 0 when the firm had realized no activity, 1 when the firm had realized between 1 and 3 activities and 2 when the firm had realized between 3 and 6 activities, thus representing in an ordinal scale the breadth of external knowledge sourcing activities.

3.2.3. Internal technological capabilities

Traditionally the firm’s efforts towards the creation of capabilities needed to acquire and assimilate external knowledge have been approximated through indicators based on R&D activities. A very common measure in empirical studies tends to be the share of R&D expenditure in total turnover (Schmidt 2010; Laursen & Salter 2006). However, we choose the percentage of employees dedicated to internal R&D as a better indicator employed by other studies in order to approximate the firm’s internal technological capabilities. This measure was used because the number of employees is a more stable indicator than firm’s total R&D expenditure over sales, which could punctually suffer large variations. For instance, a firm could decide to make a one-off purchase of expensive equipment or have higher sales fluctuations in a specific year because of external reasons. An additional reason for deciding in favor of this measurement was that employees, that is to say, human capital, is more related with tacit knowledge and experience (Muscio, 2007).

3.2.4. Formal coordination mechanisms

The creation of capabilities needed to acquire and assimilate external knowledge cannot be considered only through the technological dimension. From the theoretical perspective of absorptive capacity the firm’s ability of acquiring, assimilating and exploiting external knowledge is not the simple sum of its employee’s abilities but also the capability of transferring knowledge across and within subunits (Cohen & Levinthal, 1990). In this sense, the particular characteristics of the firm’s formal coordination mechanisms becomes determinant in successfully understanding the link between acquisition of external knowledge and firm’s innovation performance. Formalization and delegation of decision-making are central characteristics in defining the firm’s formal coordination mechanisms (Jansen et al., 2006). Thus, by measuring these two features we will characterize the firm’s coordination mechanisms and be able to understand how it is affecting the transformation of external knowledge into
innovation outputs. For this, we followed the description of formalization and decentralization used by Jansen et al. (2006) and created two questions that synthesized the meaning of both practices. In the case of formalization, respondents were asked if norms and established procedures were systematically followed within the organization. In this sense, the question captured to what extent rules and procedures occupied a central place in the organization. In the case of decentralization, we asked whether working teams had autonomy for decision-making. In this sense, the questions captured to what extent employees are encouraged to make their own decisions. In both cases, the responses were classified from “totally in disagreement” to “totally in agreement”, taking values from 1 to 4.

3.2.5. Control variables

The research model in the study also presents several important controls in order to avoid possible confounding effects. The Schumpeterian hypothesis argues that large firms have an innovation advantage over smaller firms in terms of output because firm size affects the endowment of important inputs for the innovation process, such as achieving economies of scale in R&D, the ability to spread risks over a portfolio of projects and access to a larger pool of financial resources (Veugelers, 1997). In this sense, while small firms cannot risk “betting on the wrong horse”, larger firms could afford running multiple projects increasing the chances of better exploiting external knowledge (Schmidt, 2010). For these reasons, the natural logarithm of the total number of employees was used as a measure for size.

Previous studies have shown that the age of the firm can also have an influence on innovation results. One the one hand, older firms are more likely of achieving more experience than newer firms, which in turn can be positive for enhancing innovation (Sørensen & Stuart, 2000). One the other hand, some authors have underlined possible negative effects of organizations antiquity. As firms mature they have a higher possibility of becoming more dependent on their routines becoming inflexible and rigid, thus potentially hampering innovation (Hannan & Freeman, 1984). In response to this concern we control for the number of years from the firm’s foundation.

The last control introduced will be an indicator of the belonging of the firm to a group. Organizations, which are part of a group may also exert different behavior in relation to innovation results. In this sense, these firms may have the opportunity to access additional group resources that can be used to achieve innovation (Gooding & Wagner 1985). In order to measure the dependency of the firm to a group we used a dummy variable that takes the value 1 when the firm interacted with the same group of enterprises and 0 otherwise. In this sense, we understood that generally firms that had interacted in some way with their group could be approximated as firms belonging to a group.

4. ANALYSIS AND RESULTS

Table 1 presents the descriptive statistics and the bivariate correlations between the variables used in the regression models. From the table, it can be observed that nearly the majority of firms have acquired external knowledge and they have done it through a wide range of activities. This result confirms the increasing relevance of external knowledge in the process towards the achievement of innovation results. Moreover, the
importance of knowledge acquisition in this analysis also highlights that for the firms belonging to this sector it constitutes a generalized strategy. In the case of the internal capabilities of the firm the following data is shown: according to the variables related with firm’s technological capabilities, the average percentage of employees dedicated to R&D activities rises to 4.71%. In reference to decentralization of decision-making and formalization, these practices are on average quite high, even though formalization is more extended within the organization. Besides, the correlations between the independent variables of the study aren’t highly correlated. Furthermore, we calculated variance inflation factors (VIFs) and the maximum value reported was of 1.95, which is below the rule-of-thumb of 10 (Neter, Wasserman, Kutner, & Li, 1996). These indicators indicate that there are no problems associated with multicollinearity.

Table 2 present the results of the regressions on exploitative and exploratory innovations. Our hypotheses were tested using the standard ordinary least squares (OLS) regression techniques by means of four econometric models, two for each dimension of innovation, that is to say, exploration and exploitation. The first two models present the main effects and the controls of all of our explanatory variables. The next two models are concerned with the interaction effects. Interaction effects were created by multiplying the main variables together and were standardized to reduce any potential multicollinearity problems.

Overall, our models present high $R^2$ values, indicating that an important part of the variance is being explained. Model 1 explains 42% of the variance, and increases in 8% when interactions terms are included (model 3). Model 2 explains 40% of the variance and increases in 5% when the moderator effects are taken into consideration (Model 4). Moreover, from our results we derive that the changes in $R^2$ are highly significant thus indicating that it is correct to introduce moderator effects in our model.

The results related with main effects, that is model 1 and model 2, reveal that acquisition of external knowledge exerts a strong influence on both exploratory and exploitative innovation outputs. As we intuitively argued in analyzing the descriptive statistics, this result is in line with several streams of innovation literature, which underscore the importance of external knowledge sourcing in pursuing innovations (Lundvall, 1992; Chesbrough, 2003). Moreover, in the concrete case of ceramics we can further understand and characterize the results of our analysis. In the ceramic tile industry suppliers are main drivers of industry innovative behavior. In particular, suppliers of equipment have been key actors in the process involving the production of ceramic tiles. In this sense we believe that an important part of machinery sourcing is explaining the strong effect on exploitative innovations, which are very related with enhancing the productive capabilities of the firm. However in the case of exploratory innovations not only the acquisition of external knowledge is appearing as significant but also certain internal capabilities, such as R&D and decentralization. This latter result confirms us that while exploitative innovations are generally more related with acquisition of external knowledge involving the development of activities such as training, engineering and design activities, exploratory innovations are more dependent on R&D activities and certain coordination mechanisms such as decentralization of decision-making. This last result is in line with Jansen et al. (2006) study in which centralization in decision-making was advanced as detrimental for exploratory innovations. Moreover, size is the only control variable that appears as significant reflecting that bigger firms because of their greater access to additional resources are in advantage when pursuing innovations.
We further analyze the moderating effects in order to answer our research questions. As traditional studies on external knowledge sourcing have underlined, our study shows that technological capabilities stand as important moderators between acquisition of knowledge and innovation. In this sense, it is confirmed that the development of in-house R&D activities facilitates learning from external sources and its ultimate conversion into innovation outputs. However, as we explained in our theoretical arguments, previous empirical studies have neglected the role of organizational capabilities in this process. For this reason, we developed three hypothesis related with the role of organizational capabilities as moderators of acquisition of external knowledge and innovation. In the case of decentralization of decision-making the relationships are not significant, so no clear conclusions can be derived from these results. This result could be indicating that decentralization is only important in exerting a direct effect on exploratory innovations, but not in moderating the relationship between acquisition of knowledge and innovation. In the case of formalization our results are in line with our hypothesis predicting a possible negative effect on the exploitation of external knowledge. Our argument is based on the idea that formalization can hinder the process involving the transformation of external knowledge into innovations by generating inflexible structures and demotivation of employees among other causes. Moreover, our results present a significant negative moderating relationship only in the case of exploratory innovations. In this sense, this negative effect becomes even more relevant in the case of exploratory innovations because these innovations are build on higher distant and novel knowledge where the need for creativity is higher and more difficult to obtain through rigid structures.
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<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>Minimum</th>
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<th>3</th>
<th>4</th>
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<td>4</td>
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<td>4. Formalization</td>
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<td>0,13</td>
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<td>1</td>
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<td>0,02</td>
<td>0,31**</td>
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*p<0,10  **p<0,05
**Table 2**

Ordinary least squares Regression Results: Predictors of innovation performance

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<th>Main effects</th>
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<td>Acquisition of external knowledge</td>
<td>0,27***</td>
<td>2,95</td>
<td>0,23***</td>
</tr>
<tr>
<td>Technological capabilities</td>
<td>0,04</td>
<td>0,52</td>
<td>0,17**</td>
</tr>
<tr>
<td>Decentralization</td>
<td>0,07</td>
<td>0,75</td>
<td>0,22***</td>
</tr>
<tr>
<td>Formalization</td>
<td>-0,06</td>
<td>-0,76</td>
<td>-0,05</td>
</tr>
<tr>
<td>Size</td>
<td>0,41***</td>
<td>4,02</td>
<td>0,34***</td>
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<tr>
<td>Age</td>
<td>0,04</td>
<td>0,5</td>
<td>-0,01</td>
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<tr>
<td>Group</td>
<td>0,05</td>
<td>0,54</td>
<td>-0,03</td>
</tr>
<tr>
<td>Acquisition of external knowledge x Technological capabilities</td>
<td>0,34***</td>
<td>3,31</td>
<td>0,20***</td>
</tr>
<tr>
<td>Acquisition of external knowledge x Decentralization</td>
<td>0,00</td>
<td>0,03</td>
<td>0,07</td>
</tr>
<tr>
<td>Acquisition of external knowledge x Formalization</td>
<td>-0,13</td>
<td>-1,59</td>
<td>-0,17***</td>
</tr>
<tr>
<td>R²</td>
<td>0,42</td>
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<td>Change in R²</td>
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<td>0,08</td>
</tr>
<tr>
<td>F for change in R²</td>
<td>9,42***</td>
<td>8,85***</td>
<td>4,55***</td>
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<tr>
<td>F for model</td>
<td>9,42***</td>
<td>8,85***</td>
<td>8,73***</td>
</tr>
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</table>

*p<0,10 **p<0,05 ***p<0,01
5. DISCUSSION AND CONCLUSION

This study has analyzed the role of internal capabilities as important moderators in the process involving the acquisition of knowledge and its ultimate conversion into innovation results. Following the framework provided by absorptive capacity literature this study deepens further in this under researched field by not only considering technological capabilities but also the firm’s capability of integrating knowledge coming from the firm’s external boundaries with the pool of knowledge existent within the organization. In particular, we studied formalization and decentralization in decision-making as important practices enhancing the firm’s capacity of coordinating activities between different organizational areas in order to achieve innovations. The empirical study was performed in the context of the Spanish Ceramic Tile industry.

Our findings reveal that internal capabilities condition the process involving the transformation of external knowledge in innovation results. In particular, technological capabilities are necessary in taking advantage of knowledge lying outside the boundaries of the firm. This result is in line with the empirical studies considering internal R&D as a fundamental factor for firms taking advantage of external sources. However, in this study we wanted to go further by analyzing the organizational dimension of internal capabilities, decentralization and formalization. Our results do not reveal a positive moderating effect in neither case. However, formalization appears as a strong significant and negative factor in moderating acquisition of knowledge and innovation results.

This result builds on the literature that advances formalization as a practice that can heavily hamper innovations results. Practices that enhance formalized procedures do not favor the flow of information within the organization and thus, exert a detrimental effect on the final exploitation of external knowledge. Moreover, by taking into account these results we cannot consider that formalization acts as a coordination mechanism, in reality; formalization is creating rigid structures within the organization and inhibiting innovation.

In addition to this, our results suggest that formalization hampers especially the exploitation of external knowledge when pursuing innovations, which are more exploratory in nature. Exploratory innovations are usually associated to disruptive results, which build on unrelated knowledge to that of the firm’s knowledge base. In this sense, our results are in line with studies that defend the necessity of flexible structures when attempting to pursue exploratory innovations.

Previous attempts to explain firm’s success in exploiting external knowledge have centered their attention on technological capabilities. However our results show that not only R&D activities and other related activities are important, but that certain organizational characteristics should also be also taken into consideration. Moreover, these results show that the influence of organizational capabilities on the exploitation of external knowledge can be positive or negative depending on the nature of such practice. Also, our results demonstrate that the moderating effect of organizational factors between external knowledge sourcing and innovation is contingent on the nature of innovation results.

Besides theoretical and empirical contributions, this work has also practical implications for managers. In current complex environments the role of external knowledge and its influence on innovation has been an increasingly relevant issue. In this sense, for managers to understand the role of organizational capabilities in leveraging external knowledge to successful innovations becomes definitely crucial.
6. LIMITATIONS AND FURTHER RESEARCH

In the following lines we will acknowledge the most salient limitations of our study. This study used questionnaire research, thus, perceptual measures and single-sources responses present a shortcoming to our investigation. Moreover, we were unable to contrast the dependent variable with other objective measures, although we endeavor to collect this data on the future. Eventually, counting with a larger data set would be beneficial mainly because some of the non-significant relationships could become significant. Moreover, a multi-sector analysis will allow us to generalize results.

This study is only a first step in exploring the importance of organizational capabilities as moderators of the acquisition of external knowledge and innovation. Further research could extend our study by focusing on additional dimensions of external knowledge sourcing, such as the mechanisms involved (licensing, collaborating…) or the nature of the search (i.e. breath/depth). Moreover, future studies could deepen into the recent discussion involving new organizational forms and consequently add richness into the present research.

7. REFERENCES


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**Appendix: Measures and items of exploratory and exploitative innovation**

**Exploratory innovation: In the last three years the firm has…**

- Identified new markets and new business opportunities.
- Penetrated in new markets.
- Explored new technological areas.

**Exploitative innovation: In the last three years the firm has…**

- Improved the quality of its goods and services.
- Reduced the production costs.
- Increased its production capacity or services provision.
- Improved its capacity of meeting client’s needs.