

Organizational ambidexterity and performance: the role of inter-organizational relationships¹

Ambidestreza organizacional y desempeño: el papel de las relaciones inter-organizacionales¹

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Miguel Solis-Molina²
Miguel Hernandez-Espallardo³
Augusto Rodríguez-Orejuela⁴

Abstract

Firm's capacity to innovate based on exploitation of its knowledge, while it explores new opportunities beyond its current knowledge, is captured by the concept of organizational ambidexterity. This concept has been seen as an alternative for firms to obtain a higher sustainable performance than industry average. However, this task is not easy to accomplish, and to collaborate with other organizations is a path to achieve it. The study of inter-organizational relationships to explain organizational ambidexterity is a novel field in the literature. Thus, this research presents a review about organizational ambidexterity with special emphasis on external sources, in contrast to internal sources that had been studied extensively. Journals with higher impact factor that address innovation issues from a management and marketing perspective have been reviewed. The authors conclude that inter-organizational relationships could contribute with organizational ambidexterity, and also have an effect over firm performance in the presence of absorptive capacity, relational governance and alliance capability. Results point out key factors for the success of inter-firms collaboration agreements for innovation.

Keywords: organizational ambidexterity; inter-organizational ambidexterity; inter-organizational relationships; firm performance.

Introduction

Empirical studies in the organizational scope have reflected a relationship between organizational ambidexterity and firm performance (Jansen *et al.*, 2006; Junni *et al.*, 2013). Most of the studies have focused on researching organizational ambidexterity as the simultaneous use of exploitation and exploration from

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² Colombian, Ph.D. candidate in Management, Universidad del Valle (Colombia). Professional 06 at SENA Centro Nacional ASTIN. Member of the marketing research group of Universidad del Valle (Colombia) and innovation, technological and knowledge management research group - INGETEC-ASTIN from SENA. e-mail: masolis@misena.edu.co.

³ Spanish, Associate Professor of Marketing at the University of Murcia (Spain). Ph.D. in Marketing. e-mail: migher@um.es.

⁴ Colombian, Associate Professor of Marketing at the Universidad del Valle (Cali, Colombia). Ph.D. in Marketing. e-mail: augusto.rodriguez@correounivalle.edu.co

inside the firm (Raisch & Birkinshaw, 2008). Nonetheless, according to Raisch *et al.* (2009), firms can achieve ambidexterity through the market (e.g. outsourcing) or by hybrid mechanisms (e.g. alliances or inter-organizational relationships). This debate has been seen on literature as a tension between the internal (i.e., *make*) and the external (i.e., buy or ally) (Raisch *et al.*, 2009). In this case, this study focuses on the review of the literature of organizational ambidexterity and its effect on performance, with particular attention to inter-organizational relationships. From this point of view, the general question of this research is what role plays the inter-organizational relationship in the achievement of organizational ambidexterity and performance?

This question deserves to be answered, because until now, the knowledge about the factors that make possible to inter-organizational relationships to contribute to organizational ambidexterity is still a matter of research. In this line, this study seeks to extend the knowledge about the variables in presence of which exploitation and exploration can be combined in a positive way for firm performance. Thus, this research reviews the literature departing from the journals with highest impact factor on the management and marketing fields referring to open innovation, as a simile to innovate in collaboration with other organizations. The main studies until now are identified, the principal discoveries are analyzed and research topics are raised in this field. The results obtained, point out that inter-organizational relationships contribute to firm performance in presence of variables such as absorptive capacity, alliance capability and relational governance.

Up next the concepts and principal approaches concerning organizational and inter-organizational ambidexterity are defined, with their dimensions. Subsequently, the methodology used to review the papers is introduced. Then, the most representative contributions associated with the general question of the research are presented. After that, the discussion and conclusions are posed, and finally, possible fields of research are suggested.

Exploitation, Exploration and Organizational Ambidexterity

The concept of organizational ambidexterity, arises from March (1991), about exploitation and exploration. According to March (1991), exploitation is "refinement, choice, production, efficiency, selection, implementation, execution" (p.71). On the other hand,

exploration is described by concepts such as "search, variation, risk taking, experimentation, play, flexibility, discovery, innovation".

Trade-offs or conflicts between exploitation and exploration inside the firms can be caused by the lack of resources for the simultaneous development of both kinds of activities (March, 1991). Furthermore, the presence of organizational dynamics and power tensions that, according to the culture of each firm, allows a strategy to impose above others and interfere with them (Levinthal & March, 1993). This can have as consequence, that the firms specialize in exploitation or exploration, which could expose them to the risks of learning that Levinthal and March (1993) called as the trap of success or the trap of exploitation, and the trap of failure or the trap of exploration. The first one makes reference to firms that stop exploring due to the success of their exploitation, and, as time goes by, can become obsolete being left out of the market. The second one refers to firms that explore without translating their results into performance, and this can lead them to bankruptcy due to any income restriction aside from sales. In this context, ambidextrous firms must solve the trade-offs between exploitation and exploration, meanwhile specialists must avoid the risks of learning.

Organizational ambidexterity refers to "the routines and processes by which organizations mobilize, coordinate, and integrate dispersed exploratory and exploitative efforts" (Jansen *et al.*, 2009, p. 799). In this sense, ambidexterity has been referred to a successful combination of exploitation and exploration. Empirically, an ambidextrous firm has high levels of exploitation and exploration simultaneously (He & Wong, 2004). A summary of definitions about organizational ambidexterity can be found in Papachroni *et al.* (2014).

Organizational ambidexterity has emerged as a new concept in organizational theory to answer the need of organizations to maintain a sustained performance (Raisch *et al.*, 2009). In the last two decades, the research about the conceptualization, antecedents, moderators, outcomes and tensions about ambidexterity have been approached theoretically (e.g. Gupta *et al.*, 2006; O'Reilly III & Tushman, 2008, 2013; Raisch & Birkinshaw, 2008; Raisch *et al.*, 2009; Simsek *et al.*, 2009; Tushman & O'Reilly III, 1996) and empirically (e.g. Adler *et al.*, 1999; Andriopoulos & Lewis, 2009; Atuahene-Gima, 2005; He & Wong, 2004; Jansen *et al.*, 2009; Jansen *et al.*, 2006; Lubatkin *et al.*, 2006).

Ambidexterity has been used in different contexts. For example, O'Reilly III and Tushman (2013) described a contextual, sequential and structural ambidexterity. However, only the structural refers to the simultaneous balance between exploitation and exploration, either through separated subunits or by the development of competences, processes and cultures associated with exploitation and exploration (O'Reilly III & Tushman, 2008).

On its side, Simsek et al. (2009) posed a typology where four types of organizational ambidexterity exist: harmonic, cyclical, partitional and reciprocal. Each one refers to a combination of two dimensions: time and structure. We highlight the temporal dimension, which poses that ambidexterity can be sequential or simultaneous, and the structural dimension, that poses that can be independent –inside the same unity- or interdependent –between unities of the same organization or other organizations-. In the case of the simultaneous organizational ambidexterity between unities of different organizations, a reference is made to partitional inter-organizational ambidexterity.

The former classification suggests an extension of the concept of organizational ambidexterity focusing on inter-organizational relationships. Although, empirical studies that have analyzed inter-organizational relationships as a generator of organizational ambidexterity are few (e.g., Kauppila, 2010), and in its majority, its scope has been from the inside of the firm towards the external environment, and not deriving out of the inter-organizational relationship towards the firm. This approach, lead us to think into a kind of complementary ambidexterity to organizational ambidexterity. This complementary ambidexterity is known as inter-organizational ambidexterity, concept in which we are going to center from now on.

Inter-organizational ambidexterity

Inter-organizational ambidexterity assumes the simultaneous development of exploitation and exploration based on inter-organizational relationships (Kauppila, 2010). Parmigiani and Rivera-Santos (2011), introduce the concepts of co-exploitation and co-exploration to describe two components of an inter-organizational relationship. Co-exploitation is the cooperative volunteered agreement to execute knowledge, tasks, functions or activities where the emphasis is the use and extension of the existing knowledge. Yet, the co-exploration consists in the volunteered cooperative agreement to create new knowledge, tasks, functions or activities.

Starting from this concept of co-exploitation and co-exploration, it would be possible to address the operationalization of the inter-organizational relationships in the frame of a kind of inter-organizational ambidexterity complementary to organizational ambidexterity, as a mean to avoid the trade-offs and the learning traps that exploitation and exploration can carry at organizational level (Leviathan & March, 1993). In first place, throughout inter-organizational relationships the base of resources can be extended to develop activities of exploitation and exploration. In second place, relying on separated portfolios of relationships, some focused on exploitation and others in exploration, avoids one strategy impose or interfere with the other. In third place, establishing relations with successful firms in exploitation and exploration minimizes the risks of the success traps and/or failure traps, since firms can learn the best practices of other organizations to avoid the noxious effects of exploitation and exploration (Kauppila, 2010).

Methodology

First, we identified the journals associated with management topics and open innovation. For this, the ISI Web of Knowledge database, Journal Citation Report Social Sciences Edition 2010 (144 journals) and 2013 (173 journals) was consulted. The study of Vieira and Teixeira (2010), served as support to identify the most important journals of the fields of management and marketing. Likewise, Dahlander and Gann (2010) served to identify the most used journals to publish about open innovation. Table 1 presents the journals reviewed.

Once identified the main journals, a search was made using as keywords “organizational ambidexterity”, “inter-organizational ambidexterity”, “co-exploitation”, “co-exploration” and “ambidextrous collaboration”. In total, 153 papers were identified that referred to organizational ambidexterity and jointly to exploitation and exploration. From them, 35 were linked to the inter-organizational relationships field. From the most relevant papers, a review was made to identify previous studies and main authors about this subject.

Results

The section of results include: 1) Theoretical studies about organizational and inter-organizational ambidexterity, and 2) Empirical studies about the

relation between ambidexterity and performance, both at organizational and inter-organizational level.

Theoretical Studies

The theoretical studies about organizational ambidexterity evolved from a scope purely centered in the firm through a scope that contemplates the firm and its environment, due to the managerial studding in which firms are into, and that makes them to take into account the inter-organizational relationships as a factor that influence their performance. Also, this reflects the focusing of firms in their core business for the development of innovation activities, which leads them to establish inter-organizational relationships for the handling of other entrepreneurial functions that do not belong to their main activity, and that can be developed through other organizations.

In the beginning, the scope centered in the firm, is associated to the concept of Duncan (1976), who suggested the term of ambidextrous organization as a characteristic of the organization that achieves combining two ways of acting in front of situations that require in some cases rigidity and in others flexibility. Then, Tushman and O'Reilly III (1996), retake the concept and use it to describe those firms that accomplish to keep superior performance, mixing both activities of radical and incremental innovation based on their internal capabilities. Departing from Koza and Lewin (1998), it is started to settle that alliances can also contribute to exploitation and exploration activities of the firm. Subsequently, Raisch and Birkinshaw (2008) made a review about the internal sources of organizational ambidexterity. This effort is complemented with a study in which inter-organizational relationships are included as a possible source of ambidexterity (Raisch et al., 2009). In the case of Simsek et al. (2009), they proposed a typology that allows organizational ambidexterity at the internal and external context of the firm. For these authors, firms that co-specialize in exploitation and in exploration by means of separated units, as it is the case for inter-organizational relationships, are more suited to reach superior performance in both exploitation and exploration.

On its side, Lavie et al. (2010) posed a framework to develop the research about ambidexterity at the organizational and inter-organizational contexts. They covered the main concepts, approaches and variables studied. Regarding the inter-organizational context, these authors suggested to juxtapose the organizational and inter-organizational contexts of exploitation and exploration. Then, Parmigiani and Rivera-Santos (2011) contributed to

the theoretical framework addressing the study of inter-organizational relationships based on co-exploitation and co-exploration, which makes possible their interaction with exploitation and exploration of the firm.

This theoretical review ends with O'Reilly III and Tushman (2013), which describes the study of organizational ambidexterity in literature. Its proposal is to continue extending the limits of the firm towards hybrid organizational forms, that is to say, combining internal and external structures, such as inter-organizational relationships.

Up next, empirical studies that have addressed the relation of ambidexterity and performance are presented with the purpose to rely on a common framework that allows identifying focal points and variables that link both contexts organizational and inter-organizational.

Empirical studies about the effect of ambidexterity on performance at the organizational level

The use of theories and literature for the study of the effect of ambidexterity on performance at the organizational level is characterized by the use of organizational knowledge theories, associated to the design of organizational structures, some based on exploitation and others on exploration. This scope is alike to the concept of structural and simultaneous ambidexterity. Likewise, the theory of contingency is drawn on suggesting that organizations will be more effective if they are designed to accomplish the nature of their main task, this being exploitation or exploration (Burns & Stalker, 1961).

On the other side, based more in a behavioral perspective, understanding that executives and people are the ones who make choices, exploitation and exploration tasks, and generate the derived innovations of these activities, other theories have been used related with leadership, knowledge, group processes, senior management and incentives. These theories obey to an intra-organizational scope that seeks to evidence the sources of organizational ambidexterity at different executive levels, senior teams, mid-level manager and individuals (Jansen et al., 2008; Jansen et al., 2012; Jansen et al., 2009; Lubatkin et al., 2006; Mom et al., 2015). Besides, the theory of human resources of strategic management has been used to identify methods that allow people to develop exploitation and exploration activities simultaneously, in a context that favors this purpose (Prieto & Pérez, 2012).

Tabla 1. Revistas consultadas

Journal	2010		2013	
	Classification	Impact factor	Classification	Impact factor
Management				
Academy of Management Review**	1	6.720	1	7.817
Journal of Supply Chain Management	2	5.853	11	3.717
Academy of Management Annals	3	5.440	2	7.333
Academy of Management Journal**	4	5.250	5	4.974
Journal of Operations Management	5	5.093	7	4.478
MIS Quarterly	6	5.041	4	5.405
Research in Organization Behavior	7	4.833	83	1.250
Organizational Research Methods	8	4.423	13	3.525
Journal of International Business Studies	9	4.184	12	3.594
Journal of Business Logistics	10	3.905	21	2.886
Journal of Management Studies	11	3.817	14	3.277
Organization Science*	12	3.800	9	3.807
Journal of Management	13	3.758	3	6.862
Administrative Science Quarterly**	14	3.684	34	2.394
Strategic Management Journal**	15	3.583	18	2.993
Technovation*	20	2.993	25	2.704
Strategic Organization	26	2.727	49	1.853
Research Policy*	34	2.508	27	2.598
Academy of Management Perspectives	37	2.470	23	2.826
Management Science	42	2.221	29	2.524
Journal of Product Innovation Management	44	2.079	74	1.379
Manufacturing & Service Operations Management	45	2.048	66	1.450
Long Range Planning	53	1.727	39	2.111
California Management Review	54	1.682	54	1.944
Journal of Applied Behavioral Science	57	1.682	92	1.088
R&D Management*	59	1.580	80	1.266
Human Resource Management	68	1.341	71	1.395
Research Technology Management*	102	0.754	124	0.745
Marketing				
Journal of Marketing Research***		3.800		2.660
Journal of Marketing***		3.770		3.819
Marketing Science***		1.724		2.208

* Most used journals to publish subjects on open innovation (Dahlander & Gann. 2010)

**Highest relative impact factor journals used in the field of management (Vieira & Teixeira. 2010)

***Highest relative impact factor journals in the field of marketing (Vieira & Teixeira. 2010)

Source: The authors

Concerning to performance, it is clear that one of the topics that is more associated with organizational ambidexterity has to do with innovation, and especially with technological innovation (He & Wong, 2004). In this sense, the literature about organizational knowledge has been used to explain ambidexterity departing from their exploration and exploitation dimensions, incorporating

concepts such as the learning capacity of the firm (Lin et al., 2012). Other aspects of performance have to deal with the literature of strategic management. From this point of view, organizational ambidexterity allows firms to obtain a competitive advantage over other organizations. In this line, the resource-based view of the firm (Wernerfelt, 1984), with their extensions of the resource and sustained

competitive advantage theory of the firm (Barney, 1991), and the knowledge-based theory of the firm (Grant, 1996; Kogut & Zander, 1992, 1996), contribute to explain why the ambidextrous organizations obtain a higher sustained performance.

Likewise, the behavioral theory of the firm (Cyert & March, 1963) has been used to pose that exploitation and exploration are orientations that can bring better performance (Uotila et al., 2009). Also, marketing theories suggest strategic guidelines towards the consumer and the competitor (Atuahene-Gima, 2005), and eclectic approaches combine theories to explain the effects of ambidexterity on performance (Morgan & Berthon, 2008).

In his organizational context, the first empirical studies are case studies about efficiency and flexibility of the firms (Adler et al., 1999), retaking the first notions suggested by Duncan (1976). Then, Gibson and Birkinshaw (2004), He and Wong (2004), and Venkatraman et al. (2007), performed the first empirical test about the effect of organizational ambidexterity on performance, finding a positive effect, departing from the focuses used in literature respectively (contextual, structural and sequential). Adding to these findings, Atuahene-Gima found, on one side, a positive effect of exploitation on incremental innovation, and in other, of exploration on radical innovation, thus linking

exploration and exploitation with the field of innovation. From then on, studies about organizational ambidexterity and performance analyzed the effect of internal and environmental issues of the firms.

In this regard, Jansen et al. (2006) incorporated the environment. On one side, they found that high competitive environments positively moderate the effect of exploitation innovation on financial performance. On the other side, those environments highly dynamic moderate the effect of exploration innovation on performance.

The review at organizational level ends with Junni et al. (2013), concerning the effect of ambidexterity on performance. This meta-analysis consolidates the results of empirical studies, offering a general view about the magnitude of the effects of ambidexterity on performance, the kind of performance variables used, the units of analysis, and the sectors where the research has been made, among other issues. The main conclusion of this study is that ambidexterity has a positive effect on performance. Also, that the contexts where ambidexterity has an effect on performance should be addressed to establish when and how this happens. The main unit of analysis addressed has been the firms. The most relevant empirical studies found at organizational level are presented in Table 2.

Table 2. Empirical studies about the effect of ambidexterity on firm performance at the organizational level.

Authors, year	Theories/ Literature	Dependent variable	Independent, mediator or moderator variable	Methodology and sample	Results
(Adler et al., 1999)	Organizational learning, Contingency	Combined levels of efficiency and flexibility.	Flexibility and efficiency.	Study of the NUMMI Plant case, Toyota branch, 60 interviews.	A superior performance is proposed mixing efficiency and flexibility. Ambidexterity relies on the trusting relationships with suppliers.
(He & Wong, 2004)	Organizational learning, Technology lifecycle. Innovation management.	Average sales rate increase in the last three years.	Ambidexterity: interaction of the strategy of exploitation and the strategy of innovation of exploration. Mediators: Intensity of product innovation. Intensity of process innovation.	Survey to executives of 216 technologically innovating firms in Singapore and Malaysia.	Positive effect of the interaction of innovation strategies of exploitation and exploration on the increase of sales.

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Authors, year	Theories/Literature	Dependent variable	Independent, mediator or moderator variable	Methodology and sample	Results
(Atuahene-Gima, 2005)	Marketing. Resource-based theory of the firm.	(1) Competence of exploration and competence of exploitation. (2) Performance of incremental innovation and radical innovation.	Customer orientation. Competitor orientation. Mediators: Exploitation competence. Exploration competence. Cross-functional coordination between orientations and performances	Survey to 127 firms in China.	Positive effect of exploitation on radical innovation. Negative effect of exploitation on radical innovation and of exploration on incremental innovation. A high-low couple of exploitation and exploration, instead of high-high of ambidexterity.
(Jansen <i>et al.</i> , 2006)	Organizational learning. Strategic management.	Exploitation innovation. Exploration innovation. Financial performance.	Centralization of choice making. Formalization. Connectivity. Environmental dynamism. Environmental competitiveness. Moderators: Dynamic environment. Competitive environment.	Two-phased survey: 1) 462 organizational units and 2) 283 service units.	Positive effect of the connectivity on exploitation and exploration promoting ambidexterity. Positive effect of exploration innovation on performance in high dynamic environments and of exploitation innovation on performance in high competitive environments.
(Lubatkin <i>et al.</i> , 2006)	Group processes. Top executives.	Relative perception of performance of the firm in front of competitors. Sales growth. Market share growth. ROE.ROA.	Ambidextrous orientation: mixed index of exploitation and exploration (sum). Behavioral integration of top executives. Mediator: ambidextrous orientation of behavioral integration of top executives and firm performance.	Survey to top executives of 139 small-sized and medium-sized firms (i.e., SMEs) from the United States.	Positive effect of ambidextrous orientation on performance, and of behavioral integration and ambidextrous orientation on performance in small-sized and medium-sized firms.
(Venkatraman <i>et al.</i> , 2007)	Organization. Strategic management.	Sales growth in the software sector.	Interaction of exploitation and exploration (simultaneous and sequential). Moderators: Age of the firm. Dominance in the market. Competition in multiple markets.	Longitudinal. Data panel with 1.005 software firms 1991-2001.	Positive effect of sequential ambidexterity on sales growth.

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Authors, year	Theories/Literature	Dependent variable	Independent, mediator or moderator variable	Methodology and sample	Results
(Jansen <i>et al.</i> , 2008)	Organization. Leadership. Incentives.	Organizational ambidexterity: Interaction of exploitation innovation and exploration innovation.	Exploitation innovation. Exploration innovation. Shared view. Social integration. Incentives of senior group. Moderator: Transformational leadership.	305 senior teams and 89 executive directors of financial services from Europe.	Positive effect of the shared view and incentives on high levels of exploitation- and exploration-innovation (organizational ambidexterity).
(Schulze <i>et al.</i> , 2008)	Organization. Strategic management.	Operative and strategic performance.	Structural ambidexterity: Moderator: strategic orientation. Dynamism of the environment. Competitive intensity.	Survey to 284 executives of large-sized and medium-sized firms from Germany.	Positive effect of ambidexterity on performance.
(Morgan & Berthon, 2008)	Marketing. Strategic management. Technological innovation. Organization and learning.	Perception of performance in comparison with the competitors. Competitive position. Sales growth. Average utilities per consumer. Global performance of the firm.	Market orientation. Learning generation. Ambidexterity: interaction of the strategy of exploitation and exploration innovation.	Survey to executives of 160 firms of biotechnology in the United Kingdom.	Positive effect of the strategy of exploitation innovation, exploration innovation and ambidexterity on performance.
(Han & Celly, 2008)	Organization. Internationalization. Innovation.	Perception of performance of new international business. Profitability. Growth.	Strategic ambidexterity: innovation strategies and standardization.	Survey to 70 executive of new international firms.	Positive effect of the strategic ambidexterity (innovation and standardization) on performance.
(Jansen <i>et al.</i> , 2009)	Organization.	Ambidexterity.	Structural differentiator. Mediator: integration mechanisms. Connectivity. Cross-functional interfaces. Social integration. Incentives.	230 organizations of different industrial sectors.	Mediation of social integration, cross-functional interfaces and connectivity.
(Andriopoulos & Lewis, 2009)	Innovation. Organizational learning.	Strategic objective. Consumer orientation. Personal motivations.	Emphasis in Utilities vs. Discoveries. Adjusted Coupling vs. Loose. Discipline vs. Passion.	Study of comparative case of 5 ambidextrous firms of the industry of product design. Journals, documental review and observation.	Firms with last gen products (<i>cutting edge</i>) had a favorable financial performance. They find three paradoxes of apparently three opposite activities that generate more innovation and more than trade-offs synergies.

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Authors, year	Theories/Literature	Dependent variable	Independent, mediator or moderator variable	Methodology and sample	Results
(Uotila <i>et al.</i> , 2009)	Behavioral theory of the firm.	Financial performance: value of the market (Tobin's Q).	Ambidexterity: relative amount of exploitation orientation and exploration orientation. Moderator: research intensity. Development of the industry.	Content analysis of index news from S&P 500. 1989- 2004 of 279 firms.	Inverted "U" curvilinear relation of the exploration orientation and financial performance.
(Prieto & Pérez, 2012)	Strategic management of human resources. Organizational learning.	Social climate. Ambidextrous learning. Firm performance in sales growth. Utilities. Market participation. Investments. Consumer and employee satisfaction.	Human resources practices to strengthen the ability, motivation and opportunity. Mediator: (1) practices social climate and ambidextrous learning. (2) Social climate ambidextrous learning and performance.	Survey to 198 firms of the industry in Spain.	The high commitment of human resources practices, favor the social climate that, in turn, makes easier ambidextrous learning and performance.
(Jansen <i>et al.</i> , 2012)	Organization. Innovation.	Rate of return above expected Return in two consecutive years of the business unit.	Ambidexterity of the unit of business: interaction of exploitation and exploration innovation. Moderator: structural differentiation. Centralization of choice making. Resources generosity. Resource interaction at organizational level.	Surveys and reports of 285 unit managers of 88 branches from a European financial firm.	Positive moderation of centralization of decision making, richness and interdependence of resources on the effect of ambidexterity on performance.
(Lin <i>et al.</i> , 2012)	Resource and competitive sustainable advantage theory of the firm.	Businesses performance.	Ambidexterity innovation: interaction incremental and radical innovation performance. Learning capability. Mediator: Innovation ambidexterity. Organizational ambidexterity.	204 business units.	Positive effect of ambidexterity innovation on businesses performance.
(Junni <i>et al.</i> , 2013)	Meta-analysis of ambidexterity-performance relation.	Performance.	Organizational ambidexterity.	Meta-analysis of empirical studies.	Positive effect of ambidexterity on performance.
(Mom <i>et al.</i> , 2015)	Human resources.	Individual performance.	Manager's ambidexterity. Experience. Uncertainty. Work context.	Large-sized firms managers.	Ambidexterity contributes to the individual performance in contexts of great uncertainty.

Empirical Studies about the effect of ambidexterity on performance at inter-organizational level

The use of theories at the inter-organizational level is characterized by organizational learning playing a main role to explain the formation of alliances, inter-organizational collaborations, and cooperation activities, understanding that accessing and internalizing the knowledge of others organizations is one of the main motivations to establish inter-organizational relationships (Koza & Lewin, 1998). This carries out the possibility of exploitation and exploration activities with complementary resources of other organizations (Park et al., 2002; Rothaermel, 2001; Rothaermel & Deeds, 2004).

The use of exploitation and exploration in strategic alliances was first proposed by Koza & Lewin (1998). From there, authors like Rothaermel (2001), Rothaermel and Deeds (2004), Lavie and Rosenkopf (2006) and Lin et al. (2007) performed empirical tests about the effects of exploitation and exploration activities in the context of inter-organization relationships.

On his part, Park et al. (2002) conducted a study about the formation of alliances based on internal resources. This study is addressed from the resource dependence theory (Pfeffer & Salancik, 1978) and the strategic management. Their results point out that there is a positive effect of the market changes on the internal resources. The authors observed a positive moderation of the manufacturing resources in the effect of market changes on exploration alliance formation. On the other side, the technological resources moderate the effect of market changes on exploitation alliance formation. Regarding Rothaermel and Alexandre (2009), their study evidenced a “U” inverted relationship between mixed sources of new technologies (exploration) and known (exploitation) on performance. In this study, the main moderation is given by absorptive capacity, the type of environment (dynamic or competitive) and the firm features (age, size, industrial sector). Both studies evidenced the effect of mixed internal and external resources on performance.

Lin et al. (2007) performed an application of organizational learning, the resource dependence theory in the context of strategic alliances, and the network theory. These authors proposed the concept of ambidexterity in the alliance as an indirect measurement of the mix of current and new partners, and their similar and different features. Their results evidenced a positive effect of ambidexterity in the alliance on performance at large-sized firms, and for

strategies focused in exploitation and exploration in small-sized firms (Lin et al., 2007). However, general results point out a negative effect of ambidexterity in the alliance on performance.

Im and Rai (2008) studied inter-organizational relationships as a unit of analysis. These authors found that the simultaneous sharing of exploitation and exploration knowledge decreases the variability of performance in the relationship. Case studies such as Dittrich and Duysters (2007), and Kauppila (2010), proposed exploitation and exploration strategies through inter-organizational relationships as a way to complement firm's activities, thus evidencing the presence of co-exploitation and co-exploration activities.

Kristal et al. (2010) with a more eclectic approach used dynamic capabilities, the knowledge-based theory of the firm and the law of requisite variety. The former proposes that an organization must have an adequate minimum of diversity in its interior to survive, decreasing the risk of becoming obsolete (Menor et al., 2001). In this sense, Kristal et al. (2010) studied the effect of ambidexterity, represented by the simultaneous practices of exploitation and exploration in the supply chain on firm performance. Their results suggest that combinative competitive capabilities mediate the positive effect of ambidexterity on performance. This allows the firms to obtain a greater efficiency, and at the same time, to seek opportunities through inter-organizational relationships (e.g. suppliers, distributors).

Regarding the resource-based theory of the firm and specifically, the knowledge-based theory of the firm, it is used to explain the reason of inter-organizational relationships and their effects on performance. Hernández-Espallardo et al. (2011) found that in the context of relationships with distributors, in the presence of inter-organization learning the trade-offs between exploitation and exploration are solved, allowing the accomplishment of the two activities at the same time. On the contrary, when the inter-organizational learning is not present, the correlation between the developments based on exploitation and exploration innovations turn out to be negative, giving place to trade-offs between them.

Other approaches address the relational governance, identifying the most effective governance for exploitation or exploration activities (Zimmermann & Raisch, 2009). In this same line, Blome et al. (2013) studied the most effective governance combinations (relational vs. contractual), in a joint way with ambidexterity, that generates the best results.

For this, the authors used the transaction cost economics theory to explain the types of governance structures that generate less costs. A main principle of this theory proposes that an agreement between the type of governance and the characteristics of the transactions leads to more efficient results, thus reducing transaction costs (Williamson, 1985). Likewise, they used the complementarity theory and the relational exchange theory. The complementarity theory proposes that two activities are complements when one carries out the benefits of performing the other (Milgrom & Roberts, 1995). On its part, the relational exchange theory assumes that the relational rents are based in standards such as reciprocity or flexibility that eventually improve performance and constitute the lifeguard to prolong the relationships and extend their benefits (Poppo & Zenger, 2002).

In the case of Stettner and Lavie (2014), they studied not just one inter-organizational mode, but they combined and compared the effectiveness of external modes such as alliances and acquisitions with internal modes to carry out exploitation and exploration activities. Their studies revealed that to explore in an external way through the use of acquisitions or alliances and exploit in an internal way favors firm performance. In the case of Colombo et al. (2014), they proposed that hybrid alliances, the combination of exploitation and exploration activities at inter-organizational level, favor a higher performance to the outcomes of radical innovation, more than the outcomes of incremental innovation.

Regarding the study of the effect of inter-organizational relationships on performance, using the co-exploitation and co-exploration dimensions, Kauppila (2015) finds that co-exploitation has a positive effect on short-term financial performance. In the same way, he pointed out that co-exploration has a positive effect on firm's growth in the long term. However, Kauppila (2015) stated that even though a point of view suggests that co-exploitation and co-exploration lead to a higher performance, when both of these activities are pursued at the same time (Kauppila, 2010; Kristal et al., 2010), results point out that to carry out the two activities simultaneously, lead to a mediocre performance in both due to the trade-offs (i.e., scarce resources competition). In this case, Kauppila (2015) found in line with Lin et al. (2007) that the ambidextrous inter-organizational collaboration is negatively related to firm's growth. For this reason, he suggests that future studies should research the variables that moderate the relation between ambidextrous inter-organizational collaboration and firm performance. Table 3 presents the

studies considered most relevant about ambidexterity and performance at the inter-organizational level.

Discussion and conclusions

The question that motivates the current research seeks to determine the role that inter-organizational relationships play in organizational ambidexterity and their effects on performance. For this, a review of the most cited journals on the fields of management and marketing associated with open innovation was held. As a result of this review, we found that organizational knowledge is the most used theory to study the organizational and inter-organizational contexts of ambidexterity. Similarly, the resource and competitive sustainable advantage theory of the firm and the knowledge-based theory of the firm are used as well. These theories are used to explain that the successful combination of exploitation and exploration requires resources based mainly in knowledge and learning processes.

Regarding empirical studies about the effect of ambidexterity on performance at the organizational level, we observed that initially these studies were centered at intra-organizational level, or in issues about the environment of the firm. Then, the studies have been including both intra-organizational issues and the environment to obtain a better understanding about this relationship and the conditions that affect it. On its part, the empirical studies at the inter-organizational level show an evolution from the use of indirect measurements for ambidexterity in strategic alliances to the use of scales as a supply chain context. Likewise, other variables have been linked to these studies such as absorptive capacity, alliance capability and governance.

Results point out that inter-organizational relationships contribute to organizational ambidexterity through new knowledge for exploration activities and complementary resources for exploitation activities, thus increasing the amount of resources available. In this way, inter-organizational relationships contribute, on one side, to solve the trade-offs deriving from the lack of resources to develop exploitation and exploration activities simultaneously and, on the other side, to solve the learning traps associated with the specialization in exploitation or in exploration. Regarding the effects on performance, there are still issues to solve. Positive and negative effects have been found in the simultaneous combination of exploitation and exploration in inter-organizational relationships. However, this can be explained by the presence or absence of other variables.

Table 3. Empirical studies about the effect of ambidexterity on performance at the inter-organizational level

Authors, year	Theories/Literature	Dependent Variable	Independent Variable, moderator or mediator	Methodology and sample	Results
(Rothaermel, 2001)	Innovation. Strategic alliances. Entrepreneurship.	Development of new products. Financial performance of the firm (ROE).	Exploitation. Exploration.	889 strategic alliances of 32 Large-sized pharmaceutical firms and biotechnology suppliers.	The focusing of the incumbents of a sector in exploitation of complementary assets of other organizations allows them to obtain a better performance to those that focus in exploring new technologies.
(Park <i>et al.</i> , 2002)	Resource-dependence theory. Strategic behavior.	Occurrence probability and alliance formation frequency.	Internal resources. Market changes. Sales growth. Exploitation alliances and Exploration alliances formation Moderator: technological and manufacturing resources.	174 start-up firms with 471 strategic alliances in 10 years.	Positive moderation of internal resources and sales growth. Positive manufacturing resources moderation on the effects of market changes on exploration alliances formation; and of technological resources on the effect of market changes on exploitation alliances formation.
(Rothaermel & Deeds, 2004)	Organizational learning. Strategic alliances.	Products in development. Products on market.	Exploitation alliances. Exploration alliances. Moderator: Size of the firm and the effect of exploitation alliances on products on the market.	325 biotechnology firms.	Positive effect of exploration alliances on products in development, and exploitation alliances on products on market. Positive effect of the sequential ambidexterity on performance.
(Lavie & Rosenkopf, 2006)	Organizational learning.	Function. Structure. Year one of exploration attributes.	Function. Structure. Exploration attributes.	337 software firms in the United States.	The firms tend to keep a balance between exploitation and exploration in the internal and external context.
(Lin <i>et al.</i> , 2007)	Organizational learning. Strategic alliances. Social networks. Resource-dependence theory.	Firm performance: Net sales divided by assets in one year.	Ambidexterity in the alliance (exploitation and exploration). Total partners in the alliances. Moderators: Size of the firm. Environment uncertainty. Centrality of the firm in the network. Networks' configuration. Year of the alliance.	Sample: 33 pharmaceutical, 25 computers, 25 Food, 5 steel and 7 paper industries. Simulated measure: 25 to 75 nodes, volatility of the environment 0.003 to 0.04, 30 years of simulation.	Negative effect of ambidexterity in the alliance on performance. Positive effect of ambidexterity in the alliance on performance in large-sized firms and for strategies focused on exploitation or exploration in small-sized firms.
(Dittrich & Duysters, 2007)	Network. Strategic alliances.	Partner's billing. Number and kind of alliance with or without capital participation.	Exploitation and exploration strategies in innovation networks.	Nokia partners 1985-2002, semi-structured interview, quantitative analysis concerning the alliance.	Exploitation emphasis in the first two generations and in exploration in the third generation. The generation refers to each collaboration cycle.

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Authors, year	Theories/Literature	Dependent Variable	Independent Variable, moderator or mediator	Methodology and sample	Results
(Im & Rai, 2008)	Organizational learning. Technology information. Cutting-edge digital objects.	Relationship performance.	Ambidexterity: interaction of sharing exploitation and exploration knowledge. Contextual ambidexterity Moderator: Relationship's length.	76 long term relationships from the perspective of the seller and the client.	Less performance variability of the relationship when the exploitation and exploration knowledge is shared simultaneously in comparison to when there is an emphasis in sharing more exploration knowledge. Likewise, a superior average value of performance is obtained in the relationship due to ambidexterity.
(Zimmermann & Raisch, 2009)	Organizational learning. Relational governance.	Governance structure: autonomous and integrated. Independent or collective exploitation and exploration processes.	Vertical and horizontal inter-organizational relationships	Four cooperative projects developing new products. Two vertical inter-organizational relationships projects and two horizontals.	The vertical inter-organizational relationships exhibit autonomous governance structures associated with independent exploitation and exploration processes. On the other side, the horizontal inter-organizational relationships evidence governance structures associated with collective exploitation and exploration processes.
(Rothaermel & Alexandre, 2009)	Organizational learning.	Financial profitability (ROE). Innovation capability (patents).	Ambidexterity: mix of new and known technological sources. Moderator: absorptive capacity.	Survey to 141 technological managers in manufacturing firms in the United States.	Inverted "U" relation of mixing new and known technology sources (ambidexterity) and performance. Positive moderation of absorptive capacity in this relationship.
(Kauppila, 2010)	Organization and strategy. Contingency.	Ambidextrous organizational context.	Exploitation and exploration through network.	In depth case study of a firm that created ambidexterity based on inter-organizational exploitation and exploration relationships.	Importance of ambidextrous organizational context to seize the benefits of exploitation and exploration relationships. Exploitation and exploration balancing methods inside the organization.
(Kristal <i>et al.</i> , 2010)	Dynamic capabilities. Firm based on knowledge. Requisite of variety law.	Firm performance: Market share. Profits.	Ambidextrous supply chain strategy: Exploitation and exploration practices. Mediators: Combinative competitive capabilities. Quality. Delivery speed. Process flexibility. Low cost.	174 manufacturer firms in the United States.	Positive effect of the ambidextrous supply chain strategy on performance. Total mediation of the combinative competitive capabilities on the effect of the ambidextrous supply chain strategy on market share and profits.

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Authors, year	Theories/Literature	Dependent Variable	Independent Variable, moderator or mediator	Methodology and sample	Results
(Hernández-Espallardo <i>et al.</i> , 2011)	Knowledge-based theory of the firm.	Open system performance. Rational goals performance.	Knowledge in the inter-organizational relationship. Mediator: Exploitation innovation. Exploration innovation.	201 surveys to firms in the sector of food and beverage.	The knowledge obtained in relation with the distributors allows developing innovations based on exploitation and exploration simultaneously. Positive effect of the innovations based on exploitation on open system performance. Positive effect of innovation exploration on the rational goals performance and open system.
(Blome <i>et al.</i> , 2013)	Complementarity. Transaction cost economics theory. Relational exchange theory.	Performance: Cost reduction. Innovation.	Ambidextrous governance: contractual and relational. Moderator: Organizational ambidexterity.	97 survey couples of managers/vice-presidents and purchasing manager.	Positive effect of the ambidextrous governance on performance. Organizational ambidexterity moderates the effect of ambidextrous governance on innovation.
(Stettner & Lavie, 2014)	Strategy.	Market's value of the investor <i>ex ante</i> .	Exploration acquisition. Exploration alliance. Internal exploration.	190 software firms in the United States.	Explore through external modes such as acquisitions or alliances while doing internal exploitation favors firm performance.
(Colombo <i>et al.</i> , 2014)	Innovation. Strategic alliances.	Introduction of new products. Radicality.	Exploitation alliance. Exploration alliance. Control: Acquisition mode. Alliance mode. Alliances experience. Experience acquisitions.	149 alliances for academic spin-offs.	The relative's exploitation performance is higher in hybrid alliances (i.e. mix of exploration and exploitation activities) when the alliance has radical innovation outcomes. On the contrary, exploration has a higher relative performance in hybrid alliances when the alliance obtains incremental innovation outcomes.
(Kauppila, 2014)	Resource-based theory.	Increasing rate of the number of employees. Financial performance (ROI).	Inter-organizational ambidextrous collaboration: Co-exploitation and co-exploration interaction. Alliance management capability.	172 surveys to SMEs firms in the manufacturing sector.	Positive effect of co-exploration on performance represented in the number of employees increase in two years. Positive effect of co-exploitation on the financial performance in a year. Negative effect of the co-exploitation and co-exploration interaction on firm growth.

Thus, taking into account that inter-organizational relationships can be an additional source of resources based on exploitation and exploration knowledge, co-exploitation and co-exploration represent the potential of added value to exploitation and exploration activities internally developed or existent in the firm. In this sense, co-exploitation and co-exploration reflect the direct contribution of the relationship or portfolio of inter-organization relationships on firm's innovation activities. Nonetheless, the literature has not finished yet explaining the way in which these dimensions of the inter-organizational relationship have an effect on performance. The literature review suggests that to embrace this potential of added value requires of other factors associated with the inter-organizational level. Among these factors, absorptive capacity plays a major role as a condition to acquire, assimilate and apply knowledge from an inter-organizational relationship, and translate it into performance. For this, we suggest empirical studies to address the moderating variables of the effect of co-exploitation and co-exploration on ambidexterity and performance. The use of absorptive capacity in models that link ambidexterity with performance will allow approaching the effect that external sources of knowledge have on internal sources of knowledge, and thus evidencing their effects on firm performance.

Additionally, as a complement to the effect that absorptive capacity could have at organizational level, the use of alliance capability is proposed as a more centered variable at the inter-organizational level. Alliance capability can be seen as an extension of the ability of the firm to collaborate with other organizations, as well as to search, and to establish an adequate portfolio of relationships that allow the firm achieving co-exploitation and co-exploration objectives. Besides, the use of this variable will allow a higher understanding of how organizations transfer what they have learned from a relationship to apply it into others, thus improving performance and transaction cost reductions. In this way, we expect to extend the knowledge about the effects of inter-organizational relationships on performance.

Therefore, having a better understanding of the way that inter-organizational relationships contribute with performance, will help to understand exploitation and exploration integration processes from external sources of knowledge, as an added value and complementary to internal sources of the organization. This ability to combine exploitation and exploration offers an advantage in terms of performance to those firms that achieve it. Finally, we suggest that firms that obtain a sustained performance in

the long term and superior performance in the short term, as ambidexterity proposes, make an effective management of hybrid sources of exploitation and exploration from internal and external contexts, like those from inter-organizational relationships.

Other issues that should be taking into account have to do with the effective governance that allow exchanging knowledge and learning, without overly compromising the integrity of the firms in a relationship. To explain this, transaction cost economics theory and the relational exchange theory have been used to evidence the safeguarding, evaluation and adaptation problems involved in a relationship, and the best way to manage them. What is expected from introducing governance as a variable is that it contributes to a higher understanding of the mechanisms or routines (formal or informal) that generate the best performance.

Future lines of research

Based on the current literature review, future fields of study have been identified, in theoretical and empirical issues that link organizational ambidexterity and inter-organizational relationships (see Table 4). Table 5 presents the managerial implications for firms of this review.

Table 4. Ambidexterity and inter-organizational relationships fields of research

Effect	Description	Previous studies
Effect of absorptive capacity on the relation between the organizational ambidexterity and performance.	This is the first link between internal knowledge and inter-organizational relationships. This contributes with a higher understanding of the mechanisms that moderate ambidextrous organizational relationships and performance based in the capability that the organizations have to acquire, assimilate, combine and apply the external knowledge provided by the inter-organizational relationships.	(Fernhaber & Patel, 2012; Geyskens et al., 2006; Hernández-Espallardo et al., 2011; Jansen et al., 2005; Lichtenthaler, 2009; Rothaermel & Alexandre, 2009)
Effect of alliance capability on the relation between the co-exploitation and co-exploration, and performance.	To address the role of alliance capability in relation to co-exploitation, co-exploration and performance will contribute to a better understanding of the conditions under which co-exploiting and co-exploring are favorable.	(Biao & Yi-Ju, 2014; Kauppila, 2015; Stettner & Lavie, 2014).

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Effect	Description	Previous studies
Effect of organizational ambidexterity on firm performance departing from co-exploitation and co-exploration.	To extend the findings about organizational ambidexterity and firm performance, while studying the interaction of organizational ambidexterity with the dimensions of the inter-organizational relationship (co-exploitation and co-exploration), will allow having a clearer perspective of the effects of combining internal and external innovation strategies on firm performance.	(Biao & Yi-Ju, 2014; Kauppila, 2010, 2015; Koza & Lewin, 1998; Lavie & Rosenkopf, 2006; Lin et al., 2007; Parmigiani & Rivera-Santos, 2011; Quinn & Rohrbaugh, 1983; Rothaermel & Deeds, 2004)
Effect of relational governance on co-exploitation and co-exploration projects performance.	To study relational governance, co-exploitation and co-exploration, will contribute to identify the most effective governance mechanisms that allow inter-organizational relationships to have an added value on organizational ambidexterity and firm performance, in framework of innovation projects.	(Biao & Yi-Ju, 2014; Blome et al., 2013; Zimmermann & Raisch, 2009)

Source: The authors

Table 5. Managerial implications.

Implication	Description
The role of absorptive capacity and alliance capability	Managers' understanding of the role that absorptive capacity and alliance capability play will allow firms to be better prepared to capitalize and increase their benefits from inter-organizational innovation efforts. Likewise, we call the attention on absorptive capacity and alliance capability as strategic factors that may have positives effects on performance
Inter-organizational relationships and their added value in performance.	To have a better understanding of the factors that affect the firm performance in the framework of inter-organizational relationships, will facilitate managers to make better collaboration agreements for long term sustain and superior performance than industry average in short term.
The most effective governance in innovation projects	To know the most suitable governance mechanisms that favor the organizational ambidexterity will allow executives to manage and control in a better way inter-organizational relationships.

Source: The authors

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