

The role of boundary management in open innovation: towards a 3D perspective

Boundary
management in
open
innovation

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57

Received 27 January 2021
Revised 9 June 2021
Accepted 27 July 2021

Abstract

Purpose – The aim of this paper is to investigate the role of boundary management when firms should implement open innovation.

Design/methodology/approach – The relevant literature on strategic management, firm boundaries and open innovation fields is revised and critically assessed. An interpretive-qualitative methodology is applied to analyse empirical data obtained from a questionnaire and subsequent interviews of a sample of Italian listed firms. By critically integrating literature review and empirical analysis, a framework is provided with the objective of supporting open innovation implementation.

Findings – The study shows that on the one hand, open innovation and many modern paths of growth are connected to a firm's boundaries and that on the other hand, boundary management plays a key role in the implementation of open innovation.

Practical implications – The paper has implications for practitioners by driving them to shift the focus of open innovation implementation towards the management of boundaries, in which boundary capabilities and activities play a key role.

Originality/value – This paper sheds light on the advantages and risks that can jeopardize a successful opening up innovation processes without the effective management of boundary studies. Thus, the authors identify and propose causes for reflection and tools maximizing potentiality and reducing risks in the implementation of such processes.

Keywords Open innovation, Boundary management, Corporate growth strategies, Strategic management

Paper type Research paper

1. Introduction

Corporate growth strategies should be properly developed to create innovative paths and competitive advantages (Kortmann *et al.*, 2014; Liu and Liang, 2015; von Hippel, 1988; Zhang, 2011; Llanes, 2019). Scholars investigating innovation paths have recently juxtaposed the “open innovation” approach with the traditional “closed innovation” perspective (Chesbrough, 2003a, b, c; Berkhout *et al.*, 2006; von Hippel and von Krogh, 2006; Almirall and Casadesus-Masanell, 2010). Studies on open innovation first paid attention to the potential

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The authors would like to thank the Editor and the anonymous reviewers for their insightful comments on the manuscript. The authors would also like to thank the experts who participated in the study.



benefits of opening up innovation processes (Huizingh, 2011; Abulrub and Lee, 2012; Gambardella and Panico, 2014). The more recent literature highlights that the implementation of open innovation involves organizational, cultural, managerial and technological challenges (Lombardi *et al.*, 2016; West and Bogers, 2013; Singh *et al.*, 2019; Albats *et al.*, 2020) by identifying issues faced within firm boundaries and beyond them (Giannopoulou *et al.*, 2010; West *et al.*, 2014; Naqshbandi *et al.*, 2019). However, despite the relevance of organizational boundaries to the innovation literature stream (Lakhani *et al.*, 2013; Roy and Sarkar, 2016), few studies have analysed the relationships between corporate growth strategies, the implementation of open innovation and firm boundaries (Fiorentino, 2016; Trequattrini *et al.*, 2012; Garzella *et al.*, 2020). Conversely, studies must investigate the role of boundary management – how managers coordinate resources, activities and business processes on the boundaries of a firm – in the implementation of open innovation amongst leading firms in searching for the right balance between open and closed approaches. By shedding light on the relationships between corporate growth strategies, open innovation and boundary management, scholars should provide means of seizing opportunities for open innovation by effectively managing risks related to the protection of internal firm assets.

Accordingly, in addressing the call for work on the challenges that face firms embracing open innovation approaches (Chesbrough, 2006; Enkel *et al.*, 2009; Hossain *et al.*, 2016; Hosseini *et al.*, 2017; Van de Vrande *et al.*, 2009; Calof *et al.*, 2018), the aim of this paper is to investigate the role of boundary management at play when firms should implement open innovation. Specifically, we posit the following research questions: What is the link between open innovation, new paths of corporate growth and firm boundaries? What boundary resources and activities foster the management and implementation of open innovation? How can firms face the typical risks of implementing open innovation through boundary management?

In answering these questions, we developed a research project based on an interpretive and qualitative approach. First, we reviewed the relevant literature on strategic management, open innovation processes and firm boundaries to define the state of the art in these fields. Second, we administered a questionnaire survey to a sample of Italian listed firms. On the basis of the questionnaire results, we also conducted semi-structured interviews to perform an in-depth analysis of the most critical aspects and suggestions raised by the survey. By critically integrating a literature review and empirical data analysis, a framework is provided with the objective of supporting open innovation implementation.

The next section provides a theoretical background. Section 3 discusses methodological issues, providing a detailed description of the research methods used to address the research questions. Section 4 presents and discusses the findings. Finally, Section 5 presents conclusions, implications and limitations.

2. Theoretical background

We analysed the theoretical background with reference to three main literature streams: (1) corporate growth strategies, (2) open innovation and (3) boundary management. Insights from the literature review were used to develop research questions.

New competitive contexts, network dynamics, digitization and the sharing economy present continuous stimuli for renewing the sources of competitive advantage (Caputo *et al.*, 2021; Kortmann *et al.*, 2014; Liu and Liang, 2015; Zhang, 2011; Chen, 2019; Haseeb *et al.*, 2019; Veiga *et al.*, 2021). Current markets are witnessing a rapid increase in activities that were traditionally realized within companies by outsourcing processes (McIvor, 2009; Kwak *et al.*, 2018; Abeysekara *et al.*, 2019; Patrucco *et al.*, 2020). The search for success frequently leads to partnerships and strategic alliances (Boddy *et al.*, 2000; Li *et al.*, 2017; Aggarwal and Kapoor,

2019; Reuer *et al.*, 2016). At the same time, companies have an increasing amount of information on environmental dynamics (Gupta and Kohli, 2006; Karmarkar, *et al.*, 2015; Trantopoulos *et al.*, 2017; Vrontis *et al.*, 2017), and big data have led to new types of interactions amongst companies and external stakeholders (Rosenzweig, 2009; Mikalef *et al.*, 2020; Zerbino *et al.*, 2018; Wamba and Mishra, 2017). Traditional “internal growth” and “external growth” strategies are becoming less useful for analysing corporate growth strategies. The topic of boundaries has been analysed by scholars of economics, management and organizational behaviour (Villalonga and McGahan, 2005; Caputo *et al.*, 2019a; Kim and Jin, 2017). Traditional theories, such as “transaction cost economics” and “resource-based views”, generally investigate growth strategies through a “make or buy” lens (Barney, 1991; Coase, 1937; Williamson, 1975). Transaction cost economics (TCE) focuses on the benefits and costs of managing activities inside or outside of firms. The resource-based view (RBV) suggests that analyses should encompass the traditional dichotomy between benefits and costs to focus on the analysis of resource and capability development. These theories have been recently developed based on the evolution of competitive and technological landscapes towards collaborative decisions in resource, knowledge and business process management (Foss, 1996; Milgrom and Roberts, 1990; Parmigiani and Mitchell, 2009; Santos and Eisenhardt, 2005; Tortoriello and Krackhardt, 2010; Costa *et al.*, 2016; Enderwick and Buckley, 2019; Lombardi *et al.*, 2021).

The rise of new growth strategies characterizes managerial issues and makes the management of firm boundaries a key variable (Foss *et al.*, 2013; Swink *et al.*, 2007; Caputo *et al.*, 2019a; Garzella *et al.*, 2020). Studies increasingly focus on firm boundaries as a third alternative to integration and the market, and the joint use of skills and knowledge has highlighted the role of boundary management (Alexander, 1997; Breschi and Malerba, 1997). Boundary management should be used to integrate the benefits of internal and external growth strategies (Hargadon, 2002; McEvily and Zaheer, 1999; Steensma and Corley, 2001; Takeishi, 2001; Garzella, 2000). Firm boundary decisions are generally the answer to pressures to extend and complement internal resources and to the need for risk control (Yang *et al.*, 2010). Thus, the management of boundaries requires the activation of a decision-making process mainly to define activities allowing for a connection between the firm and the external environment (Caputo *et al.*, 2019a, p. 6): “The management of boundaries involves making decisions on “how” to define activities that integrate and interface a firm with the external environment”. Specific decision-makers (e.g. strategic managers or strategic subjects who are not fully internal and external) identify the business processes, value chains’ opportunities and key relationships that internalize resources and assets. In this area, decision-making appears focused on the business process periphery supporting boundary strategies for seeking opportunities (Caputo *et al.*, 2019a). In light of previous considerations, our first research question is as follows:

RQ1. How are open innovation, new paths of corporate growth and firm boundaries related?

Under this scenario, the relevance of open innovation in management research is demonstrated by an exponential number of studies focused on the topic (Bogers *et al.*, 2018; Hossain *et al.*, 2016; West *et al.*, 2014; Huizingh, 2011). Through the introduction of a new paradigm (Chesbrough, 2003a, b, c; Berkhout *et al.*, 2006; von Hippel and von Krogh, 2006), open innovation has been investigated under several perspectives and in reference to specific issues referring both to large firms and to small and medium-sized enterprises (SMEs) (Hossain and Kauranen, 2016; Abdulkader *et al.*, 2020). In this area, the pioneering study by Chesbrough (2003a) defines open innovation as “a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology”.

In terms of knowledge flows, open innovation is based on outside-in, inside-in and coupled processes or modes (Aloini *et al.*, 2017; Enkel *et al.*, 2009; Gassmann and Enkel, 2004; Trequattrini *et al.*, 2012; West and Bogers, 2013). Thus, open innovation is guided by external versus internal modes of ideas and knowledge (inbond), internal versus external modes of ideas and knowledge (outbond) and a combination of previous modes. Chesbrough *et al.* (2006) state that open innovation is a “purposive inflow and outflow of knowledge to accelerate internal innovation and to expand the markets for external use of innovation”. Van de Vandre *et al.* (2009) recognize purposive outflows and inflows of knowledge of technology exploitation (venturing, outward IP licensing and employee involvement) versus technology exploration (customer involvement, external networking, external participation, outsourcing R&D and inward IP licensing), including a combination of them: “Purposive outflows of knowledge, or technology exploitation, implies innovation activities to leverage existing technological capabilities outside the boundaries of the organization. Purposive inflows, which we will refer to as technology exploration, relates to innovation activities to capture and benefit from external sources of knowledge to enhance current technological developments”.

Although several open innovation modes exist in terms of openness, e.g. joint ventures, in-licensing, out-licensing and cross-licensing (Gambardella and Panico, 2014; Lombardi, 2019), Abulrub and Lee's (2012) study shows that firms use only a few types of the 13 identified modes of open innovation, including joint research development, contract R&D, customer involvement and external networking. In implementing open innovation modes, firms change their activities and processes by transforming innovation management models and business models (Zhu *et al.*, 2019; Garzella *et al.*, 2020; Saebi and Foss, 2015; Abdulkader *et al.*, 2020) and sharing knowledge with producers, providers, users, research centres, universities and other network actors (Lombardi *et al.*, 2016; Cassiman and Valentini, 2016; West and Bogers, 2013; Secundo *et al.*, 2019). The involvement of several external resources has become a focal issue in recognizing firm boundary resources and in governing firms through strategic boundary management (Giannopoulou *et al.*, 2010; West *et al.*, 2014; Fiorentino, 2016). Although the influence of openness in innovation modes on business performance should be defined (von Hippel, 1988; West and Bogers, 2013; Chesbrough and Bogers, 2014), Toma *et al.* (2018) highlights that “OI has been defined as a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model”. Thus, our second research question is as follows:

RQ2. Which boundary resources and activities foster the management and implementation of open innovation?

In a global environment where the speed of competition has substantially increased, the literature shows that cooperation strategies often lead to relevant benefits when firms, due to a lack of know-how or funds, can barely self-generate the innovation needed to effectively respond to market needs (Lorenzoni and Lipparini, 1999; Aggarwal and Kapoor, 2019; Bouncken *et al.*, 2020; Ritala *et al.*, 2015). The topic of boundaries has been analysed in studies of economics, management and organizational behaviour (Villalonga and McGahan, 2005; Roy and Sarkar, 2016; Seru, 2014). These studies have referred to boundaries to analyse resources, activities and processes that can be jointly controlled and influenced by many organizations (Yang *et al.*, 2010; Nason *et al.*, 2019). Scholars have found that “control” should be the most useful criterion for defining where firm boundaries should be placed: “the organization ends where its discretion ends and another begins” (Pfeffer and Salancik, 1978, p. 32). More specifically, boundaries should be viewed as part of a continuum that represents an intermediate form of hybrid governance (Normann and Ramirez, 1993; Roberts and Beamish, 2017; Zander, 2007). Since this continuum constitutes a “border area” from which it

is not easy to distinguish firms from the external environment, it is increasingly necessary to use the concept of boundaries and the “boundary zone” as central elements of network dynamics, digital innovation and sharing economy perspectives (Caputo *et al.*, 2021; Garzella *et al.*, 2020; Nambisan *et al.*, 2017).

The management of resources, knowledge and activities on firm boundaries is becoming a new paradigm for obtaining and sustaining a competitive advantage (Dyer and Singh, 1998; Garzella, 2000; Wagner, 2003; Gonzalez-Benito and Lannelongue, 2014). Scholars have proposed advantages from boundary management (Cao and Zhang, 2011; Cassiman and Veugelers, 2006; Parmigiani and Mitchell, 2009; Caputo *et al.*, 2019a). Studies find that boundary management favours the integration of coordination and flexibility benefits by jointly developing both (Park *et al.*, 2004; Lavie, 2006; Swink *et al.*, 2007). Another literature stream focuses on the likelihood of facing relevant risks of current contexts, such as the full outsourcing of key activities by partially enhancing outsourcing, thereby increasing resource and knowledge portfolios from relationships with external actors. These findings lead managers to overcome the traditional trade-offs between internal and external growth strategies (Blocker *et al.*, 2012; Fiorentino, 2016; Troilo *et al.*, 2009).

In contexts where new innovation paths and ways of governing relationships are established, boundary management plays a key role (Adamides, 2015; Foss *et al.*, 2013; Schmenner *et al.*, 2009; Nason *et al.*, 2019). Boundary management should favour the design and management of innovation from a broader perspective to identify new integration and coordination opportunities amongst the value chains of the firm and of external “partners” (Boddy *et al.*, 2000; Pil and Holweg, 2006; Porter, 1987) through “linking” and “bearing” strategies (Caputo *et al.*, 2019; Garzella, 2000; Scott, 2003).

“Linking strategies” seek to internalize the resources and skills of the partners. Firms pursuing information sharing and the alignment of internal and external innovation processes should allow the innovative redesign of the entire business model. At the same time, however, firms must supervise innovation processes by developing “bearing” strategies that protect from the risks involved when external actors should acquire key information through their relationships with their firms. Boundary strategies add specific potential to the strengths that characterize open innovation paths, and decision-making processes are directed to profitably manage boundaries and related resources (Caputo *et al.*, 2019a). Our third research question is as follows:

RQ3. How can firms face the typical risks of implementing open innovation through boundary management?

3. Methods

To carry out this research, an interpretive and qualitative methodology (Lukka and Modell, 2010; Yanow and Schwartz-Shea, 2014; Schwartz-Shea and Yanow, 2012) was applied to answer our research questions. In particular, we use a survey (Cooper *et al.*, 2006; Hoque, 2018). Although this method is influenced by some bias, such as nonresponse bias (de Villiers and Dumay, 2014), it is relevant to collecting empirical data and information on firms through the utilization of one or more questionnaires, allowing for the proposal of relevant reflections on the results by respondents. With the aim of deepening the analysis, we also conducted semi-structured interviews; this approach is an accepted means to provide further evidence on empirical data raised through a questionnaire (Hopper and Powell, 1985; Orlikowski and Baroudi, 1991).

Thus, we designed a research project using two complementary research methods. The first method involved the use of a survey to provide an understanding of the issues

related to the prior literature review; the second involved the use of interviews to validate and extend questionnaire data (Edmondson and McManus, 2007).

In this way, this paper investigates the role of organizational boundary management at play when firms are directed to adopt and implement open innovation approaches, providing a specific framework generated from the integration of a literature review and empirical data. In this vein, the following subsections describe the selection of our respondents, data collection method and data analysis.

3.1 Respondent selection and data collection

Respondent were selected through utilization of the AIDA data source provided by Bureau van Dijk. In this way, all 334 Italian listed companies in 2018 were selected. Additionally, the e-mail addresses of investor relatives and information about the key internal actors – the chief executive officer (CEO), general manager (GM) and chief executive officer of R&D (CEO-R&D) – of each company were collected. This is because CEOs, GMs and CEOs-R&D lead significant decision-making processes in organizations, including decision-making on corporate strategy and open innovation implementation. Thus, these individuals participate directly and indirectly in innovation activities at the organizational level, and they have an awareness of the strategic management of their firms.

In investigating the role of boundary management at play when firms adopt and implement open innovation approaches, data were collected using a survey created in Google Docs and directed at the CEO, GM and CEO-R&D responsible for each company in the sample. The questionnaire was developed following Dillman's (2000) method. Specifically, an invitation to participate in an online questionnaire was sent via email to the relevant investors of the sampled firms. To increase the response rate, the invitation included a cover letter explaining the purpose of the research and inviting the addressees of the survey to access the online questionnaire through a direct link. Approximately one month later, a reminder e-mail was sent to those who had not responded. At the end of this procedure, 30 responses from CEOs, GMs and CEOs-R&D had been obtained, meaning that the response rate was approximately 9%.

Subsequently, the empirical research was completed by semi-structured interviews with the aim of comparing and validating the prior questionnaire results. For respondent selection, we adopted a pragmatic approach. The respondents – shown in Table 1 – were Italian, engaged in top management roles, and working for listed firms from several industries, allowing us to observe the studied issues from different perspectives. Specifically, we selected nine respondents who were involved in the prior steps of our research. Our aim was to shed light on differences in perception and insights related to firms of different sector groups. Indeed, because of their different operational fields, the respondents offer a comprehensive representation of challenges related to the opportunities and risks of implementing open innovation processes.

3.2 Data analysis

The questionnaire used for the online survey focused on defining open innovation and on how open innovation is implemented in the studied firms. Thus, to obtain evidence supporting the purpose of this research, the questionnaire was divided into three main parts in addition to an introduction to the study focused on the general context and aims of the research. The first section collected general data on key internal actors, including information on names and surnames, roles, education history, titles and involvement in open innovation implementation. The second section focused on the role of open innovation in corporate development strategies. The third section obtained information on success factors and risks derived from open innovation implementation in firms. However, each section introduced the

Sector	Industry	Sub-industry	Interviewee
1. Health care	Pharmaceuticals, biotechnology and life sciences	Biotechnology and pharmaceuticals	Chief scientific officer
2. Consumer discretionary	Automobiles and components	Auto components	R&D director
3. Consumer discretionary	Automobiles and components	Automobiles	Chief executive officer
4. Information technology	Software and services	IT services	Head of strategy
5. Communication services	Media and entertainment	Publishing and broadcasting	Chief executive officer
6. Industrials	Transportation	Air freight and logistics	Chief executive officer
7. Financials	Diversified financials	Capital markets	Open innovation manager
8. Financials	Diversified financials	Diversified financial services	Founder and president
9. Financials	Insurance	Insurance	Business architect

Table 1.
Characteristics of the
interview respondents

main topic of focus and questions explaining main keywords such as “open innovation”, “business model” and “competitive advantage”.

Additionally, the questionnaire included 22 questions, of which two were open-ended questions, eight were open-closed questions (“yes”, “no” and “other”) and 12 were closed-ended questions. The closed-ended questions were structured with a five-point scale model ranging from “not essential” to “highly essential”. The questionnaire can be found in the [Appendix](#).

The reliability of the proposed questionnaire derives from our pretesting activities. However, the integrity of the proposed investigation is guaranteed by a joint work strategy adopted amongst the authors as well as by our considerable experience and knowledge in this field. Specifically, we discussed and analysed the results of the online questionnaire to achieve significant research and practical considerations and implications on the topic analysed.

From the primary insights that emerged from this analysis, we also conducted semi-structured interviews. Thus, we do not rely on our statistical analysis of the survey results alone to answer our research questions; empirical data obtained from our surveys were used to guide the formulation of the interview questions with the aim of verifying, clarifying and fully understanding the respondents’ experiences with the implementation of open innovation approaches. The respondents were asked about their past and current “open innovation experiences”, specifically their most relevant experiences over the previous three years.

The interviews included open-ended questions about actions, advantages and risks related to the implementation of open innovation processes. The interviews (performed face-to-face, by telephone or by Skype) lasted 30–60 min and were collected in two (a second round was designed to seek external validation and refinement) rounds from the end of 2018 to the beginning of 2020. During the interviews, we asked the respondents for their opinions, perceptions, suggestions and practices on the studied topic. We adopted semi-structured interviews to allow for free descriptions, thus fostering an interactive discussion ([Huff and Jenkins, 2002](#)). This well-established approach emphasizes lived experience in management and social studies and is not epistemologically concerned with sampling a specific population and instead focuses on theoretical categories ([Gephart, 2004](#); [Gioia et al., 2013](#)). Indeed, the

interviews were intended to encourage the participants to describe their feelings and their cognitive management of their coping efforts related to the implementation of open innovation approaches, emphasizing their lived experience (Schaeffer *et al.*, 2010). Although the interviews were developed around interactive discussions (Huff and Jenkins, 2002), the guiding questions used in the interviews are listed in the Appendix.

This study applies a blend of inductive and deductive processes (Graebner *et al.*, 2012) to critically analyse a wide range of data. After transcribing the interviews, qualitative data were analysed using thematic qualitative coding techniques (Miles *et al.*, 2014). During data analysis, definitions and themes were drawn from the existing literature (Eisenhardt *et al.*, 2016).

All data collected were analysed via content analysis (Mayring, 2014). We initially developed a tentative coding scheme and identified grounded categories and subcategories related to open innovation processes, boundary resources and corporate growth strategies (Guest *et al.*, 2012; Titscher *et al.*, 2000). Then, we developed a coding agenda and examined and interpreted the material by going back and forth between the data and literature until we achieved a stable degree of triangulation (Graebner *et al.*, 2012; Jonsen and Jehn, 2009).

Furthermore, the most important observations were summarized and submitted to the interviewees to obtain their confirmation of the content and to allow the interviewees to provide new comments (Lukka and Model, 2010). Validation by research participants is a common interpretive methodology (Torrance, 2012). This final step was important for establishing the trustworthiness of our interpretation (Lincoln and Guba, 1985; Sandberg, 2005) and involved presenting the results to the original informants or others for feedback and correction.

Starting from the theoretical background, all data related to the survey and interview were examined and interpreted to determine whether and how they fit the expected process (Graebner *et al.*, 2012). The related findings and discussion are presented in the following section. The results are presented below along with some of the most representative quotes from the interviews.

4. Findings and discussion

Our explorative research aimed to provide a comprehensive view of the role of boundary management at play when firms should implement open innovation. We asked about the relationships between open innovation, new paths of corporate growth and firm boundaries; about boundary resources and activities for fostering management and open innovation and about the role of boundary management in facing typical risks of open innovation. Thus, the experts' answers provided interesting insights to advance theories on firm boundaries (Cao and Zhang, 2011; Villalonga and McGahan, 2005; Roy and Sarkar, 2016; Garzella *et al.*, 2020), open innovation (Chesbrough, 2003a; Enkel *et al.*, 2009; Trequattrini *et al.*, 2012; Aloini *et al.*, 2017) and corporate growth strategies (Fiorentino, 2016; Foss *et al.*, 2013; Garzella and Fiorentino, 2014), revealing relevant issues of boundary management that are at play when firms embrace open innovation.

Regarding actions used to implement open innovation, almost all survey respondents reported using several corporate actions to develop strategies fostering open innovation, contributing to existing theories (Fiorentino, 2016; Foss *et al.*, 2013; Garzella, 2000). Calls for ideas, H2020 projects and business start-up scouting for specific technologies aligned with corporate strategies, research centre collaboration, business model innovation, vertical acceleration projects and technological development in the field are examples of strategies adopted by the firms to foster open innovation. Many respondents view collaboration with partners on innovation projects over the next three years to be essential for firms.

It is no longer enough to engage in R&D activities within the company alone. Currently, companies need to look beyond their boundaries and towards new external subjects that can bring new ideas and skills to create more business value and increase their competitive advantage (Respondent 6; CEO)

Additionally, we asked whether the firms are willing to collaborate with key individuals. Providers of goods and services and territorial organizations seem to be the most relevant key individuals according to approximately half of the experts' answers. Highly essential key individuals and entities are identified as providers of goods, clients, research centres and university and territorial organizations. However, substitute providers and new entrants on the market seem to be less relevant than other key individuals.

4.1 RQ1. How are open innovation, new paths of corporate growth and firm boundaries related?

First, we asked how, in the respondent's opinion, strategies, innovation and firm boundaries are related assuming a profitable contribution to the literature and advancement of theories (Fiorentino, 2016; Garzella, 2000; Trequattrini *et al.*, 2012). The findings suggest that open innovation is equally important for product, process and business model innovation. In new competitive contexts, open innovation is more obligatory than an option. Open innovation represents a real alternative to traditional strategies for achieving positions of competitive advantage.

In collaborating with external players, our company may benefit from the research of others to create technological innovations and new and more competitive business models. When talking about growth, we cannot do it by considering only the company's perimeter. Implementing open innovation processes for firms to re-examine business paths is considered immutable (Respondent 5; CEO)

Most importantly, respondents suggest that open innovation can be framed mainly as a rethinking of the traditional distinction between internal and external growth strategies. Firms adopt open innovation to increase creativity, to reduce time to market and to improve product and process quality more than to reduce risks and costs.

Open innovation processes reduce the impact of increasingly rapid changes in technology. Indeed, in this scenario, companies, in the face of the high R&D expenses required to develop new products and remain competitive in markets, fail to generate sufficient revenue to build "appealing margins" on their innovative products. Open innovation is no longer a choice; it is almost a necessity (Respondent 4; Head of Strategy)

The questionnaires underline that open innovation makes it possible to enhance knowledge produced outside the company by transferring it within. However, relations with partners emerge as one of the main risks of external growth strategies and open innovation. The following response describes these aspects:

Internally/externally sharing knowledge can play a key role in strategic growth paths when the parties are equally involved and have sufficient technical and managerial skills to be able to support each other. In a business relationship, the mix of economic advantages and practical advantages must be well balanced for the best result for all parties involved in the process to be achieved (Respondent 2; R&D Director)

Accordingly, in the respondent's opinion, boundary management can play a key role in improving corporate strategies and open innovation first by reducing the timing of innovation processes (thus increasing the value of innovation) and by avoiding interorganizational conflicts. Furthermore, boundary resources and activities can help firms question consolidated thinking models.

4.2 RQ2. Which boundary resources and activities foster the management and implementation of open innovation?

Second, we investigated the relevant resources and activities for fostering open innovation implementation (Chesbrough, 2003a; Enkel *et al.*, 2009). We asked what types of resources are of greater or lesser practical relevance to open innovation success processes to determine how much certain factors affect the implementation stage. The findings suggest that the effectiveness of the open innovation process depends mainly on the relational skills of top management. In open innovation implementation, relations with customers are, surprisingly, more important than relations with suppliers. An illustrative quotation is as follows:

For us, it is natural to think of relationships with customers as the starting point of every reflection and the end point of every activity (Respondent 1; Chief Scientific Officer)

Success in implementing open innovation is also related to the creation of organizational units devoted to boundary management by new ad hoc organizational units for each open innovation process and to the creation of culture and organizations favourable to open innovation. The following quote illustrates this point:

Very often amongst company staff I have observed an absence of an “innovation gatekeeper” who can guide management in understanding which innovations to take from outside and which ones to instead pursue internally. Companies often suffer from a “non-product-here” syndrome that keeps them from adopting solutions developed outside. Another critical issue is having an R&D department with the absorptive capacity to understand the quality of external innovation (Respondent 7; Open Innovation Manager)

Our results highlight that in fostering open innovation, boundary managers should be engaged in relevant boundary activities such as, in order of importance, the development of staff with boundary management skills, the selection of subjects to be involved in open innovation implementation, the capacity to adequately assess risks and goals of open innovation with other involved subjects, the adoption of linking strategies with partners and the adoption of bearing strategies.

4.3 RQ3. How can firms face the typical risks of implementing open innovation through boundary management?

Furthermore, we sought information on ways in which boundary management should be used to face implementation risks in light of existing theories on boundary management (Cao and Zhang, 2011; Cassiman and Veugelers, 2006; Garzella, 2000; Parmigiani and Mitchell, 2009; Wagner, 2003). Consistently, the survey results confirm that boundary management can play a key role in enhancing cohesion and collaboration in open innovation working teams, reducing coordination costs, improving commitment to the project, enduring resistance in the corporate culture and leading change management processes, enhancing a willingness to fairly share know-how and protecting internal know-how. Moreover, generally overlooked factors found to be relevant in our survey are the relations amongst internal functions, which are more important than relations with external partners. In this regard, the role of boundary managers is strengthened. The following quotation is representative of several perceptions described:

The promotion of an open culture is a critical aspect to pursue. The real commitment must be equally spread at various levels of the company through several corporate figures, which have the task of cultivating, developing and encouraging the entire project. Moreover, it is important to spread awareness of a possible failure of open innovation processes for each innovative initiative (Respondent 8; Founder and President)

The respondents felt boundary management is relevant because it impacts the management of typical firm risks in implementing open innovation. Boundary management can improve

RQ	Insights	Implications
The relationships between open innovation, new paths of corporate growth and firm boundaries Boundary resources and activities fostering the management and implementation of open innovation	Open innovation and boundary strategies are important for achieving positions of competitive advantage Relational skills of top management play a key role in the effectiveness of open innovation implementation processes	Firms can enhance creativity, reduce time to market and improve product and process quality via open innovation and boundary strategies Firms should carefully (1) Develop relations with customers (2) Implement relations with suppliers; and (3) Improve partner selection Firms should create
How firms can face typical risks in implementing open innovation via boundaries management	The introduction of boundary managers can improve the selection of partners, foster managerial formation, and reduce internal resistance	(1) <i>Ad hoc</i> organizational units with specific skills for boundaries management; and (2) A culture and organization favourable to open innovation

Table 2.
The main insights into
and implications of
each research question

the selection of partners through effective negotiation processes. Indeed, a focus on boundary resources and activities can foster a continuous process of manager formation to address a lack of skills in the management of collaborative relations. Finally, boundary management should be useful in the management of internal resistances. [Table 2](#) summarizes these main results.

5. Discussion and implications

A previous analysis of the respondents' answers showed the role of boundary management when firms implement open innovation, contributing significant advances to existing studies ([Cao and Zhang, 2011](#); [Chesbrough, 2003a](#); [Enkel et al., 2009](#); [Fiorentino, 2016](#); [Foss et al., 2013](#); [Garzella et al., 2020](#); [Trequattrini et al., 2012](#); [Villalonga and McGahan, 2005](#)). However, we highlight the studied firms' lively activation of open innovation strategies through several targeted actions (e.g. calls for ideas, H2020 projects, research centre collaborations and business model innovations). Additionally, we observe the fundamental role of collaborations with key individuals, especially referring to providers of goods and services and territorial organizations.

In contributing to existing theories ([Fiorentino, 2016](#); [Garzella et al., 2020](#); [Trequattrini et al., 2012](#); [Caputo et al., 2019a](#)), we argue that this research confirms open innovation to be relevant to product, process and business model innovation and competitive advantage. Several advantages of open innovation implementation, including increased creativity, a reduced time to market and improved product and process quality, are confirmed. Additionally, open innovation can favour the business model innovation in contexts where digitalization trends disrupt the ways in which firms do business ([Caputo et al., 2021](#)). However, in this scenario, we assume that the relevance of boundary management supports corporate strategies and open innovation, as shown by our evidence. Thus, innovation process timing and interorganizational conflicts seem to be reduced, and boundary resources and activities are directed to question consolidated thinking models used in the firm.

Additionally, implications of our study for open innovation implementation are posed ([Chesbrough, 2003a](#); [Enkel et al., 2009](#); [Zhu et al., 2019](#)). In this phase, the relational skills of top management, qualified human resources, image and reputation and relationships with clients

play a key role. Thus, boundary managers must educate people, select subjects to participate in open innovation implementation, assess risks and goals of open innovation with other involved subjects and adopt linking strategies with partners and bearing strategies. Since relations with partners emerge as one of the main risks of open innovation implementation, negotiation by boundary management can play a key role in making joint decisions amongst subjects involved in open innovation (Buckley and De Mattos, 2021; Caputo *et al.*, 2019b; Ertel, 1999).

In summary, it is not implausible to argue that boundary management is very relevant in implementing open innovation. In other words, boundary management plays a significant business role in light of theories on its relevance (Caputo *et al.*, 2019a; Cao and Zhang, 2011; Cassiman and Veugelers, 2006; Garzella, 2000; Parmigiani and Mitchell, 2009; Wagner, 2003). Our results highlight the importance of overlooked aspects of open innovation implementation, such as firm internal relations and external relations. Accordingly, firms should create *ad hoc* organizational units with boundary management-specific skills. These aspects are summarized in Figure 1.

6. Conclusions

The results of this paper show that open innovation and many modern firms' paths of growth – home banking, teleworking, networking, new supply chains, e-commerce, etc. – are connected to the boundary, of which the main significant element is represented by management.

Making the decision to embrace open innovation involves first understanding opportunities inherent to this perspective and then considering its effective, efficient and correct implementation. Thus, it is possible to identify both boundary strategies and distinctive resources from which they are successfully implemented. Amongst these resources, strong relational skills, the control of information technology, a strong corporate image within the innovation network and managerial skills to dynamically harmonize power/dependence relations (with partners, customers and suppliers) stand out. Alongside the strengths of boundary management and its ability to read weak signals from the environment, risks of strategic approaches and modalities for implementation have also emerged.

This study sheds light on the advantages and risks that can jeopardize successful innovation processes without the effective management of boundary studies. In recognizing

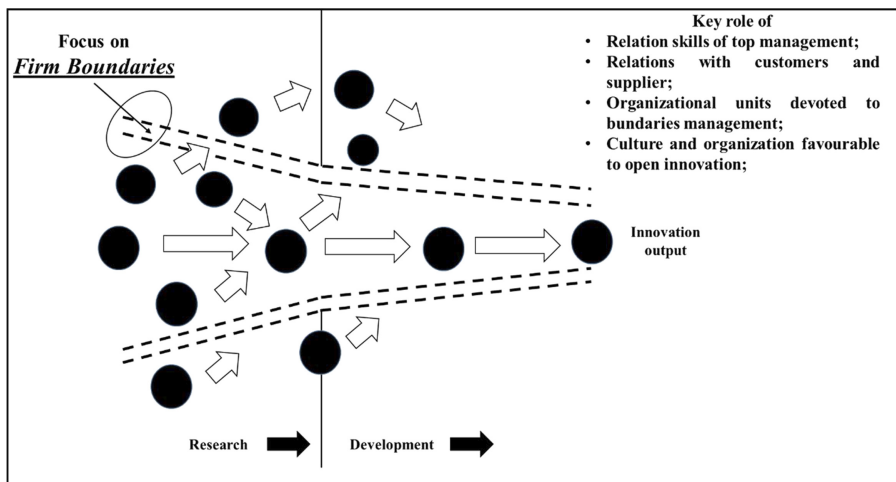


Figure 1.
Implementing open
innovation: the role of
boundary management

the boundary as the core of open innovation implementation issues, boundary management should be based on elements both internal and external, which outline paths difficult to place within the typical and traditional dichotomies and taxonomies of strategic management studies. Consistently, the current theoretical and managerial solutions to open innovation, such those from strategy studies, cannot make useful contributions to the implementation of paths that are increasingly based on boundary resources. Future studies should provide in-depth research on the role of boundaries in open innovation implementation to learn more and to limit the risks of centrifugal thrusts.

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1. Questionnaire for “The role of boundary management in open innovation: Towards a 3D perspective”

GENERAL INFORMATION

Name and Surname

Email

Role

Years of experience in the role

Qualification

Have you been directly involved in open innovation implementation? YES NO

Company name

Company size (in terms of the number of employees)

Company location

1 How important are the following resources for the implementation of successful open innovation paths?

Technology

not essential somewhat essential essential very essential highly essential

Corporate image and reputation

not essential somewhat essential essential very essential highly essential

Production capacity

not essential somewhat essential essential very essential highly essential

Relational skills of management

not essential somewhat essential essential very essential highly essential

Customer relations

not essential somewhat essential essential very essential highly essential

Supplier relations

not essential somewhat essential essential very essential highly essential

Skilled human resources

not essential somewhat essential essential very essential highly essential

Other

not essential somewhat essential essential very essential highly essential

- 2 What is the importance of open innovation for the development of the following types of innovation?
- Product innovation
- not essential somewhat essential essential very essential highly essential
- Process innovation
- not essential somewhat essential essential very essential highly essential
- Business model innovation
- not essential somewhat essential essential very essential highly essential
- Other
- not essential somewhat essential essential very essential highly essential
- 3 What are the main advantages of open innovation implementation, internal and external ideas and technology exploitation? (open-ended question)
- 4 How important are the following risks of the implementation of open innovation?
- Uncontrolled knowledge transfer
- not essential somewhat essential essential very essential highly essential
- Lack of independence in R&D activities
- not essential somewhat essential essential very essential highly essential
- Development of projects not appropriate to resources
- not essential somewhat essential essential very essential highly essential
- Development of projects not appropriate to strategic objectives
- not essential somewhat essential essential very essential highly essential
- Other
- not essential somewhat essential essential very essential highly essential

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- 5 How important are the following factors in establishing partnerships?
- Increased flexibility
- not essential somewhat essential essential very essential highly essential
- Increased creativity
- not essential somewhat essential essential very essential highly essential
- Risk reduction
- not essential somewhat essential essential very essential highly essential
- Cost reduction
- not essential somewhat essential essential very essential highly essential
- Reduction in the length of the innovation process
- not essential somewhat essential essential very essential highly essential
- Improvements of product/service quality
- not essential somewhat essential essential very essential highly essential
- Other
- not essential somewhat essential essential very essential highly essential
- 6 How important is open innovation for improving the following parameters?
- Creativity and the capacity to generate new ideas
- not essential somewhat essential essential very essential highly essential
- Risk reduction related to innovative activities
- not essential somewhat essential essential very essential highly essential
- Reduction in the average development cost of new products/processes
- not essential somewhat essential essential very essential highly essential
- Improvements in the effectiveness of innovation processes
- not essential somewhat essential essential very essential highly essential
- Renewal of business skills

- not essential somewhat essential essential very essential highly essential
- Improvements in sales profitability
- not essential somewhat essential essential very essential highly essential
- Improvements of return on investment
- not essential somewhat essential essential very essential highly essential
- Improvements in overall firm profitability
- not essential somewhat essential essential very essential highly essential
- 7 In your opinion, is open innovation a real alternative to traditional strategies for achieving new positions of competitive advantage? YES NO OTHER
- 8 In your opinion, is open innovation an internal growth strategy? YES NO OTHER
- 9 In your opinion, is open innovation an external growth strategy? YES NO OTHER
- 10 In your opinion, can open innovation be defined as a rethinking of the traditional distinction between internal and external growth strategies? YES NO OTHER
- 11 In your opinion, does open innovation generate knowledge exclusively within the company?
 YES NO OTHER
- 12 In your opinion, does open innovation generate knowledge exclusively outside the company?
 YES NO OTHER
- Of
13 In your opinion, does open innovation allow you to enhance the knowledge produced outside of the company by transferring it to the business model? YES NO OTHER
- 14 Has the company already implemented actions aimed at developing open innovation strategies?
 YES NO OTHER
- If so, which ones have been implemented?

-
- 15 How willing is the company to collaborate with the following entities?
- Competitors
- not essential somewhat essential essential very essential highly essential
- Providers of services
- not essential somewhat essential essential very essential highly essential
- Providers of goods
- not essential somewhat essential essential very essential highly essential
- Substitute providers
- not essential somewhat essential essential very essential highly essential
- New entrants
- not essential somewhat essential essential very essential highly essential
- Clients
- not essential somewhat essential essential very essential highly essential
- Research centres and universities
- not essential somewhat essential essential very essential highly essential
- Territorial organizations
- not essential somewhat essential essential very essential highly essential
- Other
- not essential somewhat essential essential very essential highly essential
- 16 What is the likelihood of collaborating with partners in innovation projects over the next three years?
- not essential somewhat essential essential very essential highly essential
- 17 What is the likelihood of collaborating with partners in innovation projects after three years of their activation?
- not essential somewhat essential essential very essential highly essential
- 18 What are the main critical issues involved in the implementation of open innovation?
(open-ended question)

19 How important are the following types of relations for the success of open innovation implementation?

Relations with competitors

not essential somewhat essential essential very essential highly essential

Relations with non-competitors – companies upstream and/or downstream of the supply chain

not essential somewhat essential essential very essential highly essential

Relations with research centres and universities

not essential somewhat essential essential very essential highly essential

Relations with financial institutions

not essential somewhat essential essential very essential highly essential

Relations with consultants and territorial organizations

not essential somewhat essential essential very essential highly essential

Relations among internal functions

not essential somewhat essential essential very essential highly essential

Other

not essential somewhat essential essential very essential highly essential

20 How important are the following organizational solutions to the success of open innovation implementation?

The creation of an organizational unit that consistently supervises technological collaborations

not essential somewhat essential essential very essential highly essential

The creation of an ad hoc operational unit for each collaboration project

not essential somewhat essential essential very essential highly essential

The creation of a corporate culture and organizational climate favourable to open innovation

not essential somewhat essential essential very essential highly essential

The integration of open innovation into the overall strategic process of the company

not essential somewhat essential essential very essential highly essential

Other

not essential somewhat essential essential very essential highly essential

21 How important are the following activities to the implementation of successful open innovation?

Support from top management

not essential somewhat essential essential very essential highly essential

The development of means to protect against the risks of external actors acquiring key information from relationships

not essential somewhat essential essential very essential highly essential

The development of strategies for sharing knowledge and aligning internal processes with external partners

not essential somewhat essential essential very essential highly essential

The formal assessment of risks and objectives

not essential somewhat essential essential very essential highly essential

The analysis of potential partners

not essential somewhat essential essential very essential highly essential

The ongoing training of human resource staff

not essential somewhat essential essential very essential highly essential

Participation in events, fairs, conferences and workshops

not essential somewhat essential essential very essential highly essential

Other

not essential somewhat essential essential very essential highly essential

22 How important are the following causes of failure in the implementation of open innovation?

Opportunistic behaviour from partners

not essential somewhat essential essential very essential highly essential

Economic and financial issues

not essential somewhat essential essential very essential highly essential

Quality of partners

not essential somewhat essential essential very essential highly essential

Cultural differences

not essential somewhat essential essential very essential highly essential

Lack of capacity in managing collaborative relations

not essential somewhat essential essential very essential highly essential

Higher costs and/or more time than planned

not essential somewhat essential essential very essential highly essential

Internal cultural resistance

not essential somewhat essential essential very essential highly essential

Managerial difficulties or the evaluation and knowledge of technologies available on the market

not essential somewhat essential essential very essential highly essential

Lack of qualified human resource staff

not essential somewhat essential essential very essential highly essential

Limited knowledge of the target market

not essential somewhat essential essential very essential highly essential

Other

not essential somewhat essential essential very essential highly essential

2. Guiding interview questions

1. What key resources and capabilities are needed to successfully implement open innovation?
2. How can open innovation approaches lead to a redefinition of innovation processes?
3. What are the main critical issues related to implementing open innovation?
4. What are the main risks of implementing open innovation?
5. What are the main advantages of the exploitation of external ideas and technologies?
6. How can the management of firm boundaries lead to a redefinition of relationships between firms and external partners?
7. What are the evolutionary perspectives on the relationships between corporate strategies, innovation paths and firm boundaries?