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Stage of development, governance and performance of inter-firm innovation cooperation: a conceptual model and propositions

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Summary: This paper presents a framework for the dyadic study of inter-firm innovation cooperation, beyond the boundaries of collaborative innovation projects. In order to understand how two firms can maximize the performance of their relationship, we performed a literature review combined with interviews with practitioners. The result of this study is a model associated with propositions on the interactions between its different elements, which are (i) the governance of the relationship, (ii) its performance, (iii) its level of development and (iv) the degree of innovation of the collaborative projects. This paper concludes by suggesting future researches and stating implications for managers.

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Key words: inter-firm innovation cooperation; governance; cooperation relationship development and performance

Submission category: working paper

INTRODUCTION

Over the last thirty years, innovation cooperation between firms has experienced tremendous growth (Van de Vrande, de Jong, Vanhaverbeke and de Rochemont, 2009). In a context where the need for innovation continuously increases and where companies are more and more concentrating on their core businesses, independent firms are engaging in innovation cooperation in order to strengthen their competitiveness (Le Dain, Calvi and Cheriti, 2011). These types of inter-firm collaboration are mainly achieved through the implementation of innovation projects or programs jointly undertaken by two firms. Because of the proliferation of outsourcing innovation, it is highly probable that the relationship between two companies involved in such a project will go beyond that one project, with such probability increasing in areas where innovation capabilities are rarer.

However, the success of an innovation project does not presume the success of the cooperation relationship. Conversely, an innovation program that fails may not necessarily negatively affect the performance of the cooperation relationship and its continuation. Indeed, the performance of an innovation cooperation relationship is not limited to the success of each joint project or program of a dyad; it is also derived from the development of innovation and collaboration capabilities specific to both cooperating firms.

The performance of inter-firm relationship focused on innovation is characterized by the development of new knowledge that increases and expands the realm of targeted innovations for the two firms as well as increases their ability to work together; this knowledge arising from the information exchanges within the dyad. This performance is also characterized by the development of a competitive advantage unique to the dyad: the relational rent which represents the mutual capacity to understand the other, anticipate the other's needs and respond to them, beyond the initial commitments (Dyer and Singh, 1998). As such, the performance of the innovation cooperation relies on the quality of interactions and on the capacity of the organizations to adapt to one another over time (Doz, 1996).

In our paper, we are looking at the mechanisms and factors that contribute to the performance of inter-firm innovation cooperation, along the course of the development of the relationship. To do this, we utilized literature on inter-firm relations, both in the fields of strategic alliances and customer-supplier relationships, as well as literature on Open Innovation. We relied upon

the theory of transaction costs and upon the resource-based view, which includes the knowledge based view (Grant, 1996).

We also adopted the interaction model applied to dyads as proposed by the IMP group (Håkansson and IMP Project Group, 1982). Relying on interviews with practitioners, we developed a framework to study the development and functioning of dyadic inter-firm cooperation in the joint undertaking of innovation projects or programs, over the course of their relationship, and the resulting effect on the performance of the relationship.

In order to answer our research questions *"how governance mechanisms, during the development of a relationship, impact the performance of cooperation for innovation? And, what impacts these governance mechanisms?"* we begin by clarifying the theoretical framework of inter-firm relationships and collaborative innovation. We then present our research method. Next, we present our conceptual model and our propositions. We conclude by discussing the managerial implications of the results of our work and delineate further research directions.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

LITERATURE RELATED TO INNOVATION COOPERATION

Research on inter-firm relationship relies on the distinction between discrete transactions and relational exchanges. It suggests that inter-firm cooperation belongs to the latter category because it *"traces to previous agreements; exchange [and] is longer in duration, reflecting an ongoing process [with] joint efforts related to both performance and planning over time"* (Dwyer, Schurr and Oh, 1987).

Many researchers have studied the characteristics of the relationship between firms. They are interested in both the organizational forms it can take (Kale and Singh, 2009; Takeishi, 2001) and the relationship between interorganizational interactions and the atmosphere of this relationship (Håkansson and IMP Project Group, 1982) – with inter-firm trust being the main studied element of the atmosphere (Morgan and Hunt, 1994; Zaheer, McEvily and Perrone, 1998). In addition, since the mid-1970s, under the leadership of the IMP group, the study of inter-firm relationship, which had, until then, been conducted from the point of view of a mere protagonist, began to be conducted through a dyadic approach (Håkansson and IMP Project Group, 1982; Håkansson and Snehota, 1995).

Innovation within inter-firm cooperation is addressed through three overlapping streams of strategy and relationship marketing research: (i) the study of R&D alliances and technology partnerships, (ii) Open Innovation and (iii) the study of supplier involvement in new product development (ESI in NPD). The first of these addresses the inter-firm relationship through the pooling of technological resources and the way the firms govern it; with a focus on research and development activities. Open Innovation enlarges the focus on R&D activities to the implementation of innovation, but adopts the perspective of a major player, considering the joint innovation project to be inbound or outbound (Huizingh, 2011). Finally, if the literature on early supplier involvement in NPD may adopt a dyadic approach (Le Dain et al., 2011), the study of the relationship is analyzed in the context of a single project or program innovation.

Therefore, our study attempts to contribute to this literature by proposing to study innovation cooperation between two firms (i) including all activities beyond R&D, (ii) adopting a dyadic perspective and (iii) considering the relationship beyond the innovation project.

THEORETICAL BACKGROUND RELATED TO INTER-FIRM RELATIONSHIP

In order to discuss innovation cooperation two theoretical streams provide the common conceptual basis for the above researches: Resource Based View (RBV) especially the knowledge-based view, and transaction cost economics (TCE). The works from the IMP group provides the perspectives for a dyadic approach of the research.

RBV based arguments propose that resources that grant a sustainable competitive advantage to a firm are rare, valuable, non-imitable and not substitutable. Resources includes the assets of a company and also its processes and routines (Sluyts, Matthyssens, Martensand Streukens, 2011). The combination of a firm's resources with external complementary resources allows the firm to develop and reach new potential resources. Thus, two firms will be keen to cooperate to develop a competitive advantage through the pooling their respective resources. More precisely, the Knowledge Based View, presented by Grant (Grant, 1996), proposes to explain the building of these new resources through knowledge transfers that occur at both intra and inter-firm levels.

Therefore, the mechanisms that enable a firm to learn from the other firm and from its own experiences, in other words, to capture knowledge and apply it, are central for value creation in a business relationship. It is even more important when the relationship is about innovation, in which case the relationship is focused on knowledge transfers between the firms and within them (Cohen and Levinthal, 1990; Hatchuel, 1999; Huizingh, 2011).

Cost transaction economics (TCE) provides another conceptual lens for the economic picture of the cooperation relationship. According to TCE, in order to achieve a given goal, a company evaluates a priori the costs of available options, both internally and externally (Williamson, 1975). The estimated costs are those which are related to the achievement of the goal, including those related to uncertainty reduction, as well as those which take into account the potential opportunistic behaviors of cooperating firms. This assessment allows a firm to determine the extent to which they can rely on internal and external sources for a given objective (Ring and Van de Ven, 1992).

Within the field of research on relational marketing, however, TCE is recognized as not being able to describe the relationships between companies because it remains focused on discrete transactions and does not take into account the impact of repeated interactions between two companies (Gulati, 1995). Nonetheless, TCE provides an approach that allows to identification and analysis of the changes that occur within such a relationship (Gulati, Lawrence and Puranam, 2005). These changes are considered as mechanisms that safeguard the achievement of the cooperating firms' goals, taking into consideration the potential opportunistic behaviors from the one or the other firm.

In the examination of the innovation cooperation relationship, the RBV and TCE theories are worthwhile tools for the understanding of the tensions between the building of new resources, the knowledge exchanges, and the defense of the individual interests of the firms for which the cooperation payoff might exceed that of solo endeavors. This tension can be expressed within the governance mechanisms that are put in place by each firm and at their interface to manage the relationship.

Lastly, the dyadic perspective proposed by the IMP group offers a customer-supplier relationship approach by providing a global overview of the relationship. The interaction model of the IMP group proposes to describe the relationship as comprised of (1) the elements and processes of interaction, (2) the participants in the interaction process, (3) the atmosphere affecting and affected by the interaction and (4) the environment within which interaction takes place (Håkansson and IMP Project Group, 1982). Thus it addresses the relationship by integrating the perspective of each of the cooperating companies.

RESEARCH METHOD

Our research followed an abductive approach: we performed data collection and analysis in conjunction with a search for complementary theories, constantly seeking to deepen our understanding of theories and data throughout the process (Dubois and Gadde, 2002).

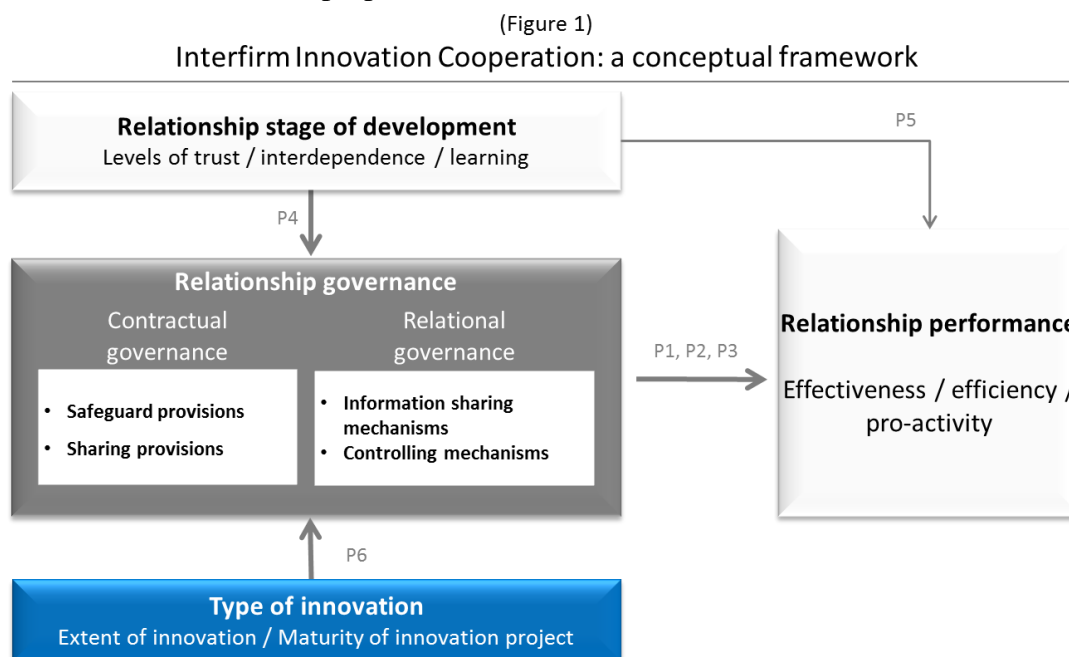
The data collection was conducted through 35 in-depth interviews from 2011-2012 in several industries with French company stakeholders and institutional actors involved in inter-firm innovation cooperation. There were 15 purchasing or partnership managers in large firms, 8

top managers of small firms, 5 governmental agents and 7 managers of company clusters. 4 governmental agents were in charge of developing French industry through public financing and control of collaborative innovation projects, and 1 was in charge of improving inter-firm relationships in France. The role of company clusters was to conduct joint lobbying actions and to develop innovation and industrial collaborations. Some firms' managers were also implicated in clusters with management position. The interviews were conducted with a series of open questions and discussion topics that allowed respondents to raise issues that were not necessarily covered (Hesse-Biber and Leavy, 2010). The interviews lasted an average of an hour and a half and have been noted and transcribed.

As a parallel, we relied on the literature on inter-firm relations to characterize the relational exchange, its mechanisms and its development. Successive versions of the model were recorded in research notebooks, both paper and electronic. The data collected with the practitioners was confronted to the theories. Regularly, some cases resulted in paradoxes and contradictions that led us to change our perception by attempting to reconcile them (Eisenhardt, 1989), leading us to amend our attempts to describe the phenomena, but also to leave open questions for later investigation. The model was revised until saturation (Dumez, 2004).

THEORETICAL FRAMEWORK FOR INNOVATION COOPERATION AND PROPOSITIONS

Based upon our literature review and the data analysis of our interviews with practitioners, we propose the following framework (Figure 1) that points out four interconnected sets described below and formulate six propositions.



RELATIONSHIP GOVERNANCE

The relationship governance of an innovation cooperation refers to the set of mechanisms that ensure and regulate the interactions within the relationship and the elements being exchanged that are (i) product or service, (ii) information, (iii) financial and (iv) social exchanges (Håkansson and IMP Project Group, 1982). These exchanges occur partly under the rules of formal contractual arrangements and partly through the relational mechanisms related to interactions within and between organizations (i.e. processes, tasks, tools and routines).

- *Contractual governance*

The contractual governance defines the legal realm of the relationship through a formal framework in which the cooperating firms mutually agree on their expectations, rights and obligations (Kale and Singh, 2009; MacNeil, 1980; Reuer and Ariño, 2007). The contracts are formed in order to protect the relationship against opportunistic behaviours through (1) safeguard provisions, and to fix the distribution of inputs and outputs of each organization through (2) sharing provisions.

(1) The **safeguard provisions** enable the reduction of uncertainties linked to opportunistic behavior by giving each party the ability to impose its will on the other without his consent (MacNeil, 1980; Williamson, 1975). It is such provision that specify the resolution of potential disputes and that limit information disclosures. The risk of sanctions has a positive effect on the relationship, on the one hand by forcing companies cooperating to stay focused on their common objectives, and secondly by establishing “*deterrence-based trust*” in the relationship (Gulati, 1995).

In the context of repeated links in a cooperative relationship, these provisions are adapted to the perceived state of the atmosphere by each member of the dyad (Ring and Van de Ven, 1994). If the provisions have a positive impact on the performance of the relationship when their coercive effect is established at a low level, they conversely become counterproductive from the point at which their coercive influence is perceived as high (Hausman and Johnston, 2010).

(2) The **sharing provisions** consist of defining the respective inputs of each cooperating firm and the rules for sharing the outputs. By fixing the rules for the pooling of resources, the cooperation strategy becomes greater than the defection strategy, thus supporting the goal of maintaining the relationship.

The most common principle to establish the sharing provisions is equity (Jap, 2001). This principle contributes to the quality of the relationship through its positive impact on satisfaction from the cooperating firms and through the perception of fair play that encourages the pursuit of the collaboration (Jap, 2001).

- *Relational governance*

Relational governance represents the inter-firm contact patterns, either within the individual organizations or at their interface with one another. Effective both at the organizational level and at the personal level, it is the combination of mechanisms that participate to (1) exchange information and (2) control the relationship. The relational governance mechanisms complete the contractual governance mechanisms in order to manage the interaction processes between the participants of the innovation cooperation relationship.

(1) The **information sharing mechanisms** refer to the information and knowledge exchange patterns both within and between cooperating firms. These mechanisms provide regulatory action (through tools and processes that enable the management of the relationship) and a sharing action (through the formal and informal dissemination of information such as meetings, publication of reports or emails). They have the capacity to positively impact performance of the relationship (Sluyts et al., 2011) by facilitating mutual learning and increasing effectiveness of the interactions.

Nevertheless, if the repetition of contacts and projects within the relationship can lead to the multiplication of these mechanisms for the development of organizational routines specific to the dyad, it can also lead to performance loss of the relationship because of the increase of coordination costs.

(2) The **control mechanisms** of the relationship refer to the mechanisms implemented to safeguard the interests of the dyad, which also includes the interests of each cooperating firms. Their role is to ensure the compliance of the contractual mechanisms and with the policies and standards of each entity involved in the

relationship. Their pivot is constituted by the assessment mechanisms which are followed by eventual adjustments to the governance mechanisms (Doz, 1996; Le Dain et al., 2011). But, as these adjustments to governance mechanisms span from the execution of safeguard provisions to less coercive influence strategies, they have the capacity to discourage or encourage cooperation.

Thus, if the main objective of all of these governance mechanisms is to increase and sustain the effectiveness of the relationship, they also have the potential to encourage or discourage cooperation within this relationship.

(P1) Relationship governance mechanisms impact the relationship performance.

Over time, strategies and organizations of cooperating firms might vary because of changes in environments and staff, but also because of the new resources born from cooperation. Simultaneously, the iteration of contacts between firms promotes the installation of real organizational routines specific to the dyad, which also require adjustments in the governance of the relationship. Moreover, the capacity of each firm to adjust and to keep coherent operating mechanisms in place to manage the inter-firm relationship is seen as a cause of success or failure of the cooperation (Doz, 1996).

(P2) The lack of adjustments in the relationship governance over time negatively impacts the relationship performance.

During the life of collaborative projects, there may be several entities of each company involved in the relationship. As each entity might be in charge of different activities of their organization, it may have its own goals and interests (Doz, 1987) and therefore specific governance mechanisms and assessment standards. Since there is no consistency of governance mechanisms within a firm, as a result there is a risk of conflicting or chaotic interactions with the cooperating firm that lower the overall efficiency of the relationship. Conversely, this can also lead to a commitment of the firm that might be superior to the original target.

(P3) The consistency of each firm's specific governance impacts the performance of the relationship.

RELATIONSHIP LEVEL OF DEVELOPMENT

The term « relationship stage of development » refers to the evolution of an inter-firm relationship from its beginning. We consider that an innovation cooperation relationship can follow various levels of development. The development of such a relationship is not necessarily linear (Barnes, Naudé and Michell, 2007). It results from a continuous cycle of achievements, assessments and adjustments that leads either to an increased collaboration at each iteration, or a decreased collaboration (Doz, 1996; Ring and van de Ven, 1992). The transition from one level of development to another is possible on both ways.

- The scale of development of the relationship

We propose to study the development of the cooperative relationship of innovation as a development scale which four main levels are (0) discovery (1) exploration, (2) development and (3) stabilization. These four levels can be described as follows:

- (0) The **discovery level** is the stage where there is a "*unilateral consideration of potential exchange partners*" (Dwyer et al., 1987).
- (1) The **exploration level** means the engagement in discussion, negotiation and first interaction stage of the relationship (Dwyer et al., 1987; Kale and Singh, 2009; Lee and Johnsen, 2012).
- (2) The **development level** is characterized by increasing interactions, the development of a specific capability of collaboration and the reduction of the uncertainties linked to the relationship (Dwyer et al., 1987; Håkansson and IMP Project Group, 1982; Lee and Johnsen, 2012).

- (3) The **stabilization level** is the state of balance of contributions and powers in the relationship. This state allows a long-term mutual commitment of cooperating firms as it is based upon established trust and shared (Dwyer et al., 1987; Lee and Johnsen, 2012).

Each level of development corresponds to an increasing level of three key characteristics: (i) trust, (ii) interdependence and (iii) learning.

- *Three key characteristics of the development of the relationship*

(i) **Trust** represents each cooperating firm's confidence in the ability of the other to achieve the goals of the relationship and to act fairly, especially in case of possible opportunism (Zaheer et al., 1998). The establishment and the development of trust in a relationship lead to a reduction of conflict and facilitate inter-firm information and social exchanges. Thus, the more trust is important, the less need there is for control mechanisms (Ring and van de Ven, 1992).

(ii) The notion of **interdependence** within a cooperation is based on the relative scarcity of alternative resources available externally to those available through the relationship (Thibaut and Kelley, 1959). For a cooperating firm, the more the dependence upon the other firm grows, the more its commitment to the relationship is important (Morgan and Hunt, 1994). This commitment is realized through the implementation of dedicated mechanisms that distinguish this relationship from the others and secure it.

(iii) The **learnings** within the dyad are the result of the information exchange between cooperating companies and the creation of knowledge born from inter-firm interactions. These learnings are impacting both the capability of the dyad to cooperate and to innovate. The better firms know each other, the less need there is for control mechanisms (Gulati, 1995) and the more governance mechanisms are adjusted to the relationship (Doz, 1996). Moreover, the increase of mutual learning can lead to an increase of joint projects and, consequently, new governance mechanisms.

Thus, as these three characteristics influence the adjustment of governance mechanisms (Håkansson and IMP Project Group, 1982) and every level of development is characterized by a growing importance of these characteristics, we can hypothesize that

(P4) Each level of development is related to a specific mix of governance mechanisms.

When trust and interdependence positively impacts the cooperation and commitment of cooperating firms in their relationship (Morgan and Hunt, 1994), the mutual learnings positively impact the efficiency of the cooperation (Doz, 1996; Sluyts et al., 2011), and is an objective of innovation cooperation. As the level of these three characteristics of the relationship development are related to the level of performance of innovation cooperation relationship:

(P5) Each development level allows a growing level of relationship performance.

TYPE OF INNOVATION

Innovation is defined as "*the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations*" (OECD and Statistical Office of the European Communities, 2005). The type of innovation is applied to the main innovation projects or programs conducted in collaboration within the innovation cooperation relationship. It can be approached through the combination of the degree of change and novelty related to the project or program, and of the state of maturity of the innovation project that corresponds to the proximity of its implementation within the organization or in the market.

- *Extent of innovation*

The extent of innovation is the degree of novelty or change which the targeted innovation brings to the market and to the organizations. It can be approached through indicators such as the level of change (minor vs. major), the existence of the target market (client or application) and the estimated level of risk (high vs. low) (Kim, Kumar and Kumar, 2012). It is commonly assessed by a continuous classification from incremental to radical innovation.

At the organizational level, the higher the extent of innovation, the more it involves to make changes from its knowledge to its operating modes (Johnsen, Calvi and Philips, 2012). When uncertainty about the feasibility of the innovation is high, there is a search for flexibility rather than control in the dyad, leading to the establishment of governance arrangements involving less commitments (Johnsen et al., 2012; van de Vrande, Vanhaverbeke and Duysters, 2009).

- *Maturity of the innovation*

The type of innovation may also be evaluated in terms of the stage of development of the innovation project jointly conducted (Clark and Fujimoto, 1991). As the innovation project is maturing, the activities and staff involved in the firms are changing (Johnsen et al., 2012). That leads to a change of both the expectations and the distribution of tasks within the dyad (Le Dain et al., 2011). Therefore, governance mechanisms related to the innovation project or program are continuously adapted to the maturity of running innovation projects or programs within the cooperation.

(P6) The type of innovation of the joint innovation projects impacts the governance of the relationship.

RELATIONSHIP PERFORMANCE

Performance of innovation cooperation is based upon the completion of the relationship objectives, the quality of the utilization of the dyad's resources in the context of the cooperation and the development of the relational rent. Le Dain et al. (2011) propose to evaluate the performance of innovation collaboration, at the firm level through factors of effectiveness, efficiency and proactivity. We suggest that the relationship performance might be assessed through these factors, adapted for evaluation at the dyad level:

1. The effectiveness of the relationship corresponds to the satisfaction of the formal objectives of cooperation via the compliance with expected costs, delivery and quality but also via the meeting of objectives, such as the building of new or superior innovation capabilities.
2. The efficiency of the relationship refers to the ability to use resources optimally – both at the firm levels and at the inter-firm level.
3. The proactivity of the cooperating firms is linked to the level of a relational rent within the dyad, as it reflects the level of commitment of each firm in the cooperation through their ability to anticipate the other's needs, improve itself and deliver more than expected.

These three factors cover all situations that may be encountered by companies involved in innovation cooperation (Le Dain et al., 2011) and provide an image of the importance of the specific competitive advantage born from the innovation cooperation relationship.

DISCUSSION AND IMPLICATIONS

This paper contributes to the comprehension of the elements that impact the performance of cooperative innovation considering it as a relationship. Our model and the propositions we suggest also contribute to the development of the consideration of these elements in the management of inter-firm relationships with collaborative innovation.

RECOMMENDATIONS FOR FUTURE RESEARCH

In order to empirically test our model, we propose to define the appropriate variables related to each of its four blocks as well as the methods of measurement. The unit of analysis will be dyadic, in line with the work of the IMP group. We propose to conduct this study through a survey with a large sample in order to perform analyses of correlation and sensitivity between the different elements of our model, as quantitative evidence can indicate relationships which may not be salient to the researcher (Eisenhardt, 1989).

Moreover, the evolution of organizations across the way from one level of development to another might be observed through longitudinal case studies conducted with dyads of independent firms in various industries. This will also allow us to add the impact of interpersonal relationships to the conceptual framework, which is of great importance in the inter-firm relationship (Doz, 1987; Håkansson and Snehota, 1995; Zaheer et al., 1998).

In addition, the model can be further detailed through the specification of the different governance mechanisms used and through the exploitation of the practices described in different fields of literature on alliances (Kale and Singh, 2009) and on Open Innovation (Van de Ven et al., 2009). It would also be interesting to evaluate in our model whether the different families of innovation within the Oslo Manual (OECD and Statistical Office of the European Communities, 2005) differently impact the governance mechanisms.

With this paper we contribute to the literature of open innovation offering a theoretical framework for further investigations into inter-firm cooperation within a dyadic unit of analysis. It might contribute to the balancing of studies between inbound and outbound open innovation, as there are more case studies on the internalization of innovation from outside the firm than on the outsourcing of innovation from the inside (Huizingh, 2011).

It also contributes to the developing literature on early supplier involvement in new product development offering a relational view that adds a complementary vision of the relationship experience before and after the innovation project.

MANAGERIAL IMPLICATIONS

The model and the propositions made in this paper have three main implications for managers. Firstly, it helps to raise awareness among managers involved in innovation cooperation that relationship management is essential in order to get the best performance of an innovation cooperation; the managers must take into account all of the interactions between the two companies involved. These interactions involve all of the activities that occur within the relationship, not only those which are directly related to innovation project, but also those which are not related to, for example, the supply chain or to financial exchanges.

Moreover, as the demand for the implementation of innovation projects increases when it is not always the case for a number of potential innovation partners, it will be more and more important for a firm not to jeopardize its chances to renew collaborative innovation projects with the same company. Thus, in order to keep a sustainable innovation capacity a company must establish mechanisms that will ensure the performance of its collaboration quality, not only its interacting activities strictly related to innovation projects.

These last two implications underline the interest of establishing within a firm some dedicated mechanisms that are similar to those established for privileged business partners such as key-account clients, strategic suppliers and strategic alliance partners.

Finally, the results of our research stand for the proposition that, for each level of development of the relationship, there will be a configuration of governance mechanisms that maximizes the performance of the relationship. Therefore, it is essential for practitioners to determine what that optimal configuration should be for their firm. Moreover, as new innovation projects can disrupt the equilibrium of a relationship, it is important for managers to determine which mechanisms have to be implemented in order to undertake this project while maintaining a positive impact on the performance of the whole relationship.

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