

An empirical study of the dyadic governance of vertical innovation in France – taxonomy and link with the nature of innovation projects

SERVAJEAN-HILST Romaric

i3-CRG, Ecole polytechnique, CNRS, Université Paris-Saclay

romaric.servajeau-hilst@polytechnique.edu

Résumé :

This paper presents the results of a study based on survey data from 160 managers from French supplier firms about the management of innovation cooperation with one of their client, with a dyadic view. The findings out of a hierarchical ascendant classification and principal component analysis indicates a taxonomy made of four governance types: (1) the “free” type with light contractual arrangement and few coordination mechanisms; (2) the “project-oriented” type implicating largely R&D entities, with contractual arrangement dedicated to the sole innovation project; (3) the “elaborated-partnership” type with complex contractual arrangement comprising mutual commitment and implication of all operational entities; and (4) the “exclusive-partnership” type with contractual arrangement including exclusive commitment, implication of operational entities and joint management of the relationship and of the innovation project. χ^2 statistical tests revealed the existence of a link between governance type and the maturity of the innovation project when both firms are involved, but not with the type and the extent of innovation. This study contributes to the literature on Early Supplier Involvement and on Open Innovation showing how supplier and client jointly organize their relationship regarding the timing of their common implication. Its main managerial implication is to underline the connection between the governance of joint innovation project and the governance of client-supplier relationship, both at inter-firm and intra-firm levels. For managers it implicates to take into consideration these numerous sides of the cooperation when integrating a supplier in an innovation project, or when being integrated in a client’s innovation project.

Mots-clés : innovation, gouvernance, contrôle & pilotage, R&D, enquête

An empirical study of the dyadic governance of vertical innovation in France – taxonomy and link with the nature of innovation projects¹

1. INTRODUCTION

Over the last thirty years, innovation cooperation between firms has experienced tremendous growth. In a context where the need for innovation continuously increases and where companies are concentrating more and more on their core businesses, independent firms are engaging in innovation cooperation in order to strengthen their competitiveness. These types of inter-firm cooperations are mainly achieved through the implementation of innovation projects jointly undertaken by two or more organizations. The majority of such cooperations are vertical dyads where a client-firm involves one of its suppliers in its innovation project (West and Bogers, 2014).

Many companies recognize the necessary interplay of vertical cooperation and of innovation cooperation: today's business finances innovation which makes tomorrow's business. Both practitioners and academics are looking for ways to best organize such relationships, and specifically the part related to innovation projects. This requires finding governance models that meet both the stakes related to the vertical relationship and to the innovation project. To answer this unmet need, further academic work is currently required to understand how such relationships are managed (Bogers and West, 2011; Johnsen, 2009; Säfsen et al., 2014; Vanhaverbeke et al., 2014).

This paper explores how supplier and client govern their relationship around a common innovation project, both at intra-firm and inter-firm levels. It is based on data out of 160 France-based supplier firms that answered to a survey specifically designed for this objective. Through hierarchical ascendant classification and principal component analysis, a taxonomic study led us to discover four governance configurations of vertical innovation cooperation.

^{1 1} Earlier version of this research was presented to IPSERA 2015 conference

Then statistical tests allowed us to identify the link between such governance configurations and the natures of joint innovation projects.

The article is organized as follows. After the introduction, a quick overview of the literature streams on vertical innovation cooperation is provided and a conceptual framework is developed. The next section outlines the methodology and data used. Further, the fourth section presents the findings derived from the statistic tests. Finally, the paper concludes with a discussion of the results and their implications for the management of client-supplier innovation cooperation.

2. CONCEPTUAL FRAMEWORK AND HYPOTHESIS

Innovation within the vertical relationship 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 (Doz, 1987; Gulati, 1995). It represents a strong academic basis for the two other streams.

Open Innovation integrates the studies of innovation with customers and expands the focus on R&D activities to the implementation of innovation (Chesbrough, 2003; Gassmann et al., 2010). In this stream, the joint innovation project is considered to be inbound or outbound: *“inbound open innovation refers to internal use of external knowledge, while outbound open innovation refers to external exploitation of internal knowledge”* (Huizingh, 2011, p. 4). In this literature, the majority of the studies are about inbound Open Innovation; dyadic vertical cooperation studies needs to be developed (Huizingh, 2011; West and Bogers, 2014).

Finally, ESI in NPD literature focuses on the questions of the maturity of the innovation project at the time the supplier is integrated and on the governance mechanisms that might be employed to facilitate such a relationship (Ben Mahmoud-Jouini et Calvi, 2004; Calvi et Le Dain, 2013). If ESI adopts a dyadic approach with the relational perspective (Le Dain et al., 2011), the study of the relationship is analyzed in the context of a single project or program innovation (Calvi and Le Dain, 2013; Maniak and Midler, 2008). Nowadays, rare ESI works that consider the cognitive side of such cooperation conduct studies that integrate inter-firm and intra-client stakes, and make the bridge with the Open Innovation stream.

Although such intra-firm and inter-firm integration is considered important for all three academic streams, research about the functioning of intra-firm and inter-firm integration has been rather sparse and still needs to be developed (Eng and Ozdemir, 2014; Säfsen et al., 2014; Vanhaverbeke et al., 2014). In our research we are exploring the governance configurations of innovation cooperation with the unit of analysis being a dyad in the context of a client-supplier relationship realizing a joint innovation project. We are also looking to identify the link between the joint innovation project and the governance of the cooperation. The largest aim of this research is to define which governance configuration best suits the innovation project specificities (Ben Mahmoud-Jouini and Calvi, 2004, p. 185; Vanhaverbeke et al., 2014).

2.1. CONCEPTUAL MODEL

Our conceptual model was built upon three theoretical fields that are also main references for Open Innovation, ESI in NPD and R&D alliances: transaction cost theory resource based view and relational marketing. For this research, it is made of two linked blocks that we describe below: (1) the governance configuration of vertical dyadic relationship and (2) the nature of joint innovation project. The governance configuration of vertical innovation cooperation refers to the set of formal and informal mechanisms that ensure and regulate the exchanges specific to the dyad, between and within the two firms. 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). The plurality of these mechanisms that are implemented in a dyad form a coherent mix that is specific to the dyad (Dussauge and Garrette, 1995; Heide, 2003). The governance configuration can be described in three categories of components which are described below: (1) the contractual governance, (2) the relational governance and (3) the human resources involved in the cooperation.

2.1.1. 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 (1) protect the relationship against opportunistic behaviors through

safeguard provisions, and (2) fix the distribution of inputs and outputs of each organization through sharing provisions.

(1) The **safeguard provisions** allow for 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). Such provisions specify the resolution of potential disputes and limit information disclosures. The risk of sanctions forces cooperating firms to stay focused on their common objectives.

(2) The **sharing provisions** define the respective inputs of each cooperating firm, their responsibilities and the rules for sharing the outputs, or the “Open Innovation pie.” The most common principle to establish in the sharing provisions is equity (Jap, 2001). Occasionally the rules for sharing the outputs can be voluntarily unbalanced by a firm, at his disadvantage, in order to enter into a “*hostage situation*” (Gulati, 1995) and get the commitment of the cooperating firm (Ring and van de Ven, 1994).

2.1.2. 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 interactions between the participants of the innovation cooperation relationship.

(1) The **information sharing mechanisms** refer to the information and knowledge exchange patterns 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 are implemented both within organizations and between them.

(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 firm. Their role is to ensure compliance with the contractual mechanisms and with the policies and standards of each entity involved in the relationship. Determining the control

mechanism activation depends upon each cooperating firms assessing the importance of the other firm in achieving the goals of the cooperation (Grant, 1996).

2.1.3. Human resources

Human resources consist of the entities within each firm that are involved in the cooperation. Except in dyads involving the smallest firms, a vertical cooperation innovation involves more than one entity per firm involved in the relationship (Ben Mahmoud-Jouini and Calvi, 2004). Each entity has a dedicated role in its firm. When they are in charge of different stages of innovation, from exploration of new ideas to their exploitation in a supply chain, they are often separated both in terms of organization and of location.

In addition to this separation, each of its entities can have its own goals and its own interests (Doz, 1987; Wheelwright and Clark, 1992), and consequently specific governance mechanisms and evaluation norms. The timing of their involvement in the different stages of innovation project underlines the important of the dominants logics: technology for Research & Development entities, economics for purchasing entities, market for Marketing, logistics for Supply Chain, strategy for Top Management, etc.

2.1.4. The three natures of innovation and hypothesis about their links with governance

In an innovation project, the three natures of innovation can be approached through the combination of (1) the type of innovation, (2) the degree of change and novelty related to the project, and (3) the state of maturity of the innovation project with regard to market-readiness. These natures of innovation project are described below and the hypothesis of their link with governance configuration is presented.

- *Type of innovation*

The joint innovation projects have 4 different types of innovation that can be combined : product innovation, process innovation, new marketing method and new organizational method (OECD and Statistical Office of the European Communities, 2005). The type of innovation strongly impacts the involvement of the various entities of each cooperating organization, which varies according to their knowledge or to the operational implication on the innovation target. In the case of a process or an organization innovation, the targeted innovation can even be the establishment of new information exchange mechanisms between

or within the firms. Further, when a joint product innovation is generally framed by a contract, it is rarely the case for the three other types of innovation alone. These last are currently considered as continuous improvement and not as specific innovation project; as such they are not integrated in specific innovation contracts.

Hypothesis 1 (H1) The type of innovation of the joint innovation projects impacts the governance configuration of the relationship.

- *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 determined through indicators such as the level of change to the state of the art of technologies or practices (no change, minor or major) and the existence of the target market (client or application) (Danneels, 2002; Kim et al., 2012; Lenfle and Loch, 2010). It is commonly assessed by a continuous classification from incremental to radical innovation or from exploitative to explorative innovation.

At the organizational level, the higher the extent of innovation, the more it involves making changes from its knowledge base to its operating modes (Johnsen et al., 2012; Lenfle and Loch, 2010). 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 et al., 2009).

Hypothesis 2 (H2) The extent of innovation of the joint innovation projects impacts the governance configuration of the relationship.

- *Maturity of innovation projects*

The type of innovation may also be evaluated in terms of the stage of development of the joint innovation project (Clark and Fujimoto, 1991). An innovation project generally follows successive stages that reflect the growing maturity of the project from the new idea to the market: the idea generation phase, the business case phase, the development phase the launch phase and the industrialization phase.

As the innovation project is maturing, the activities and entities involved in the firms are changing (Johnsen et al., 2012). That leads to a change in the expectations and in the distribution of tasks within the dyad (Le Dain et al., 2011; Säfsen et al., 2014; Vanhaverbeke

et al., 2014). Contractual and relational governance can be adapted to the stage of maturity (Maniak and Midler, 2008; van de Vrande et al., 2009, 2009)

Hypothesis 3 (H3) The maturity of innovation of the joint innovation projects impacts the governance configuration of the relationship.

The conceptual model and the hypothesis that drive our research are presented in figure 1.

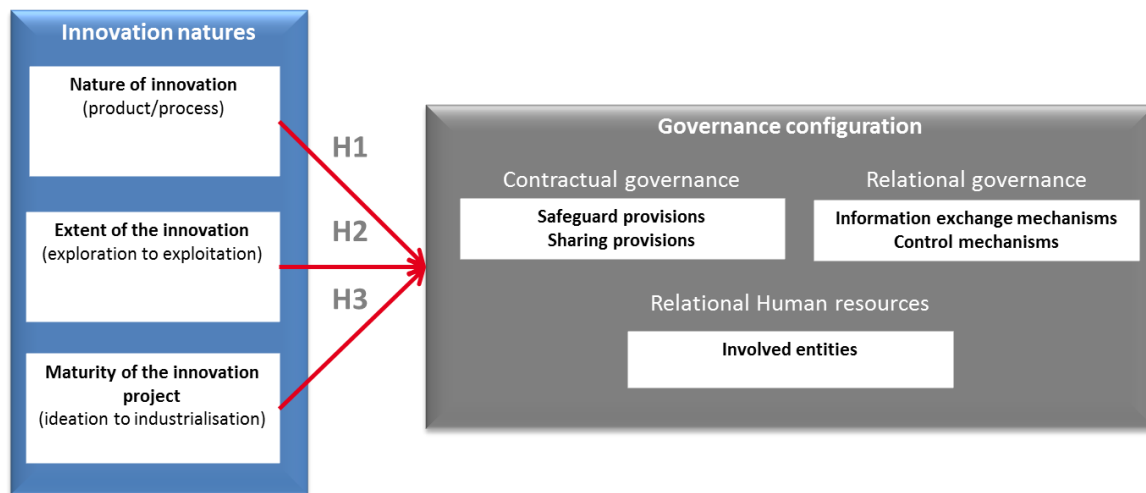


Figure 1: conceptual model and hypothesis

3. RESEARCH DESIGN

3.1. SURVEY DESIGN

To conduct this explorative research on a broad empirical basis, we designed a dedicated questionnaire following standard survey instrument development techniques (Alreck and Settle, Robert B, 1985). A first version of the questionnaire was drafted based on the reviewed literature and on 35 qualitative semi-structured interviews with practitioners implicated in innovation cooperations. The set of measurable variables mainly relies upon scales previously developed and validated in the strategy and relationship marketing literature. The original scales were adapted to the specific context of vertical innovation cooperation. Appendix 1 provides an overview of information sought in the questionnaires to capture the governance of such relationships. The scale label for the large majority of items is a 7-point Likert scale from “*I fully agree*” to “*I full disagree*.” A 5-point reverse Likert scale was designed for defining frequency of contact with the different entities of each firm. A time scale was created from interviews and situations encountered in France and then adopted for all related items in order to facilitate responses on these items.

The order of the proposed themes was arranged in order to lower the impact of one theme on another (Alreck and Settle, Robert B, 1985, p. 103). The drafted survey instrument was discussed with two scholars with expertise in the area of vertical relationship and of dedicated surveys. Then, the questionnaire was reviewed and pretested with five practitioners. Finally, attention was paid to create a nice look and feel to the questionnaire in order to reduce the non-response rate and measurement errors (Dillman, 2007). The survey tool used was LimeSurvey (LimeSurvey Project Team and Schmitz, 2012), an Open Source survey tool integrated to our university website.

The objective was to survey a cross-section of 4,500 supplier-firms in France by means of a self-administered internet-based survey. Contact addresses of supplying firm managers were collected. We decided not to distinguish “innovative suppliers” and “classic suppliers” as our initial qualitative interviews revealed that some vertical innovation cooperations are not considered as innovative by clients when they actually are. The first sample of 500 emails came from a business-to-business meeting event. The second sample of 4,000 emails came from personal supplier databases provided to the author.

Respondents were asked to answer about one relationship with one of their clients and about the most representative joint innovation project. They were offered anonymity and confidentiality. To encourage them to answer the entire survey, it was announced at the beginning of the questionnaire that providing their email at the end of the questionnaire would allow them to receive the results of the investigation. Data were collected in two stages. The first round of inquiry with the first sample began in mid-August 2013. The second round began in mid-November 2013. They were boosted 3 times, with a 10 to 15-day time range.

3.2. STATISTICS TESTS

We conducted two successive analysis methods. First, we considered that the overall properties of a particular configuration of each brick of our model may be more important than the properties of each element of the component. In order to identify these different configurations, we opted for a taxonomic analysis. Second, we looked to assess the existence of an association between these configurations and the three natures of the described innovation projects. All work on the data from the questionnaire is performed on R version 3.0.1 (R Development Core Team, 2012) - FactominR packages for the ACP and rpart for

regression trees. The results were validated with SPSS version 21 (IBM Corp, 2012). In the sections below, we present the research settings and the results obtained.

In order to have homogeneous variables, each of the 90 variables was previously reduced centered. A Mann-Whitney U test was conducted to check that the two responding samples were coming from the same population. Its results indicated that there is no significant difference between the two samples that can be treated as a single sample. Hierarchical ascendant classification (HAC) was used in order to find homogeneous groups without knowing them in advance. As we were uncertain about the number of classes, Euclidian distance was selected as the dissimilarity index and Ward method as aggregation procedure (Ketchen and Shook, 1996; Scheibler and Schneider, 1985). Based on the analysis of the dendrogram proposed by the software, we determined that 4 classes is the number which avoids losing too much inter-classes inertia. We then validated this classification using a principal component analysis (PCA). The PCA allowed visualizing the link between the studied variables and the positioning of the classes on the new axis. It was completed by the analysis of the mean of the variables for each class (appendix 2). Then, the taxonomy was also validated through its operational nature.

As the configurations of governance and the natures of innovation project are described through categorical variables, the statistical significance test of association was the Pearson's chi-squared (χ^2) test. To obtain a larger size of the cells of the crosstabs, we recoded the variables "extent of innovation" (niche marketing and technology revolution were grouped into "intermediary innovation") and "maturity of innovation" (basic research phase was merged with the concept feasibility phase, and validating pilot phase with the industrialization phase and post-launch optimization). According to general practices in management research, we only considered the tests where the p-value was under 0.05, that is to say when the significance of the statistical test was less than 5%. Due to the low numbers in certain cells of the tested panels, these results are consistent for an exploratory research.

3.3. DATA SETTING

The response rate was 4% that is to say 179 responses from French-based supplier firms about vertical cooperation dyads. 19 responses were eliminated due to lack of information, inconsistency of answers or seniority of either the respondent (retired respondent) or

innovation project (8 were launched more than 3 years ago). These last ones were rejected in order to avoid post-rationalization and though increase internal validity (Säfssten et al., 2014). All 160 answered and retained questionnaires represent contemporary vertical relationship and innovation project. All 160 answered and retained questionnaires represent contemporary vertical relationships and innovation projects. This pattern is reasonable considering the length of the survey and the initial database: addressing this questionnaire to selected innovative suppliers could have increased the response rate but should have decreased the extent of our results. Further, this rate is consistent with previous studies addressing this type of subject (Kim et al., 2012; Personnier et al., 2013; Reuer and Ariño, 2007).

Responding firms (suppliers)		Client firms	
Aeronautics, naval and train construction	16	Aeronautics, naval and train construction	16
Agrifood	10	Agrifood, cosmetics and pharmacy	16
Automotive	30	Automotive	30
Chemistry, plastics	17	Chemistry, plastics	17
Construction industry	2	Consulting, research and services	11
Consulting, research and services	11	Electronics, hardware and IT industry	36
Cosmetics and pharmacy	6	Environment and construction industries	11
Electronics, hardware and IT industry	36	Leisure and tourism industry	2
Environment, energy, waste and water industries	9	Mechanics, metallurgy and packaging	21
Leisure and tourism industry	2		
Mechanics	9		
Metallurgy	9		
Packaging	3		

Figure 2: sectors of activity

Figure 2 shows an industry breakdown of the sample. Table 1 shows the firm size asymmetry breakdown. The data collection yielded a heterogeneous sample covering a broad range of sectors and firm sizes and revealed no systematic bias. The respondents are managers of these firms, coming from Top Management (31%), Sales (32%) and Research & Development (26%). 81% of them had been with their firm for more than 3 years.

			Client			
			SME		Large firms	
			VSE	SME	Intermediate	Large
Supplier	SME	VSE	3	2	4	17
		SME	1	11	8	35
	Large firms	Intermediate		3	7	36
		Large		2	3	28

Table 1: firm sizes' repartition

Regarding the type of joint innovation project described by the respondents, 105 target only product innovation, 12 target process innovation and 43 target product and process innovation. Regarding the extent, 61 projects can be considered pure exploitation or incremental innovation, 65 can be considered a revolutionary innovation leveraging customer exploration, 13 can be considered a niche creation that implicates minor change to the state of the art of technologies or practices, and 21 can be considered as architectural or pure exploration. Regarding the maturity of the innovation project at the time of the joint involvement of the client and the supplier firms, the repartition of time of involvement of the supplier is displayed in figure 3. Lastly, 38 dyads have only the described innovation project in common when 98 are conducting or have conducted between 1 and 5 more joint innovation projects, and 19 more than 5 joint innovation projects.



Figure 3: distribution of “innovation project maturity”

4. RESULTS

4.1. TAXONOMY OF VERTICAL OPEN INNOVATION COOPERATIONS

The results of our investigations drove us to identify four clearly distinct types of dyadic governance mixes for vertical Open Innovation cooperation (figure 4). These models are distinguished through the three components of the dyadic governance configuration: (i) the contractual arrangements dedicated to the innovation project, (ii) the relational mechanisms related to interactions within and between organizations (i.e. processes, tasks, tools and routines), and (iii) the human resources represented by the firm’s implicated entities.

	<i>Free</i>	<i>Project-oriented</i>	<i>Elaborated-partnership</i>	<i>Exclusive-partnership</i>
Contractual governance	No contract or transactional or co-development contract	Joint development or consortium contract Public financing Joint-patent or patent with cross-licensing agreement	Transactional or co-development complex contract Provisions for termination, arbitration, regular reporting... Purchasing commitment (minimum volume)	Transactional or co-development contract or addendum Purchasing commitment (exclusivity)
Relational governance	1 relationship coordinator designated within supplier-firm Few encouraging attitude from the client		Client-firm communicated its procedures to the supplier-firm and regularly informs him of its results Supplier-firm relies on external experts (lawyers, IP specialists...) to support him in this cooperation Informal exchanges Threatening attitude from the client through reference to the contract	1 coordinator in each firm Common management of the relationship/innovation project Supplier-firm has a dedicated process for managing its innovation cooperation Encouraging attitude from the client and reference to the contract
Involved human resources	R&D ; Purchasing-Sales	R&D	++ Purchasing-Sales R&D ; Operations ; Logistics	R&D ; Purchasing-Sales ; Operations ; Logistics

Figure 4: main elements discriminating the 4 dyadic governance types of vertical innovation cooperation

The first dyadic governance type – *free* model – is the lightest formal governance mode: The trend of this cluster is to have a mere transactional contract or no contract at all for the innovation project. It is combined with a relative absence of formal coordination mechanisms, at the exception of a relationship coordinator within the supplier-firm.

The second type – *project-oriented* model – seems exclusively dedicated to the innovation project, at the exception of a supplier's relationship coordinator. The contractual arrangement is predominantly bounded to the innovation project: its legal form is a joint development agreement or a consortium contract where only intellectual property output is shared. The Research and Development entities of both firms are largely implicated, whereas the Purchasing/Sales entities (of client/supplier) are not frequently mobilized in this sole model.

The third and fourth types, the *partnership* models, have a common preference for the substantial involvement of Operation and Logistics entities of both firms further to R&D and Purchasing/Sales entities as well as a contractual scope that goes beyond the innovation project. Three other common relational elements are (1) the communication from the client-firm of its procedures, (2) regular feedback to the supplier of its results, and (3) the client's influence strategy who reminds to the supplier its contractual commitment to deliver the expected results.

The third type – *elaborated-partnership* model – presents the utmost complexity both in its contractual and non-contractual elements. The contractual arrangement is largely personalized with numerous enforcement and coordination provisions. It engages both parties for future collaboration in case of successful launch of the innovation project, specifically with a commitment of the client-firm to purchase a minimum volume to the supplier-firm. The latter uses third parties to assist him in its relationship with the former.

The fourth type – *exclusive-partnership* model - is also characterized by the complexity of its configuration. The contractual arrangement principally comprises a sales-purchasing exclusivity in case of successful innovation project. The relational specificity of this model is the joint management of the relationship and of the innovation project. The supplier-firm also has a dedicated internal process to manage its cooperation. This is also the only mix where the client's influence strategy is a notably encouraging attitude.

4.2. TEST OF THE LINK BETWEEN GOVERNANCE TYPES AND NATURE OF INNOVATION PROJECTS

Table 2 reports the results of the χ^2 test to test our hypothesis. The test of the independence of the variables describing the type of innovation and the configuration of governance reveals that the value of χ^2 is low: 4.52, with a degree of freedom 6. The p-value was 0.60 and thus higher than the statistical significance of 5%. We cannot reject the hypothesis of independence between two variables. It seems that this type of innovation has no link with governance classes. For the variables “extent of innovation” and “configuration of governance”, the value of χ^2 is low: 4.43 with a degree of freedom 6. The statistical significance is of 0.0618 and thus higher than the statistical significance level of 5%. We

cannot reject the hypothesis of independence between two variables. It seems that the extent of innovation has no link with governance classes for statistical significance that we chose.

Hypothesis	Variable tested vs. governance type variable	Pearson χ^2	Degree of freedom	P-value	
H1: The type of innovation of the joint innovation projects impacts the governance configuration of the relationship	Type of innovation	4,524 ^a	6	0,606	Hypothesis 1 rejected
H2: The extent of innovation of the joint innovation projects impacts the governance configuration of the relationship	Extent of innovation	4,433 ^b	6	0,0618	Hypothesis 2 rejected
H3: The maturity of innovation of the joint innovation projects impacts the governance configuration of the relationship	Maturity of innovation	22,688 ^c	6	0,001	Hypothesis H3 accepted

a. 4 cells (33,3%) have a theoretical size under 5. The minimum theoretical size is 2,18
 b. 3 cells (25%) have a theoretical size under 5. The minimum theoretical size is 3,81
 c. All cells have a theoretical size above 5. The minimum theoretical size is 5,26

Table 2: results of the Pearson χ^2 tests

The test of the independence of the variables “Innovation maturity” and “governance type” gives a high value of χ^2 : 22.688, with a degree of freedom 6. The p-value is 0.001 and therefore below the statistical significance of 5%. We can therefore reject the hypothesis of independence between these two variables. It seems to be a relationship between the governance of vertical Open Innovation cooperation and the maturity of the innovation project at the time both firms are jointly involved. Table 3 shows the distribution of the observed population regarding these variables.

	Free	Elaborated-partnership	Project-oriented	Exclusive-partnership	
Research and feasibility	35% 35	16% 16	30% 30	20% 20	100%
Product design and prototyping	34% 10	38% 11	3% 1	24% 7	100%
Pilot and industrialization	50% 15	37% 11	7% 2	7% 2	100%
	25% 25	29% 29	6% 6	7% 7	
	100%	100%	100%	100%	

% of the line cell size
 % of the column

Table 4: sample distribution regarding governance configuration and innovation maturity

5. DISCUSSION

Our study takes up a recent observation from a panel of Open Innovation scholars regarding a need for a deep study of the governance configuration of Open Innovation cooperations taking into account interfaces challenges between R&D and Operations (Säfsen et al., 2014; Vanhaverbeke et al., 2014; West and Bogers, 2014). Our study's first objective was to provide a new understanding of how client and supplier manage their innovation cooperation integrating the governances of the innovation project and the client-supplier relationship. Its second aim was to examine the link between the nature of the innovation project and the integrated governance. As an exploratory research, these two objectives are completed. Below we present and discuss the three contributions of this research.

Our first contribution is to have identified four types of vertical governance of innovation cooperation considering both intra and inter-firm governance components. Thus, we are among the first to describe such hybrid forms and to complete earlier works on dyadic interfaces challenges within innovation cooperation (Lakemond et al., 2007; Maniak and Midler, 2008; Takeishi, 2001). Each of the identified types of governance is characterized by a coherent configuration between relational governance, contractual governance and human resources components.

Elaborated relational governance appears together with elaborated contractual governance; simple contractual governance appears together with simple relational governance. The more safeguard provisions there are, the greater the relational control mechanisms. Relational control mechanisms and information mechanisms are also linked by the implemented tools (e.g., joint monitoring can be used to share information and to monitor the development of the project) and by the quantity of mechanisms implemented. This analysis is in line with the work of relational exchange theorists that see the relational governance as a complement to legal protection mechanisms rather than a substitute (Dwyer et al., 1987; Gulati, 1995; Hausman and Johnston, 2010; MacNeil, 1980).

We also noted the consistency between information sharing mechanisms and sharing provisions. The more commitments, the more information is exchanged in structured or informal ways. We find here the results of (Gundlach et al., 1995) which showed that the importance of commitment in a relationship was positively correlated to the development of relational social norms. In addition, the contractual provisions for "sharing the pie of an Open

Innovation project” are also consistent with the entities most frequently implicated. In all configurations, contacts with R & D entities of the two firms are important. In the case of two “partnership” governance configurations, contracts contain purchasing commitments in case of innovation successes and contacts with the Operation functions (Purchasing-Sales, Operations and Logistics) are more important. The more complex the contract, the more entities are implicated.

The exception is the “free” governance type where the variety of entities is higher than within the “project-oriented” governance type while the contract is much less complex. One possible explanation is the lack of contractual recognition (or desire for contractual recognition) of the innovative aspect of the project by the customer. A second explanation could be that the formal mechanisms of relationship management are relatively minor and relational elements substitute for a contract. This could reflect the importance of trust between the two parties (Gulati, 1995; Sobrero and Roberts, 2002) or the importance of dependence of one of the two firms upon the other.

A second contribution is the highlight on the sharing provisions that commit client and supplier to jointly exploit the results of the joint innovation project. While studies on Open Innovation put forward the importance of the business model for innovation cooperation, this type of contractual arrangements are rarely described and studied neither in this literature nor in ESI or R&D alliance literatures. The exploitation of innovation results is mainly limited to the sharing of new intellectual property. Through our study we underline that sharing provisions dedicated to “life-cycle” industrialization of innovation, or “business-oriented”, form an important part of vertical innovation cooperation governance, as the related variables are some of the discriminating variables to define the different configurations. This insight opens new directions for further research on innovation cooperation governance.

A third contribution is to have identified that, within the three natures of innovation, there is only a link between governance type and the maturity of the innovation project when client and supplier firms are jointly involved. This result is aligned with the results found in the literature on early supplier involvement in new product development which underlines the overlap between the timing and the governance of the integration of supplier (Le Dain et al., 2011; Maniak and Midler, 2008; Säfsen et al., 2014). Nevertheless, it seems hard to believe that the extent of innovation has no significant impact (indeed, the test is significant at the 0,1

level). One possible explanation for the results we obtained could be due to the point of view of the supplier firm, besides the use of a scale that discriminated different extents of innovation projects.

It has been demonstrated that in joint innovation projects between client and supplier, the extent of innovation was reduced (Isckia and Lescop, 2011; Phillips et al., 2006, p. 452) and conversely that this type of hybrid governance was adapted for less complex innovation problems (Felin and Zenger, 2014). These results are obtained through the study of a large majority of Inbound Open Innovation practices. The adoption of the supplier-firm's point of view matches with Outbound Open Innovation practices. This difference could explain such a result and lead to further research for confirmation or invalidation through dyadic studies.

Our third contribution relies on the analysis of distribution of our sample between the different levels of innovation project maturity and governance configurations of the observed dyads (table 4). "*Free*" governance and "*elaborated partnership*" governance types are found in all stages of maturity of innovation. The two other governance types mainly reside in the earlier stages of innovation. This could be explained by the fact that these two governance types are characterized in particular by a relatively smaller presence of the Purchasing-Sales entities compared to R & D entities.

The link between the "*project-oriented*" type and the earlier stages of the innovation project is obvious. The weak link between the "*exclusive partnership*" governance type and the later stages of innovation is more unexpected, although it is not the case for the "*elaborated partnership*" governance type. If it could possibly be explained by the small size of the sample, our main hypothesis is that during the earliest stages of innovation, when uncertainty is the highest, a firm is keener to engage themselves in an exclusive contract. Sometimes, it is also the only way to convince the other firm to participate in a joint project with strong uncertainties (Ring and van de Ven, 1994). Conversely, at later stages, when uncertainties are lower and the perceived chances of success are higher, the hostage of exclusivity appears too important a debt (ibid): firms avoid creating hostage situations when the time of joint involvement is near to industrialisation.

With these findings we contribute to the analysis of the timing of R&D cooperation that was called by Vanhaverbeke, Du, Leten, and Aalders. Our exploratory research provides a first step for "*choosing the optimal involvement of different types of partners at a right moment in*

R&D projects” (Vanhaverbeke et al., 2014) taking into consideration both the inter-firm and the intra-firm levels (Takeishi, 2001). Our results first needs confirmation through broadest survey. Then, as it was conducted in a French context, they must be expanded to other countries, and further to types of cooperation other than vertical relationships.

In conclusion, this research contributes to answer to firm’s dilemmas regarding the best form of cooperation to adopt in the business context of joint innovation project. With their growing appetite for collaborative innovation, supplier and client firms claim for tools and methods to efficiently manage this specific type of relationship (Le Dain et al., 2011). Through this research we established that the form of the cooperation in joint innovation project was connected to the form of the client-supplier governance. Though, the main implication for managers is the necessity to consider these two dimensions of the relationship when choosing the (best) way to integrate, or to be integrated as, a vertical relationship partner, and not only consider the integration of the supplier to client’s innovation project.

6. ACKNOWLEDGEMENTS

The support of the company innov’& is gratefully acknowledged. We also appreciate the collaboration and feedbacks from *Elodie Gigout* co-author in the paper “Exploring the management of vertical innovation cooperation: how do supplier and client organize their relationship” presented in Ipsera 2015.

7. REFERENCES

- Alreck, P.L., Settle, Robert B, 1985. The survey research handbook. Irwin, Homewood IL.
- Ben Mahmoud-Jouini, S., Calvi, R., 2004. Les coopérations interentreprises dans les projets de développement (interfirm cooperations in development projects), in: Faire de la recherche en management de projet. Vuibert Fnege, pp. 161–188.
- Bogers, M., West, J., 2011. Managing Distributed Innovation: Strategic Utilization of Open and User Innovation. *Management* 21, 61–75.
- Calvi, R., Le Dain, M.-A., 2013. Partager la conception avec ses fournisseurs (sharing conception with suppliers). *excellence HA* 1, 27–37.
- Chesbrough, H., 2003. Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business Press.
- Clark, K.B., Fujimoto, T., 1991. Product Development Performance: Strategy, Organization, and Management in the World Auto Industry. Harvard Business Press.
- Danneels, E., 2002. The dynamics of product innovation and firm competences. *Strategic management journal* 23, 1095–1121.
- Dillman, D.A., 2007. Mail and Internet Surveys: The Tailored Design Method. John Wiley & Sons.
- Doz, Y.L., 1987. Technology Partnerships between Larger and Smaller Firms: Some Critical Issues. *International Studies of Management & Organization* 17, 31–57.
- Dussauge, P., Garrette, B., 1995. Determinants of Success in International Strategic Alliances: Evidence from the Global Aerospace Industry. *Journal of International Business Studies* 26, 505–530.
- Dwyer, F.R., Schurr, P.H., Oh, S., 1987. Developing buyer–seller relationships. *Journal of Marketing* 51, 11–27.
- Eng, T.-Y., Ozdemir, S., 2014. International R&D partnerships and intrafirm R&D–marketing–production integration of manufacturing firms in emerging economies. *Industrial Marketing Management* 43, 32–44.
- Felin, T., Zenger, T.R., 2014. Closed or open innovation? Problem solving and the governance choice. *Research Policy, Open Innovation: New Insights and Evidence* 43, 914–925.
- Gassmann, O., Enkel, E., Chesbrough, H., 2010. The future of open innovation. *R&D Management* 40, 213–221.

- Grant, R., 1996. Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal* 17, 109–122.
- Gulati, R., 1995. Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances. *The Academy of Management Journal* 38, 85–112.
- Gundlach, G.T., Achrol, R.S., Mentzer, J.T., 1995. The Structure of Commitment in Exchange. *Journal of Marketing* 59, 78–92.
- Hausman, A., Johnston, W.J., 2010. The impact of coercive and non-coercive forms of influence on trust, commitment, and compliance in supply chains. *Industrial Marketing Management* 39, 519–526.
- Heide, J.B., 2003. Plural Governance in Industrial Purchasing. *Journal of Marketing* 67, 18–29.
- Huizingh, E.K.R.E., 2011. Open innovation: State of the art and future perspectives. *Technovation* 31, 2–9.
- IBM Corp, 2012. IBM SPSS Statistics. IBM Corp., Armonk.
- Isckia, T., Lescop, D., 2011. Une analyse critique des fondements de l'innovation ouverte (a critical analysis of Open Innovation foundations). *Revue française de gestion* n° 210, 87–98.
- Jap, S.D., 2001. “Pie Sharing” in Complex Collaboration Contexts. *Journal of Marketing Research* 38, 86–99.
- Johnsen, T., Calvi, R., Phillips, W., 2012. Discontinuous innovation: A challenge for purchasing. *Journal of Supply Chain Management*.
- Johnsen, T.E., 2009. Supplier involvement in new product development and innovation: Taking stock and looking to the future. *Journal of Purchasing and Supply Management* 15, 187–197.
- Kale, P., Singh, H., 2009. Managing Strategic Alliances: What Do We Know Now, and Where Do We Go From Here? *The Academy of Management Perspectives* 23, 45–62.
- Ketchen, D.J., Shook, C.L., 1996. The Application of Cluster Analysis in Strategic Management Research: An Analysis and Critique. *Strat. Mgmt. J.* 17, 441–458.
- Kim, D.-Y., Kumar, V., Kumar, U., 2012. Relationship between quality management practices and innovation. *Journal of Operations Management* 30, 295–315.
- Lakemond, N., Johansson, G., Magnusson, T., Safsten, K., 2007. Interfaces between technology development, product development and production: critical factors and a conceptual model. *International Journal of Technology Intelligence and Planning* 3, 317–330.

- Le Dain, M., Calvi, R., Cheriti, S., 2011. Measuring supplier performance in collaborative design: proposition of a framework. *R&D Management* 41, 61–79.
- Lenfle, S., Loch, C., 2010. Lost Roots: How Project Management Came to Emphasize Control Over Flexibility and Novelty. *California Management Review* Vol. 53, pp. 32–55.
- LimeSurvey Project Team, Schmitz, C., 2012. LimeSurvey: An Open Source survey tool. LimeSurvey Project, Hamburg, Germany.
- MacNeil, I.R., 1980. Power, Contract, and the Economic Model. *Journal of Economic Issues* 14, 909–923.
- Maniak, R., Midler, C., 2008. Shifting from co-development to co-innovation. *International Journal of Automotive Technology and Management* 8, 449–468.
- OECD, Statistical Office of the European Communities, 2005. Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, The Measurement of Scientific and Technological Activities. OECD Publishing, Luxembourg.
- Personnier, H., Le Dain, M.-A., Schiele, H., Calvi, R., 2013. Failures in collaborative design with suppliers: Impact analysis on project innovation, in: *Proceedings of the 22nd IPSERA Annual Conference*, Nantes, France, pp. 1075–1095.
- Phillips, W., Lamming, R., Bessant, J., Noke, H., 2006. Discontinuous innovation and supply relationships: strategic dalliances. *R&D Management* 36, 451–461.
- R Development Core Team, 2012. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna (Austria).
- Reuer, J.J., Ariño, A., 2007. Strategic alliance contracts: dimensions and determinants of contractual complexity. *Strategic Management Journal* 28, 313–330.
- Ring, P.S., van de Ven, A.H., 1994. Developmental Processes of Cooperative Interorganizational Relationships. *The Academy of Management Review* 19, 90–118.
- Säfsen, K., Johansson, G., Lakemond, N., Magnusson, T., 2014. Interface challenges and managerial issues in the industrial innovation process. *Journal of Manufacturing Technology Management* 25, 5–5.
- Scheibler, D., Schneider, W., 1985. Monte Carlo Tests of the Accuracy of Cluster Analysis Algorithms: A Comparison of Hierarchical and Nonhierarchical Methods. *Multivariate Behavioral Research* 20, 283–304.
- Sobrero, M., Roberts, E.B., 2002. Strategic management of supplier–manufacturer relations in new product development. *Research Policy* 31, 159–182.

Takeishi, A., 2001. Bridging Inter- and Intra-Firm Boundaries: Management of Supplier Involvement in Automobile Product Development. *Strategic Management Journal* 22, 403–433.

Van de Vrande, V., Vanhaverbeke, W., Duysters, G., 2009. External technology sourcing: The effect of uncertainty on governance mode choice. *Journal of Business Venturing* 24, 62–80.

Vanhaverbeke, W., Du, J., Leten, B., Aalders, F., 2014. Exploring Open Innovation at the Level of R&D Projects, in: *New Frontiers in Open Innovation*. Oxford, England.

West, J., Bogers, M., 2014. Leveraging External Sources of Innovation: A Review of Research on Open Innovation. *Journal of Product Innovation Management* 31.

Wheelwright, S.C., Clark, K.B., 1992. Organizing and leading “heavyweight” development teams. *California management review* 34, 9–28.

8. APPENDIX 1 – MAIN ITEMS USED TO IDENTIFY GOVERNANCE

COMPONENTS OF THE STUDIED DYADS

Governance category	Item	References
Contractual	The type of contract that links the supplier and the client firms for the described innovation project is	No specific contract Kale & Singh, 2009 An addendum to an on-going contract Kale & Singh, 2009 A sales contract Kale & Singh, 2009 A co-development agreement Kale & Singh, 2009 A consortium contract (our two companies and others) Kale & Singh, 2009 A joint venture Kale & Singh, 2009 A minority stake Kale & Singh, 2009
	The contract between the two companies includes the following provisions	Regular reporting in writing of all relevant transactions and exchanges between our two companies Reuer and Ariño, 2007; Parkhe 1993 The right of access to all relevant accounts and saving my company, and the audit Reuer and Ariño, 2007 The written notice in the event of stoppage of the agreement by either party Reuer and Ariño, 2007 The use of arbitration in case of dispute Reuer and Ariño, 2007 The possibility of legal action in case of non- execution of contractual obligations Reuer and Ariño, 2007 The possibility of late penalties Reuer and Ariño, 2007 The definition of termination of this Agreement Reuer and Ariño, 2007
	The sharing of responsibilities between your client and your firm is	The other company is responsible for the overall design of the targeted innovation. My company is responsible for its implementation Bidault et al., 1998; Calvi and Le Dain, 2013; Maniak, 2009 My company offers a return on the design choices made by the other company that designs innovation. My company is responsible for the implementation of the targeted innovation Bidault et al., 1998; Calvi and Le Dain, 2013; Maniak, 2009 My company contributes significantly to the design and production of a part of the targeted innovation Bidault et al., 1998; Calvi and Le Dain, 2013; Maniak, 2009 My company has complete responsibility for the design and production of a full-fledged innovation Bidault et al., 1998; Calvi and Le Dain, 2013; Maniak, 2009 My company has complete responsibility for the design and production of the targeted innovation Bidault et al., 1998; Calvi and Le Dain, 2013; Maniak, 2009
	If intellectual property is shared, their sharing provision are	The new patent are exclusively for my company created The new patents will exclusively to another company created We share joint patents created We share the new patents based on the expertise / sector of activity of each one created
	When launching the innovation, my company is committed to	develop its industrial capacity to produce and deliver new products / services inspired by Ben Mahmoud-Jouini and Calvi, 2004; Maniak, 2009 provide a minimum volume inspired by Ben Mahmoud-Jouini and Calvi, 2004; Maniak, 2009 nothing beyond IP sharing inspired by Ben Mahmoud-Jouini and Calvi, 2004; Maniak, 2009
	And the commitments of the client company are	buy exclusively to my company inspired by Ben Mahmoud-Jouini and Calvi, 2004; Maniak, 2009 buy to my company a minimum volume inspired by Ben Mahmoud-Jouini and Calvi, 2004; Maniak, 2009 nothing beyond IP sharing inspired by Ben Mahmoud-Jouini and Calvi, 2004; Maniak, 2009
Relational (management)	We follow a well-defined process to manage our innovation cooperation	Sluyts et al. 2011
	We share our experiences and internal expertise on innovation cooperation	Sluyts et al. 2011
	In my company, there is a central contact who coordinates the internal relationship with another company	Sluyts et al. 2011
	The managers of each company exchange informally between them about the cooperation and about their know-how	Sluyts et al. 2011
	My company regularly informs the other company how it has met its objectives	Breite and Koskinen, 2013
	A quality approach (or equivalent) is used to manage the relationship between our two companies	Zaheer et al. 1998
	Resource management software, data exchange platforms... are implemented to manage information exchanges between our two companies	Roy et al. 2004
	Product lifecycle management software (PLM) and computer-aided design (CAD) systems are implemented to manage information exchanges between our two companies in the innovation project	created
	My company has electronic access to a portion of the computer system of another company and vice versa	created
	Information between our two companies on the innovation project related to PLM and / or CAD are exchanged by emails and / or by dedicated data exchange platforms	created
	Samples and demonstrators are used to facilitate exchanges around targeted innovations between our two companies	created
	Some members of my company are located in the offices of the other company, the time of the innovation project	Dayan and Di Benedetto, 2010
	My company regularly monitors and structured progress and performance of our relationship with another company (satisfaction survey)	Breite and Koskinen, 2013; Sluyts et al 2011
	My company regularly uses external experts (lawyers, patent specialists ...) to assist in this cooperation	Frechet, 2004
	The management of each company follows the progress and performance of the innovation project through joint reviews	Personnier et al 2013; Sluyts et al 2011
Relational (human resources)	The other company sent us its procedures and operating rules	Personnier et al. 2013
	On the joint innovation project, the full definition of the roles and responsibilities of each business was conducted	Personnier et al. 2014
	The management of each company follows the progress and performance of their relationship through joint reviews	Sluyts et al. 2011
	In its general attitude	The other company focuses on the positive impact on our business of the success of our innovation cooperation Hausman and Johnston, 2010 Emphasizes what they bring us back our participation Hausman and Johnston, 2010 Does not fail to refer to our contractual commitments Hausman and Johnston, 2010 Makes biased interpretations of our agreements Hausman and Johnston, 2010 Is very clear about the penalties for my company if we fail Hausman and Johnston, 2010 Threatens to disrupt our business relationship if we fail to do our part Hausman and Johnston, 2010
	The frequency of contact of the involved entities of each organizations	Top management created Purchasing created Research and Development created Marketing created Operation created Quality created Logistics created Finance created Sales created

9. APPENDIX 2 – MEAN OF REDUCED-CENTERED VARIABLES DISTRIBUTED BY CLUSTER

Governance category	Item type	Item code	Cluster - governance configuration			
			Free	Elab. Partner.	Project-or.	Exclus. Partner.
Contractual governance	Type of contract for the described innovation project	GIPGouvContr_achat	0,06	0,33	-0,51	0,02
		GIPGouvContr_addendum	-0,20	-0,20	-0,20	0,89
		GIPGouvContr_codev	-0,24	0,41	0,07	-0,12
		GIPGouvContr_consortium	-0,24	-0,08	0,69	-0,18
		GIPGouvContr_equity	-0,11	-0,11	0,43	-0,11
		GIPGouvContr_jointVentur	-0,14	-0,14	0,53	-0,14
		GIPGouvContr_NDA	-0,14	-0,14	0,53	-0,14
		GIPGouvContr_pas	0,08	0,08	-0,30	0,08
		PIProjInno_FinancPubli	-0,32	0,02	0,70	-0,15
		IPGouvContrSauf_Arbitr	-0,59	0,81	0,11	0,02
	Safeguard provisions	IPGouvContrSauf_Arret	-0,55	0,88	0,24	-0,29
		IPGouvContrSauf_Audit	-0,24	0,09	0,37	-0,04
		IPGouvContrSauf_Coord_agrega	-0,65	0,90	0,36	-0,24
		IPGouvContrSauf_CpteRendu	-0,48	0,68	0,20	-0,12
		IPGouvContrSauf_Enforce_agrega	-0,65	1,09	0,14	-0,25
		IPGouvContrSauf_Fin	-0,58	0,86	0,32	-0,29
		IPGouvContrSauf_Penalt	-0,36	0,76	-0,07	-0,18
		IPGouvContrSauf_Poursuite	-0,33	0,72	0,02	-0,28
		IPGouvContrShare_NegoClause	-0,24	0,21	-0,06	0,30
		IPGouvContrShare_PartagRespo_NUM	0,04	0,30	-0,32	-0,10
	Sharing provisions	IPGouvContrShare_PartagResult_regl_fixe	0,06	-0,15	0,05	0,03
		IPGouvContrShare_PartagResult_regl_futur	-0,03	0,19	-0,52	0,39
		IPGouvContrShare_PartagResult_regl_partage	-0,19	0,11	0,58	-0,40
		IPGouvContrShare_PartagResult_regl_rien	0,25	-0,30	0,04	-0,17
		IPGouvContrShare_Proprintel	-0,33	0,47	0,14	-0,10
		IPGouvContrShare_ProprintelPartag01_exclu	0,15	-0,34	-0,23	0,40
		IPGouvContrShare_ProprintelPartag01_fn_expertise	0,00	0,28	-0,07	-0,29
		IPGouvContrShare_ProprintelPartag01_repart	-0,16	0,05	0,32	-0,10
		IPGouvContrShare_EngageIndusM	0,01	0,14	-0,39	0,24
		IPGouvContrShare_EngagerienM	-0,03	-0,17	0,46	-0,22
Relational governance	Information sharing mechanisms	GouvRelat_CentralCoordA	-0,16	-0,18	0,05	0,50
		GouvRelat_CentralCoordM	0,13	-0,43	-0,01	0,31
		GouvRelat_CentralCoordOffiM	-0,19	0,27	-0,25	0,32
		GouvRelat_CentralCoordOffiRepM	0,20	-0,04	-0,19	-0,14
		GouvRelat_ConsistanceInterA_NUM	0,11	0,17	0,05	-0,51
		GouvRelat_ConsistanceInterM_NUM	-0,01	0,13	0,27	-0,46
		PIGouvRelatContr_ReunComm	-0,42	0,06	0,16	0,61
		PIGouvRelatContr_RoleDefini_NUM	-0,30	-0,07	0,23	0,47
		GouvRelatCtrl_CommProcessMparA	-0,19	0,39	-0,38	0,33
		GouvRelatCtrl_InformAutreparM	-0,11	0,15	-0,20	0,26
		GouvRelatCtrl_InformMparAutre	-0,37	0,48	-0,36	0,53
		GouvRelatCtrl_ProcessM	0,02	-0,20	-0,27	0,53
		GouvRelatEchg_Coloc_agrega	-0,18	0,21	0,05	0,04
		GouvRelatEchg_ColocchezA	-0,13	0,08	0,23	-0,10
		GouvRelatEchg_ColocchezM	-0,15	0,16	-0,03	0,13
		GouvRelatEchg_DemQualit	-0,09	0,28	-0,38	0,23
		GouvRelatEchg_Informel	-0,10	0,12	-0,02	0,07
		GouvRelatEchg_PartageExpM	0,11	-0,10	-0,28	0,22
		GouvRelatEchg_Sample	0,07	0,31	-0,69	0,24
		GouvRelatEchg_SI_acces	-0,15	0,26	-0,17	0,17
	Control mechanisms	GouvRelatEchg_SI_EDi	-0,10	0,20	-0,26	0,25
		GouvRelatEchg_SI_mail	-0,09	0,09	-0,23	0,34
		GouvRelatEchg_SI_PLM	-0,18	0,02	-0,16	0,53
		GouvRelatCtrl_KAMpourA	-0,38	0,25	0,13	0,31
		GouvRelatCtrl_KAMpourM	-0,11	0,33	-0,47	0,33
		PIGouvRelatContr_ReunComm	-0,42	0,06	0,16	0,61
		PIGouvRelatContr_RoleDefini_NUM	-0,30	-0,07	0,23	0,47
		GouvRelatContr_ProcesComm	-0,34	0,07	0,08	0,52
		GouvRelatContr_ReunComm	-0,36	0,05	-0,03	0,71
		GouvRelatCtrl_AppelExprtM	-0,29	0,43	0,11	-0,10
		GouvRelatCtrl_SuiviEvolRelatA	-0,32	0,29	-0,11	0,41
		GouvRelatCtrl_SuiviEvolRelatM	-0,10	0,01	-0,16	0,39
		GouvRelatCtrl_AttitudeAEncourag_NUM	-0,26	0,22	-0,07	0,33
		GouvRelatCtrl_AttitudeAInterpBiais_NUM	0,02	0,27	-0,13	-0,25
		GouvRelatCtrl_AttitudeAMenace_NUM	0,09	0,26	-0,33	-0,16
		GouvRelatCtrl_AttitudeAPenalite_NUM	-0,14	0,19	-0,15	0,23
		GouvRelatCtrl_AttitudeAPromesse_NUM	-0,23	0,10	0,05	0,28
		GouvRelatCtrl_AttitudeARappelContrat_NUM	-0,20	0,26	-0,15	0,25
Human resources	The frequency of contact of the involved entities of each organizations (client then supplier)	GouvRelat_ContactAchatA_NUM	-0,08	-0,46	0,89	-0,26
		GouvRelat_ContactAchatM_NUM	0,01	0,20	0,04	-0,32
		GouvRelat_ContactDGA_NUM	0,37	-0,20	-0,09	-0,41
		GouvRelat_ContactDGM_NUM	0,23	-0,31	0,14	-0,22
		GouvRelat_ContactFinA_NUM	0,20	-0,14	-0,02	-0,21
		GouvRelat_ContactFinM_NUM	0,17	-0,21	0,11	-0,19
		GouvRelat_ContactLogisA_NUM	0,11	-0,63	0,68	-0,17
		GouvRelat_ContactLogisM_NUM	0,10	-0,64	0,69	-0,16
		GouvRelat_ContactMkgA_NUM	0,26	-0,01	-0,15	-0,36
		GouvRelat_ContactMkgM_NUM	0,20	-0,22	0,08	-0,21
		GouvRelat_ContactOperatA_NUM	0,20	-0,14	0,30	-0,57
		GouvRelat_ContactOperatM_NUM	0,32	-0,34	0,29	-0,54
		GouvRelat_ContactQitéA_NUM	0,18	-0,59	0,65	-0,34
		GouvRelat_ContactQitéM_NUM	0,15	-0,51	0,67	-0,42
		GouvRelat_ContactRDA_NUM	0,14	0,17	-0,45	0,00
		GouvRelat_ContactRDM_NUM	0,21	0,05	-0,39	-0,05
		GouvRelat_ContactVenteA_NUM	-0,09	0,18	-0,02	-0,02
		GouvRelat_ContactVenteM_NUM	-0,01	-0,43	0,49	0,02