

# **Coordination Modes established by the Hub Firm of an Innovation Network: The Case of a SME Bearer**

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## **Abstract :**

This article aims at exploring the coordination modes that a SME bearer can implement with its different partners. We want to show that the coordination modes are not static but evolve with the project. That is why we have chosen a longitudinal case study approach. The innovation network in this study has been observed in a dynamic way to study the possible changes during its deployment.

**Keywords:** Innovation Partnership, coordination modes, longitudinal analysis, SMEs

## **INTRODUCTION**

Coordination modes are essential in innovation networks because they reduce uncertainty and opportunistic behaviour (Dhanaraj and Parkhe, 2006). Indeed, these organizational forms are particularly conducive to the exchange of information and transfer of know-how, which, unfortunately, encourages opportunistic behaviour (Goerzen, 2007). In addition, these organizational forms suffer from uncertainty caused by the often tacit knowledge of members and the low level of predictability of results.

Most of the research on inter-organizational innovation focuses on analyzing the reasons of cooperation, rather than the dynamics of coordination. And according to Dhanaraj and Parkhe (2006) there are only few empirical studies that focus on understanding the internal functioning of innovation networks. Moreover, most of the research that analyzes cooperation adopts a cross-sectional static view of the network. Furthermore, previous research focuses mostly on the performance of often large companies involved in innovation networks in the biotechnology and new technology areas (Durand, Bruyaka and Mangematin, 2008; Gilsing and Nooteboom, 2006). However, SMEs innovate also and in many areas. In 1999, there were 1,408 SMEs among applicants for patents through the national registry, or 51% of the applicants registering in France (OSEO<sup>1</sup>, 2004). The activities of these SMEs are varied and patents are in areas such as machinery, food processing, consumer goods, etc. As a result, there are gaps in the literature regarding SMEs and coordination modes in networks. This contribution is of an exploratory nature and seeks to partially fill these gaps in the literature by analyzing 1) the coordination modes established by a small firm wishing to develop an innovation project, and 2) the evolution of these modes (in terms of project phase). This article aims at exploring the coordination modes that a SME bearer<sup>2</sup> can implement with its different partners in the network. We want to show that the coordination modes are not fixed and static, but evolve with the project. That is why we have chosen a longitudinal case study approach. The innovation network investigated was observed over a period of time to study the dynamics of its deployment.

This article proposes a dynamic approach for coordination modes within an innovation network where the hub firm is a SME. In the first part of the article we explain the reasons that have led us to focus on a centralized network, controlled by one firm (the project bearer). After that we carry out a literature review of the main coordination modes that the hub firm can use. In the second part we present the monographic case study conducted over a period of 12 months to investigate the role of the project phase in the selection of the coordination modes implemented by the hub firm. And last, an analysis of changing coordination modes leads us to discuss the effects of the project advancement phase and the hub firm's dependence on the evolution of these modes.

### **1. Coordination modes established by the hub firm of an innovation network**

An inter-organizational network can be considered as cooperation among at least three legally different organizations with the aim of realizing a common project. (Lecocq, 2004). We focus on networks with the common aim of developing an innovation project and we show our research specificities. The innovation network, which does not escape the semantic vagueness which surrounds the concept of network, calls for a clarification effort and differentiation with

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<sup>1</sup> Report on SMEs depositing patents in France and their characteristics (including the industry) and their changes between 1999 and 2004.

<sup>2</sup> The project bearer is the hub in our case.

regard to the other organizational forms. In line with the research of Assens (2003), Inkpen and Tsang (2005) and Dhanaraj and Parkhe (2006), we define an innovation network as a set of relations with diverse organizations (public / private; partners / providers), piloted by the project bearer with the aim of developing the invention of the bearer.

Most of the related studies consider the importance of inter-organizational evolution (Zajac and Olsen, 1993; Ring and Van de Ven, 1994; Das and Teng, 2002), while research that analyzes the evolution of coordination modes is rare (only one found, Reuer, Zollo and Singh, 2002). Our paper aims at partially fulfilling the need for this research. The procedural research distinguishes generally three phases which have the merit of being specific and common to all innovation projects: phase 1, from invention to development; phase 2, from development to production; and phase 3, from production to distribution. To understand the evolution of coordination modes relative to these three phases, we synthesize the literature on the main coordination modes used in inter-organizational relations.

The coordination modes are seen as arrangements between economic units that govern the manners in which these units can cooperate for developing the innovation project (Grandori and Soda, 1995). This definition has the advantage of focusing on the interactions at the strategic level - and not at the operational level (like the distribution of the tasks or the communication tools).

**Degree of Formality.** Whether it is in a formal or informal way, the innovation network members have to set rules for acceptable behaviour, sharing of benefits, conflict resolution modes, etc. (Poppo and Zenger, 2002). The formal, explicit and written modes include standardized procedures, technical reports, cost accounting systems, budgeting and planning, and contracts and confidentiality agreements (Gulati, 1995; Das and Teng, 1998). The informal, implicit and verbal modes, on the other hand, include the implementation of common teams (Grandori and Soda, 1995), seminars, meetings, staff transfers and certain mechanisms for decision-making.

**Trust.** The inter-organizational trust<sup>3</sup> is defined as an underlying psychological condition which can be the cause or the benefit of behaviour or a choice (Mothe and Ingham, 2003, p. 12). The risk variations and organizational interdependence can alter the level and shape of trust. Trust is often considered as having a direct influence on the success of partnerships (Morgan and Hunt, 1994). In an innovation project with an uncertain environment, trust would allow for the prediction of members' behaviour (Ring and Van de Ven, 1994). The strong uncertainty degree in innovation networks can only be anticipated with difficulty in contracts (Cullen, Johnson and Sakano, 2000).

**Division of Benefits.** One of the essential elements of cooperation is the rule for sharing the benefits or outcome of the project (Vassolo, Anand and Folta, 2004). This distribution depends on the members' perception of justice, which may vary from one group to another and from one culture to another. An equitable division of results depends on the input of the partners and is often perceived as an incentive, encouraging project members to work harder, thereby improving the performance of an innovation project (Kabanoff, 1991). On the other hand, an equal sharing of benefits can be seen in terms of uniformity and a lack of differentiation between the members of the project. Every member of the innovation network receives an equal share of the results, no matter how much they contribute in terms of resources and/or expertise (equal share in the results, regardless of the investment). This type of sharing is risky when the members of a network bring unequal contributions to the project, as it can lead to the impression that the sharing of benefits is unfair.

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<sup>3</sup> We consider, in line with Mesquita (2007) that the inter-organizational trust has an appropriate status. For a literature review on trust, see Mesquita (2007), Mothe and Ingham (2003) or Simon (2007).

**Guarantees.** The guarantee systems establish protection against the potential of loss by making it expensive for the opportunist members to exit. We suggest distinguishing immediate guarantees, such as financial guarantees or specific assets, from deferred guarantees (indirect modes, repercussions n+1) such as reputation or future business opportunities). The direct modes allow mastering the members' behaviour (repercussions in n) while the indirect modes are based on the capacity to strike a blow to the member's reputation, or to exclude that member from a future business opportunity (repercussions n+1).

**Conflict resolution.** Mohr and Spekman (1994) propose six conflict resolution modes in bilateral relations. We adapt them and retain only five to take into account multilateral relations within networks of innovation: (1) the joint resolution of the problem: the various members make a commitment to find a mutual solution for the problem; (2) the persuasion: one of the members tries to persuade the other members that a given solution is the best to get out of the conflict situation; (3) the pressure: one, or more, partners force the others to choose their solution to resolve the conflict; (4) the penalty: the non-conforming partner is excluded; (5) introduction of a third party: this one realizes an arbitration between the various stakeholders (arbitrator or legal action).

Table 1 below classifies the main proposed coordination modes. It serves to analyze and discuss the innovation network of the Pinc&pile project.

Coordination type	Questions	Coordination modes
<b>Exchange regulation</b>	How do the members coordinate in a network of innovation?	<b>Degree of formality:</b> Whether the contract exists or not, and the number of clauses
		<b>Trust:</b> Degree of trust between partners
<b>Devices of incentive and penalty</b>	What types of devices do they mobilize in the course of a transaction?	<b>Division of benefits:</b> Equitable or equal
		<b>Guarantees:</b> ∅, direct and/or indirect
		<b>Conflict resolution:</b> Joint, persuasion, pressure, penalty, appeal to a third party (arbitrate or legal action)

**Table 1: Coordination of the members in an innovation network**

Further to this literature review of the main coordination modes within innovation networks, we study their implementation through the longitudinal study of an innovation project led by a SME Bearer.

## **2. The longitudinal study of an innovation network piloted by a SME bearer**

The main empirical research on the internal functioning of a network with one or two modes of coordination comes from Poppo and Zenger (2002), Mohr and Spekman (1994), and Mothe and Ingham (2003). To enrich this literature, we opt for the detailed analysis of a unique case study that includes (1) analyzing the possible interactions between several coordination modes and (2) understanding the evolution of these modes with the project advancement.

## 2.1. Longitudinal study of an innovation network built around a SME

To understand better the evolution of coordination modes within an innovation network, we realized a longitudinal case study. We chose this methodology because our question is wide and requires keeping up with the events in time (Wacheux, 1996). The chosen network of innovation presented certain advantages related to accessibility of data and allowed us to study the relations between the hub firm and the members during several phases. Our study is based on 9 semi-structured interviews, five days of passive observation as well as external secondary data, such as files and articles that appeared in the specialist publications and the websites of the members (see Table 2). The collection of articles about Pinc&pile comes from Echos and Stand, and data is collected from the chronicles of the Association of Professions and OSEO.

Primary data				Secondary data		
Interviews			Passive observation	Internal data	External data	
Member type	Duration	Date				
Hub firm	Inventor and manager	2h19	26/06/06	5 days	3 contracts Files for competition of the innovating project 15 E-mails 2 letters from lawyers	21 articles <sup>4</sup>
		1h10	09/11/06			
		2h32	08/03/07			
Legal members	Law firm	36 min	20/11/06			
	Cabinet in industrial property - provider	13 min	03/08/06			
Technical member	Partner company	47 min	06/07/06			
Financial member	Public partner	1h02	05/12/06			
Industrial member	Provider company	40 min	16/01/07			
Commercial member	Partner company	50 min	14/11/06			

**Table 2: Synthesis of the different types of data**

The interviews were carried with the various members of the innovation network: the project bearer, the financial, technical, industrial, commercial and legal members (cabinet in industrial property). These semi-structured interviews, of an average duration of one hour, were aimed at understanding the history of the innovation network, the different coordination modes, the main difficulties and their repercussions on the innovation project.

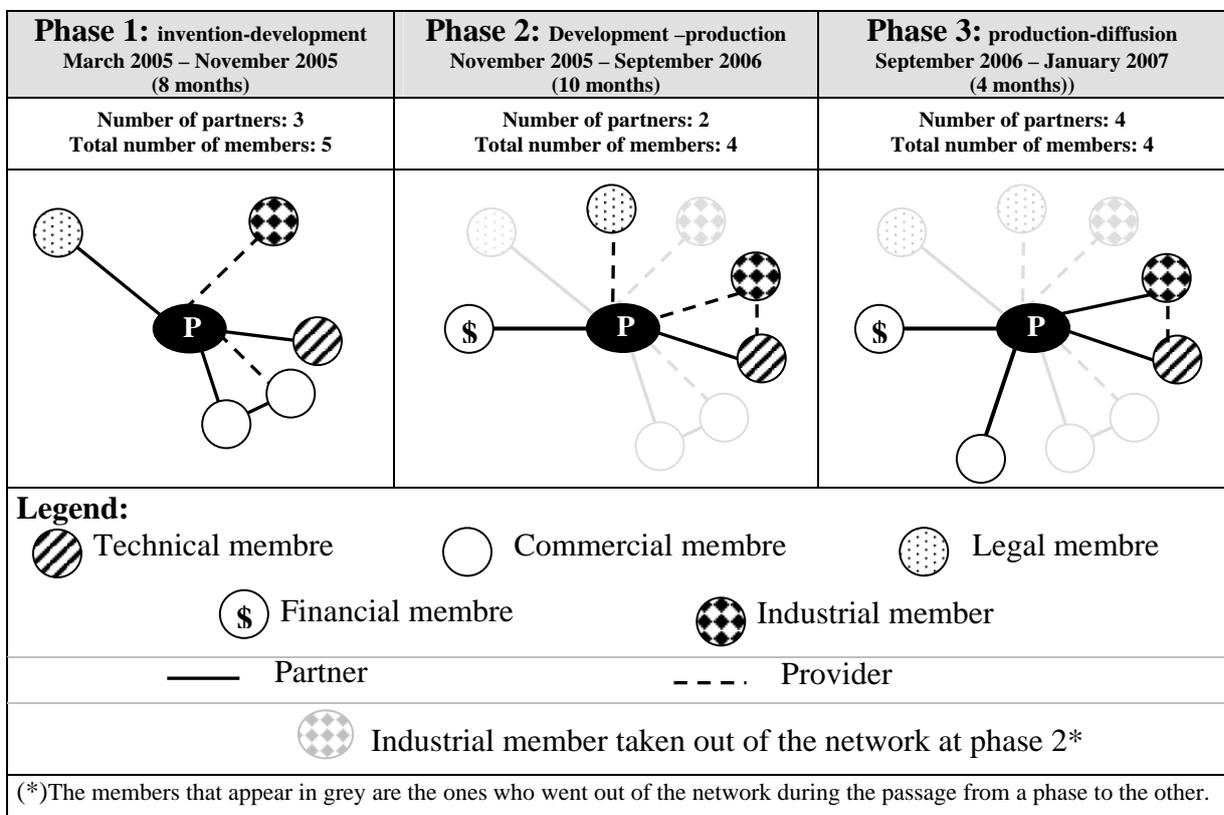
Each interview was coded (Miles and Huberman, 2003) and the codes were gradually refined during research. Also, when possible, the information was triangulated between the primary and secondary data. Our research focused on the implementation of the innovation by adopting a dynamic approach, we analyze the case according to three main innovation project advancement phases: from invention to development, from development to production and from production to distribution.

<sup>4</sup> Secondary data collection was facilitated because this work was already realized by the project bearer, which uses it as a study and part of its "portfolio".

## 2.2. Presentation of the network and the innovation project: Pinc&pile

The project was based on a report about the use of tweezers and the viability of producing disposable tweezers. In spite of its disinfection after every use, the hygiene of the tweezers is not optimal – so it can be a good idea to develop disposable tweezers. Besides, the emergence of new customer expectations and the change in hygiene standards illustrate the ill-adjustment of the means used by the beauticians. The originator of the project and her partner imagined Pinc&pile as a new answer to a problem they had found. But they had to overcome the technical problems and find investors.

At first (at the end of March, 2005), they decided to register an Enveloppe Soleau, which allows registering the ownership of an industrial idea in France, with a set time for execution, but falls short of a patent. Then in June 2005, they applied for a patent with a world cover (see Patent Cooperation Treaty). The innovation network architecture, the relations intensity and the project advancement phases are shown in Figure 1. The connections between the members represent relations and appear or disappear according to the change in relations during the advancement phases.



**Figure1: Structure of the Pinc&pile network during the project**

The Pinc&pile project required a set of resources and heterogeneous skills. So, to develop its innovation project, the Pinc&pile bearer had to coordinate with multiple organizations. We present in the next section the main coordination modes implemented by the hub firm according to the project advancement phase.

### 3. Analysis of the established coordination modes and discussion of the results

To facilitate the reading of the results, we present first the modalities implemented by the hub firm for each of the five coordination modes. Second, we present the coordination game by showing the necessity of considering not only the project advancement phase but also the dependence degree of the hub firm that affects the established coordination modes.

#### 3.1. Main coordination modes implemented by the Pinc&pile project bearer

In the Pinc&pile case, we surveyed five coordination modes identified in the literature and determined the modes used in this project, as well as their evolution, based on information from the members.

**Division of Benefits.** With the partners receiving benefits, the sharing of benefits did not pull intense discussions (with the exception of the industrial provider for phase 1 that asked for 49 % of the already registered patent). An estimate was used in contract for the payment. The amount was calculated according to the hourly volumes necessary for the realization of profit and for the engendered costs.

During phase 1, the outcome must be shared in an equitable way between the hub firm and the technical and legal partners. However, further to the conflict with the legal partner, only the technical partner that was present since the beginning of the project, gets 50 % of the realized outcome and can communicate on the Pinc&pile project as a main partner. Both members receive the same profits:

*" With [the hub firm] it is like a wedding. We are united for better and for worse"  
(technical partner, B project, 06/07/2006)*

The industrial provider (phase 2), became a partner (phase 3), and did not benefit from an equitable division of benefits. The hub firm considers that it would be inequitable that a member become partner at phase 3 (where the risks decrease) and takes advantage *"of the same treatment"* (hub firm, B project, on 26/06/2006) like a technical partner that was present since the project genesis. The division of benefits is made in proportion to the financial commitments supplied by this industrial partner. That partner can also use the project image to communicate with its customers (as, for example, the manufacturing of a single mould to make the major component of Pinc&pile).

**Guarantees against the opportunist behavior.** The guarantee modes were often one-sided and taken by the project members and not by the hub firm. This can be explained by:

- Firm size: the hub firm consisted of two persons;
- The hub's weak financial means: the financing of the investments forced it to exceed its self-financing capacity;
- The hub's inexperience: not giving it the possibility of benefiting from a strong credibility in the innovative projects area.

These three characteristics placed the hub in a vulnerable position with regard to the potential members:

*"I quickly have to find financial partners because, next year, I do not think I will be capable of maintaining my world patent. Moreover, it is because I had spoken to [commercial partner of phase 1] that he wanted to take part on my patent. Financially, I am a little bit just, some take advantage of it "* (hub firm, B project, 26/06/2006)

These reasons explain why at phase 1, with the exception of the technical partner, the members showed a certain hesitation to get involved in this innovation project. Some (the industrial provider and the commercial members of phase 1) took advantage of this weakness

to demand a bigger share of the profits (direct guarantee). These members agreed to pay part of the working costs (extensions abroad, diverse examinations procedures, etc.) on the condition of benefiting from a bigger share.

*On the contrary*, the technical partner (present since the beginning of the project) and the legal partner (phase 1) were not guaranteed the same opportunity. The mutual trust acquired during previous relations was used here as a substitute in the guarantee modes:

*"I have already worked with Mrs. [X], for different tasks, but I know her enough to know that she is the straight woman who is not going to plant me a knife in the back. Besides, I do not see how and why she would do that" (hub firm, B project, 03/08/06)*

**The resolution of conflict.** The hub firm and the members set up preventive coordination modes (guarantees, *ex ante* result division) reducing the probability of conflict. However, these measures were not sufficient. The conflicts with the commercial members, the industrial and legal members were perceived by the hub firm as threats for the projects advancement. These arose from the beginning of the project. The hub firm then had to decide whether to continue the project with them or not:

*" I wondered if I could succeed without them. After some sleepless nights and [technical partner]'s help, we arrived at the conclusion that nobody is indispensable. As I knew that I did not want to work any more with them, the discussion had no more sense" (hub firm, B project, 26/06/2006)*

The conflict ended with the exit of the two commercial members, the industrial member and the legal member. Contrary to the first three ones, the legal partner (phase 1) refused to be eliminated from the project and the hub firm had to resort to the court. They considered that the hub firm would never have been able to develop its invention without its presence and he demanded a financial compensation for the caused waste of time. The court ruled in favour of the hub firm which, even though it had won the lawsuit, lost some months with regard to the projected schedule of its project. On the contrary, conflict with the two main partners (technical and industrial), was considered as favourable to the project advancement. The hub firm perceived these discords as questioning of certain strategic or technical choices of Pinc&pile and not as a threat for the project advancement:

*"With [industrial partner] we still do not agree on the number of pieces to be produced, but it is normal that we do not agree on everything. It shows that he is really interested in my project and it is thus together that we try to find a solution for our discord" (hub firm, B project, 26/06/2006)*

The hub firm tried to channel the conflict by facilitating the discussions and by confronting points of view. The privileged conflict resolution modes were the joint resolution and the persuasion when one of the members was considered expert on the conflict topic (for example, during a discord on the plastic to be used, the technical partner tries to persuade the others of the advantages of such material). In this situation, the discussions allowing the reduction of conflict allowed for progress and facilitated the Pinc&pile advancement.

**The formalization of the exchange.** While keeping the power of decision making for the strategic stakes in the project, the hub firm privileged informal relations. It asked simply every member of Pinc&pile network to sign an agreement of confidentiality, what was considered as one of the first formalities to begin the cooperation (further to the advice supplied by the legal partner at phase 1). However, this document was not still signed from the first exchanges and the hub firm granted him no protection value of its invention:

*"[legal provider, phase 2] advised me to make everybody I discuss the project with sign a confidentiality agreement. I did it to please him, but my invention is*

*patented and, if they want to copy me, it is not this agreement that will prevent them from doing it" (hub firm, B project, 26/06/2006)*

During phase 1, except for the confidentiality contract, the hub firm took no written commitment, neither with the technical member nor with the legal member. They agreed on the partnership modalities, during meetings or during phone conversations. On the contrary, the industrial and commercial members wanted to contractualize the relation. The industrial member asked for a 49 % share. Both commercial members wanted an exclusive exploitation license. After three rounds of negotiation (by fax) to try to find an agreement, the hub firm, tired of this "*administrative wretched paper*" (hub firm, B project, 26/06/2006), opted for searching for new members because at this phase they were not indispensable to the project.

At phase 2, the relation with the public financial member (the professional association) did not give way to the signing of a cooperation contract. On the other hand, the hub firm had to draft a file similar to a business plan (project, technical feasibility, market study, balance assessment and projected income statement). With the industrial provider, contacted by the technical partner, a subcontract was signed. During phase 3, the exchange relation with the industrial provider was transformed little by little into a partnership, without the need for a new agreement. These exchange relations with the technical and industrial partners were based on a high degree of trust.

**Trust.** The Pinc&pile hub firm coordinated the transactions. However, the great majority of the tasks requiring high technical knowledge escaped its control and were managed by the technical partner since the hub firm did not possess the technical skills necessary for project realization. The hub firm had granted very high trust to the technical partner.

At phase 2, the technical partner sought a new industrial provider to create a new version of the mould allowing the production of new pieces. This was necessary since the mould proposed by the first industrial provider ended in the creation of pieces that are difficult to use. This inter-organizational trust developed gradually, emerging from the exchange relations. It is within the framework of interactions and common work that the mutual trust was able to be created. A trust existed between the hub firm and the legal partner in phase 1, which was a long-time friend. However, trust is never acquired totally. In this relation, trust did not help prevent conflict and it was quickly transformed into mistrust:

*"She [legal partner] betrayed my trust. She was jealous of my idea and wanted little by little to take my place within the project. The more that went on, the more our relation degraded. She wanted to manage everything for me and did not pass on to me all the information which she obtained on the project (...). The game had become narrow-minded, we each had one objective: to obtain more information than the other. But it is a sneaky and not really beneficial game for the project" (hub firm, B project, 08/03/07)*

### **3.2. Coordination games and discussion of the results**

In the relations of exchange between the hub firm of Pinc&pile and the members, besides the project advancement phase, the hub firm dependence appears as being a pre-eminent dimension that helps us understand the established coordination modes. The dependence is not a static characteristic; it can evolve according to the project advancement phase. The network evolves according to the cooperation and agreements between the various members (Larson, 1992). The evolution of the dependence of Pinc&pile hub firm on the other members allows, for example, a provider to become a partner or to disappear. According to the project advancement phases, the resources and skills indispensable to the bearer change and evolve. A member's negotiation power is thus determined by the resources that it brings (Yan and Gray, 1994); where the resources can be physical and financial, or non-physical like the skills and know-how (also partner reputation, a network of relations, etc.). The nature of resources

determines the dependence level of the hub firm with regard to the members of its network, and thus its power level (Blau, 1964). The acquisition of the necessary resources and skills appeared as the first source of dependence and can be subdivided into three categories (Pfeffer and Salancik, 1978): the importance of the resource, the exclusive character of a member that can supply the resource, and the extent of the member's power over the resource. If the hub firm does not possess all the resources (productive equipment or distribution channels) and skills indispensable to project advancement, then the appeal to cooperation is almost inevitable and becomes a constraint. Moreover, in the literature it is often considered that a large-sized organization has generally a superior power in inter-organizational relations (Aghion and Tirole, 1994). So, an innovation network associating companies of very different sizes (for example, a SME hub firm cooperating with a multinational) would often put the small-sized company in a dependence situation because the networking gives it a strategic character less pronounced than that of the big company (Tinlot and Mothe, 2005). In the analyzed network, the hub firm, in spite of its small size, is not in a dependence situation on all members. The case study shows that the hub firm's small size is not synonymous to dependence (see Table 3).

So, the dependence degree is neither global nor static. It is thus necessary to study it according to a member's category and according to the project advancement phase. This characteristic differentiates this research from those concerning the dependence degree in bilateral alliances (Delerue and Simon, 2005). In the studied innovation network, the hub firm can, for example, be dependent on financial members without being dependent on commercial members. Whether it is in a bilateral or multilateral relation, the dependence sources are multiple: physical and nonphysical resources, partner's size, the strategic importance of the partner and the cooperation urgency (Tinlot and Mothe, 2005).

So, at phase 1, the hub firm needed, first and foremost, legal resources to protect its invention. The commercial and industrial members were not indispensable. The technical partner appeared to be the main part of the network because it assured the technical feasibility of the project. At phase 2, the hub firm was dependent on all the members with the exception of the provider (a lawyer) whose only concern was to manage the conflict with the first legal partner. This dependence mainly arose from the hub firm's difficulty of finding members that can replace them:

*"If my technical partner had let go of me along the way, I am not really sure that the project would have succeeded. I think that partners of this quality are really very rare and I would have had difficulty replacing him" (hub firm, B project, on 08/03/07)*

At phase 3, the hub firm had products ready to be marketed. At that point in time it becomes more difficult for the partner to neglect the work put together with the hub firm. If a partner leaves the network then, that partner will receive fewer benefits than it would have by staying in the network.

In the summary table of Pinc&pile case (see Table 3 on the next page), we show the main coordination modes established according to the advancement phase and the hub firm dependence degree.

		Coordination modes	Phase 1	Observed games <sup>5</sup>	Phase 2	Observed games	Phase 3	Observed games
Hub firm dependence	No	Division of benefits	Equitable	1	Equitable	3	Equal	5
		Guarantee systems	<ul style="list-style-type: none"> <li>Industrial provider: 49 % share of the patent rights</li> <li>Commercial partners: exclusive license</li> <li>Hub firm: -</li> </ul>		<ul style="list-style-type: none"> <li>Hub firm: reputation</li> </ul>		<ul style="list-style-type: none"> <li>Members: project reputation</li> <li>Hub firm: reputation</li> </ul>	
		Conflict resolution	Sanction: the member is expelled (because it isn't indispensable)		<i>Not observed</i>		<i>Not observed</i>	
		Type of exchange	Very informal		Formal		Informal	
		Degree of trust	Weak		High		High (member recommended by another one that the hub firm trusts)	
	Yes	Division of benefits	Equal	2	Equal (technical partner) Equitable (public partner)	4	Equitable if it's a new member	6
		Guarantee systems	-		-		The investment in terms of time for the project	
		Conflict resolution	<ul style="list-style-type: none"> <li>First discord: joint resolution</li> <li>Persistent discord: legal action (but it can take a lot of time because no contract is written)</li> </ul>		Persuasion of the member or of the hub firm according to the nature of the discord. (At the technical level, the persuasion stemming from the partner. At the commercial level, persuasion stemming from the hub firm)		<i>Not observed</i>	
		Type of exchange	Very informal: meetings and phone contacts		Very informal: meetings and phone contacts Formal with public partner		Informal: meetings, telephone and e-mails or fax	
		Degree of trust	High		Very high		Very high	

Table 3: Coordination modes and games in the Pinc&pile case

<sup>5</sup> The coordination games observed between the coordination modes are presented in this column. Thus, it is not about an exhaustive representation of all the interactions between the modes.

To facilitate the understanding of this summary table, a detailed reading of six configurations is proposed.

**Configuration 1 (phase 1 – no dependence):** the trust degree between the hub firm and three members (an industrial provider and two commercial members) is rather weak because, from the beginning, these members pressed the hub firm and sought to impose their cooperation conditions. Because of the hub firm's inexperience and small size (weak trust), these members not only wished a sharing of benefits in proportion to their contributions, but also asked for very important direct guarantees: share of intellectual property rights and exclusivity license (these guarantees were not provided and appear in grey in the summary table). As the hub firm is not yet at the phase of production (phase 2), there is no immediate cooperation. The hub firm is not dependent on these three members, and a conflict caused their exit. This move is explained by the absence of dependence of the hub firm on the industrial provider and both commercial members. If these members had been indispensable to the project advancement, the hub firm would have acted in a different way:

*"In all my misfortune, I was lucky to have been able to stop my relations with these companies [at that point in time]. 8 months later, we began the production phase and I think that I would have complied with their conditions then" (hub firm, B project, 26/06/2006)*

Furthermore, the formalization exchange is weak and no written contract engages them some towards the others.

**Configuration 2 (phase 1 – dependence):** The hub firm sets up formalized relations with the legal and technical partners (signature of an agreement of confidentiality), because it relies on them (previous business relations). The projected benefits are distributed in a equitable way: each thinks that the other one will make it possible to bring the project to a successful conclusion. The hub firm did not take guarantees against opportunist behaviour; this may become problematic if a conflict related to the cooperation takes place. With these partners, the hub firm did not plan, at the beginning of their relation, special modes allowing to facilitate conflict resolution (guaranteed, contractual clauses, etc.). Informal relations and trust are the dominant coordination modes. When trust becomes blurred, or even disappears because of conflict (case of the relation with the legal partner), the weak degree of formality makes the outside arbitration delicate because of the lack of material evidence. In the Pinc&pile case, the commercial court was sought. By bringing in the court and by excluding the legal member at phase 1, the hub firm took the risk of putting its reputation in danger during the following phases and, consequently, of meeting difficulties to find a replacement member:

*"Even though the court ruled for us, continuing is always delicate. Companies looking to join the project do not necessarily know the history and can stop at the report that we had big conflict with such a company, and may start thinking 'if it had problems with this company, why not with us'. It is a partnership failure and it is not good for sales " (hub firm, B project, 08/03/07)*

**Configuration 3 (phase 2 – no dependence):** Only the new legal provider and the industrial provider are in this configuration and the data do not bring enough information for the implemented coordination modes. It is about a classic service relation. The provider gives to the contracting party (the hub firm) its know-how in a specific and definite domain. The object of the contract is a service which the provider proposes to its customer ("service sale"). The failure in its previous relations incites the hub firm towards more distrust (weak trust). That explains why the hub firm signed service contracts (strong formalization degree) with these two providers.

**Configuration 4 (phase 2 – dependence):** at phase 2, the hub firm is dependent on the financial public partner and on the technical partner. The relation is formalized for receiving financing while it is more informal when it is about technical issues. The exchange is made through meetings and through phone calls. In both cases, the hub firm trusts these members because:

- With the technical partner, the hub has previous satisfactory business relations facilitating the trust;
- With the public partner, this partner's image and objectives (helping the hub firm carry out its project) earn it an innate trust.

During light discords on the project with the technical partner, the persuasion of the most competent member allowed to resolve the problems quickly (the hub firm has a good knowledge of the potential market and persuades the other members of the marketing strategy. On the contrary, at the technological choices level, the technical member imposes its point of view).

**Configuration 5 (phase 3 – no dependence):** the technical partner is henceforth more indispensable to the project, having proved its technical feasibility for phase 2. As the relation between the hub firm and the technical member was satisfactory during the previous two phases, the coordination modes are identical to those observed during phase 2.

**Configuration 6 (phase 3 – dependence):** At this point the industrial provider became a partner. As for the technical partner, trust was privileged. The division of benefits was made in an equal way to avoid the feeling of injustice that the present technical partner felt since the project genesis. Guarantees were essentially connected to the time invested by the members in the project.

**Games of coordination that we observed.** For each of the six configurations, arrows indicate the main coordination games observed (the links between the coordination modes). Let us take the interactions observed at phase 1 (the games observed in phases 2-3 are similar to those of phase 1):

- In configuration 1, the hub firm did not sign a contract with the members of its network. It was thus relatively easy for it to exclude them from the project by not entrusting to them a new task;
- In configuration 2, it seems that a strong interorganizational trust influenced the formalization degree (very informal), the type of division of outcome method (equitable) and the guarantees established (none). Also, the formalization degree had repercussions on the conflict resolution methods. In that case, there was no contract signed thus, no arbitration clause. It is for that reason that the court was sought.

Through the longitudinal study of the Pinc&pile case, we showed that it is important to consider the project advancement phase and the dependence degree of the hub firm in order to understand the coordination modes implemented by the hub firm.

## CONCLUSION

Until now, the empirical work on coordination within innovation networks did not pay particular attention to the change in modes (Dhanaraj and Parkhe, 2006; Harmaakorpi and Melkas, 2005). A gap was noticed between the consensus which surrounds the theoretical importance of coordination modes in studying inter-organizational networks and the empirical knowledge on this phenomenon. The lack of empirical investigations is explain by the difficulty of field research (strategic nature of the project, the uncertainty as for its success, deep emotional investment of the project bearer, etc.).

The observation of the coordination modes established by a SME project bearer to develop its invention allowed us to understand better the effect of 1) the dependence degree of the hub

firm on its partners, and 2) the project advancement phase on the innovation network functioning. By analyzing the degree of formality, trust, division of benefits method, guarantees and the conflict resolution methods, we put forward the possible interactions between these five modes (called coordination games), giving a more complete view of the coordination within a centred innovation network.

## References

- P. Aghion, J. Tirole (1994), « The management of innovation », *Quarterly Journal of Economics*, Vol. 4, No. 109, p. 1185-1207.
- C. Assens (2003), « Le réseau d'entreprises : vers une synthèse des connaissances », *Management International*, Vol. 24, No. 1, p. 120-136.
- P. Blau (1964), *Exchange and Power in Social Life*, New York: Wiley.
- R.C. Calia, F.M. Guerrini, G.L. Moura (2007), « Innovation networks: From technological development to business model reconfiguration », *Technovation*, Vol. 27, No. 8, p. 426-432.
- J.B. Cullen, J.L. Johnson, T. Sakano (2000), « Success through commitment and trust: The soft side of strategic alliance formation », *Journal of World Business*, Vol. 35, p. 223-241.
- T.K. Das, B.S. Teng (1998), « Between trust and control: Developing confidence in partner cooperation in alliances », *Academy of Management Review*, Vol. 23, No. 3, p. 491-512.
- T.K. Das, B.S. Teng (2002), « The Dynamics of Alliance Conditions in the Alliance Development Process », *Journal of Management Studies*, No. 39, p.725-746.
- H. Delerue, E. Simon (2005), « Confiance, contrat et degré d'asymétrie dans les relations d'alliance », *Management International*, Vol. 10, No. 1, p. 51-62.
- C. Dhanaraj, A. Parkhe (2006), « Orchestrating innovation networks », *Academy of Management Review*, No. 31, Vol. 3, p. 659-662.
- R. Durand, O. Bruyaka, V. Mangematin (2008), « Do science and money go together? The case of the French biotech industry », *Strategic Management Journal*, Vol. 29, No. 12, p. 1281-1299.
- M. Fréchet (2007), « Les difficultés relationnelles dans les partenariats d'innovation : une approche par le contrat psychologique », *Finance Contrôle Stratégie*, Vol. 10, No. 1, p. 125-148.
- V.A. Gilsing, B. Nooteboom (2006), « Exploration and exploitation in innovation systems: The case of pharmaceutical biotechnology », *Research Policy*, Vol. 35, No. 1, p. 1-23.
- A. Goerzen (2007), « Alliance networks and firm performance: The impact of repeated partnerships », *Strategic Management Journal*, Vol. 28, No. 5, p. 487-509.
- A. Grandori, G. Soda (1995), « Inter-firm networks: Antecedents, mechanisms and forms », *Organization Studies*, Vol. 16, No. 2, p. 183-214.
- R. Gulati (1995), « Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances », *Academy of Management Journal*, Vol. 38, No. 1, p. 85-112.
- V. Harmaakorpi, H. Melkas (2005), « Knowledge management in regional innovation networks: The case of Lahti, Finland », *European Planning Studies*, Vol. 13, No. 5, p. 641-59.
- A.C. Inkpen, E.W. Tsang (2005), « Social capital, networks and knowledge transfer », *Academy of Management Review*, Vol. 30, No. 1, p. 146-165.
- B. Kabanoff (1991), « Equity, equality, power and conflict », *Academy of Management Review*, Vol. 16, No. 2, p. 416-441.
- A. Larson (1992), « Network dyads in entrepreneurial settings: A study of the governance exchange of relationships », *Administrative Science Quarterly*, Vol. 37, No. 1, p. 76-104.
- X. Lecocq (2004), « Une approche socio-cognitive de l'opportunisme : le cas d'un réseau interorganisationnel européen », *M@n@gement*, Vol. 7, No. 3, p. 109-135.

- L.F. Mesquita (2007), « Starting over when the bickering never ends: Rebuilding aggregate trust among clustered firms through trust facilitators », *Academy of Management Review*, Vol. 32, No. 1, p. 72-91.
- M.B. Miles, M. Huberman (2003), *Analyse des données qualitatives*, 2<sup>e</sup> Edition, De Boeck.
- J. Mohr, R. Spekman (1994), « Characteristics of partnership success: Partnership attributes, communication behavior, and conflict resolution techniques », *Strategic Management Journal*, Vol. 15, No. 2, p. 135-152.
- R. Morgan, S. Hunt (1994), « The commitment-trust theory of relationship marketing », *Journal of Marketing*, Vol. 58, No. 3, p. 20-38.
- C. Mothe, M. Ingham (2003), « La confiance au sein de coopérations : une étude de cas longitudinale », *Management International*, Vol. 7, No. 4, p. 17-31.
- B. Nooteboom, H. Berger, N.G. Noorderhaven (1997), « Effects of trust and governance on relational risk », *Academy Management Journal*, Vol. 40, No. 2, p. 308-338.
- OSEO (2004), *Les PME déposantes de brevets en France : caractéristiques et évolutions*, Hélène Perrin, Direction des Etudes et de la Stratégie, Etudes et bilans réalisés par les experts internes d'OSEO.
- J. Pfeffer, G. Salancik (1978), *The external control of organizations*, Harper and Row Publishers, New York.
- L. Poppo, T. Zenger (2002), « Do formal contracts and relational governance function as substitutes or complements? », *Strategic Management Journal*, Vol. 23, p. 707-727.
- J.J. Reuer, M. Zollo, H. Singh (2002), « Post-formation dynamics in strategic alliances », *Strategic Management Journal*, Vol. 23, No. 2, p. 135-151.
- P.S. Ring, A.H. Van de Ven (1994), « Developmental process of cooperative interorganizational relationships », *Academy of Management Review*, Vol. 19, No. 1, p. 90-118.
- P.H. Rubin (1990), *Managing business transactions, controlling the cost of coordinating, communicating and decision making*, The Free Press, New York.
- E. Simon (2007), « La confiance dans tous ses états », *Revue Française de Gestion*, Vol. 33, No. 175, p. 83-94.
- G. Tinlot, C. Mothe (2005), « Alliance asymétrique et pouvoir de négociation des partenaires : une relecture de l'alliance Matra-Renault », *Management International*, Vol. 10, No. 1, p. 31-49.
- R.S. Vassolo, J. Anand, T.B. Folta (2004), « Non-additivity in portfolios of exploration activities: A real options-based analysis of equity alliances in biotechnology », *Strategic Management Journal*, Vol. 25, No. 11, p. 1045-1061.
- F. Wacheux (1996), *Méthodes Qualitatives et Recherche en Gestion*, Economica, Paris.
- W.P. Wu, W.L. Choi (2004), « Transaction cost, social capital and firms' synergy creation in chinese business networks: An integrative approach », *Asia Pacific Journal of Management*, Vol. 21, No. 3, p. 325-343.
- A. Yan, B. Gray (1994), « Bargaining power, management control, and performance in United States–China joint ventures: A comparative case study », *Academy of Management Journal*, Vol. 37, p. 1478-1517.
- E.J. Zajac, C.P. Olsen (1993), « From transaction cost to transaction value analysis: Implications for study of interorganizational strategies », *Journal of Management Studies*, Vol. 30, p. 131-145.