

# Network knowledge and interaction in supplier networks

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## Abstract

In the IMP literature, extended network knowledge is considered essential to effective relationships management. However, little is known about the practical relevance of network knowledge to supplier management. This paper has three main purposes. (1) To contribute to a better insight of firms' knowledge about suppliers' connections. The factors affecting the amount and value of existing knowledge and the processes that firms use to monitor suppliers' connections are researched in this context. (2) To further the knowledge on firms' attitudes and actions towards suppliers' connections and the factors that shape them. (3) To further the understanding of industrial networks, suggesting a possible refining of the concept of network context.

**Keywords:** Supplier management, network knowledge, interaction, relationship functions

## **Introduction**

Firms must have extended knowledge about the networks they are embedded in (Ford et al., 1998). This need is strongly established in the Industrial Network Approach and is supported by the idea that a broad network vision leads to a higher probability of anticipating strategic moves of direct and indirect partners (Möller and Halinen, 1999), foreseeing their effects on the firm's network positioning and adjusting its network strategy. Knowledge appears to be an essential instrument for firms to create that broad network vision. In the more restricted field of supplier networks, the last years have witness a growing recognition of the strategic character of supply management (Gattorna and Walters, 1996) deriving from the deepening of specialization processes of firms (Cousins and Spekman 2000) that amplifies the importance of suppliers and their impact on the clients' performance. Many of the potential benefits and constrains suppliers may offer are associated with their own sets of clients, suppliers and other partners. As such, the possibility of managing or coping with those potential benefits or problems requires, at least, some knowledge on those connections.

The basic purposes of this paper are to identify the understanding firms actually have on their network knowledge and how this knowledge impacts the interaction with suppliers' partners. The paper also aims to uncover existing links between supplier management goals, the relevance attributed to supplier network knowledge and the strategies of firms to know their suppliers' networks.

The paper is divided as follows. The second section presents some notions of the Industrial Network Approach that are considered essential to the problems under study. It departs from the concepts of network theories, positioning and strategy. It then focuses on sense making in networks, and presents some recent works produced in this area. It goes on exploring specific issues of supplier management and their connections to network knowledge. The third section presents the research questions and the framework for analysis. The fourth section reviews the methodology of the research project. The fifth section describes the empirical cases and the sixth section discusses the research findings. The last section presents the papers' conclusions and main theoretical and managerial contributions.

## **The Industrial Networks Approach and Supplier Management**

This section departs from the concepts of network theories, positioning and strategy that will help to clarify the role and relevance of network knowledge. It follows with the presentation of the concept of network pictures as sense making devices potentially useful as an analysis and strategic management tool. Afterwards, this section focuses on the area of supplier management in network contexts. It discusses the impact of network connectedness and how the existence of indirect partners and connections can be integrated and explored in supplier management goals and actions.

### ***Managing and Sense Making in Networks***

During their existence, firms develop theories that reflect their intents and visions about the network's structure, processes and the effects of their and their partners' strategic actions (Johansson and Mattson, 1992). Network theories are idiosyncratic and subjective as each firm deals with a specific set of actors and interprets the network according to its past experiences and future expectations, relationships and what it knows about the networks (Ford et al., 2003). Consequently, each actor may have a different view of the extent and characteristics of the network, of who does what, what works and does not work, which actors to integrate or to exclude from 'their' networks. These views are crucial to define its network positioning, *i.e.*, the role it plays and how it connects directly and indirectly to other firms (Wilkinson and Young, 2002). Positioning has a dual nature as it reflects the objective interrelations resulting from the connections of activities and resources and the subjective

intentions and interpretations of firms (Mota, 2000). The firm's positioning is a strategic element of its resource base as its co-ordinates foster or constrain its possibilities of action (Snehota, 2004) and influences the future development of relationships. Strategic action is directed to influence the positioning of the firm and other actors and to influence the connectivity patterns that exist in the network (Mattsson, 2002). However, the strategy of a given firm is partially determined by its counterparts (Ford et al., 2003) as it depends on the actions and ideas of direction that counterparts develop to themselves and to the relationship with that firm. Thus, a firm's strategy depends on its views and interpretation of the network, on its ability to relate with valuable business partners and to make those partners see it as equally valuable. As firms interact, perceptions of network boundaries may contract or expand, through the exclusion or inclusion of actors. Expanding network boundaries means that new actors and connections are being identified and evaluated by the firm, potentially leading to new network theories, positioning and strategy.

But how do firms make sense of the networks they are embedded in? Anderson, Håkansson and Johanson (1994) claim that firms have partial views of the network and that networks may have several levels. The narrower level, the network context or focal net (Möller and Halinen, 1999) is constituted by the actors that the firm considers relevant. An intermediate level, the network horizon includes the actors that firms know but do not consider relevant. Finally, the non-identified actors constitute the environment (Holmen and Pedersen, 2000), the residual beyond the context and the network horizon (Snehota, 1990). Network levels are permeable and movements between them occur as actors gain or lose relevance, new actors emerge or are identified and others disappear. Firms' ability to sustain or enhance its network value (its position) depends on their ability to read the network (Holmen and Pedersen, 2002; Ford et al., 2003). For instance, a narrow network horizon may prevent firms from acknowledging the existence of new competitors, while a misinterpretation of these new competitors' impact may lead to their exclusion from the network context. Thus, the lack of ability to monitor and evaluate the network farther than its immediate relationships may make the firm vulnerable to network dynamics emerging outside its horizon.

A recent stream of research in the IMP Approach has been focusing on the understanding of firms' broader network context. In their synthesis, Ramos, Ford and Naudé (2005) describe, among others, the concepts of network pictures (Ford et al., 2002, Henneberg et al., 2004) and how they can be used by researchers as devices to analyse firms' networks and also by managers as tools to improve their management decisions. Holmen et al. (2003) follow a similar rationale with their concept of network framings. All these concepts share some common points: they are pictorial representations, they represent partial views of the network and they have an instrumental nature. In fact, while network framings are set at firm level and network pictures are produced by individuals, they share the idea that the framings or pictures are mapped according to specific problems that managers must solve.

Although this paper is not about Netpics, they were brought to this discussion for two reasons. First, they can be seen as new interpretations of the seminal concept of network theories (Johanson and Mattsson, 1992) that is central in this paper. Second, they present some problems that are of interest to the issues this paper deals with, namely the probable coexistence of multiple Netpics deriving from their dual source of diversity. In fact, due to their individual character, various idiosyncratic Netpics coexist in the same firm (Ramos, Ford and Naudé, 2005); due to their instrumental nature, multiple Netpics may be used by the same person to deal with different managerial situations (Håkansson and Ford, 2002). Considering the impact of Netpics in management processes a question naturally emerges: how is this diversity dealt with and how does it affect the way firms interact with business counterparts? Ramos, Ford and Naudé (2005) contend that by analysing firms' actions, reactions and interactions it is possible to infer one Netpic underpinning its interpretation of the situation. This 'apparent' Netpic may result from the balance of power between individuals in the organisation or it may reflect a consensual view of the surrounding network. Understanding each individual Netpic and their extent of commonality is a needed step to identify that 'apparent' network (Ramos, Ford and Naudé, 2005). While acknowledging the relevance of Netpics and other sense making devices to management processes, they seem insufficient to answer the basic question of this paper: what do firms know about their supplier networks and how does that knowledge affect their supplier strategies

and interactions? Before going further into these issues, the next section explores some aspects of supplier management in networks that may contribute to a better understanding of these questions.

### *Supplier Management in Networks*

As Håkansson and Johanson (1993) explain, each firm's activities are embedded in a wider web of industrial activities performed by different firms. A dyadic relationship is a way of combining the internal resources of the two actors and also of building resource constellations that include the other relationships of those actors. Inasmuch as the possibility to explore suppliers' resources and activities is conditioned by both clients and suppliers' contexts (Ritter and Ford, 2004), the evaluation of a supplier's potential is incomplete if restricted to its bundle of internal resources and capabilities. Rather, it should include the analysis of its connections in other supply chains and the evaluation of those connections' interest to the buying firm. A good illustration of this situation is provided by Dubois and Pedersen (2001), who refer two types of indirect supplier connections and potential benefits: (1) the link to a supplier's other clients may produce economies of scale or technological innovations; (2) the connection to a supplier's other suppliers extends the resources that may be accessed and influenced. These examples are in line with Araújo and Easton's (2001) claim that networks constitute an important constraint to what firms might do, but also a flexible complement to their internal resources. Both constraints and complements can derive from firms' direct or indirect relationships or partners that form the extended networks where firms are embedded in.

As a consequence of network connectedness, Håkansson and Johanson (1993) stated that relationships may perform first or second order functions, later on referred by other authors as direct and indirect (Anderson, Håkansson and Johanson, 1994; Ford and McDowell, 1999; Håkansson and Snehota, 1995; Möller and Törrönen, 1993; Walter et al., 2003) or rationalization and development (Gadde and Håkansson, 2001) functions. Direct functions are those whose effects emerge from, or are reflected upon, the dyadic relationship of direct counterparts, and are generally associated with the efficient use and connections of actors' resources and activities. Indirect functions relate to more complex issues like the development of shared network visions, activity chains or the diffusion of new technologies, thus calling for the involvement of several direct and indirect partners. In supplier management, supplier goals can be defined in terms of the direct or indirect functions and corresponding benefits that customers want to achieve in each supplier relationship. In fact, Möller and Törrönen (2003) contend that the evaluation of supply strategies is rather complex and requires a clear cut definition of the type of functions and effects sought in suppliers. The ability of suppliers to produce direct or indirect functions depends on their bundle of activities and resources, of which their pool of static and dynamic capabilities and their set of relationships are essential components. The evaluation of each supplier's relational context (part of its own positioning) needs to be supported by some kind of auditing of its network of suppliers, clients and other partners and the relationships that connect them.

The impact of suppliers' set of relationships and partners may be perceived differently according to the goals pursued in suppliers and may result in different attitudes regarding the knowledge needed to anticipate and evaluate that impact. If the buying firm is striving to achieve efficiency goals related to direct functions, knowing the suppliers' context may help to evaluate the feasibility of those goals. As Dubois et al. (2003) have shown, when a specific customer demands a higher flexibility of a supplier that may result in the degradation of the latter's ability to respond to other clients. Thus, besides the operational and technical dimensions of the changes needed to produce efficiency effects, analysing how those changes correspond to the suppliers' own interests may be useful to determine its potential commitment to, and consequent feasibility of, those changes. In fact, Håkansson and Ford (2002) and Holmen and Pedersen (2003) contend that as the perception of networks varies from actor to actor, firms must try to understand the motivations and perceptions of other actors in order to capture the dynamic of the networks. An effective knowledge on suppliers' contexts is especially relevant when the buying firm wants suppliers to perform indirect functions. In this case, the determination of suppliers' network value is important to assess their potential to perform those functions. In order to fully apprehend that value, firms must know their suppliers' other relationships and counterparts.

Inasmuch as supplier functions are considered, it seems reasonable to expect that indirect functions should be supported by wider network horizons (number of indirect partners known) and wider network contexts (number of partners considered relevant) than direct functions.

## **Framework for Analysis**

In order to investigate the basic question of this paper - what do firms know about their supplier networks and how does that knowledge affect their supplier strategies and interactions - the theoretical concepts presented so far were combined to further it through a group of more focused research questions, that are presented in the next paragraphs.

The previous sections stressed the importance of network knowledge at the theoretical level. But, is the importance of network knowledge in the literature matched by equal importance in supplier management practice? Existing works (cf. Blakenburg, 1990; Holmen and Pedersen, 2001) show that knowledge on suppliers' connections is limited, apparently contradicting its theoretical relevancy. One possible explanation to this fact lays on the mediating role that suppliers may play in gathering, filtering and communicating relevant network knowledge to the buying firm, allowing the latter to be partially ignorant of network connections (Holmen and Pedersen, 2001). Other possible explanations may be found on a conscious attitude to economise the resources needed to explore and make sense of the network or on the ignorance of the potential and possible impacts emerging from indirect partners and relationships. To help clarify these issues, one of the research questions of this paper is how extensive existing knowledge on supplier networks is, in order to confirm (or not) the gap between the importance of this issue in the literature and in the management practices.

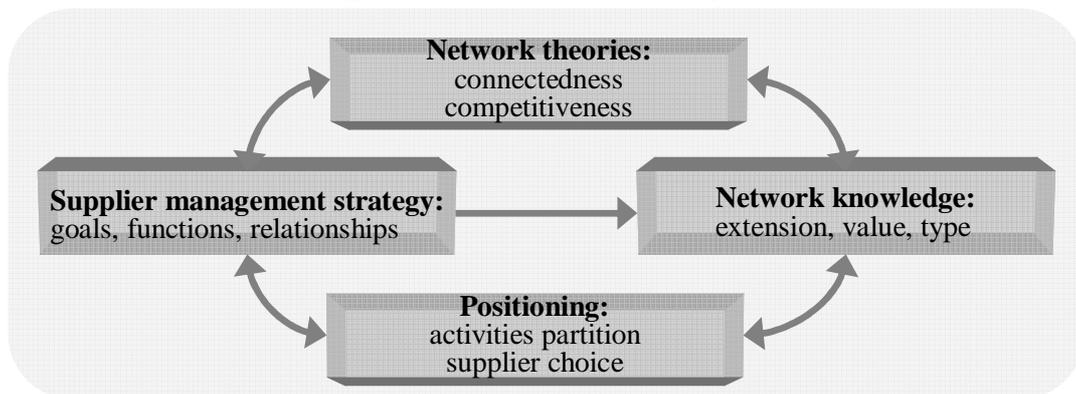
As seen before, recent research focusing on network knowledge and sense making devices (Ford et al., 2003; Holmen and Pedersen, 2003; Henneberg et al., 2004; Ramos, Ford and Naudé, 2005) claims that network visions have an individualized and instrumental nature. Networks are reconfigured according to the person who is viewing it and to the reason why she is viewing it, leading to multiple network views. Despite their interest, these works seem still insufficient to understand how and why knowledge on suppliers' networks is built, diffused and valued by the buying firms. Regarding diffusion, it can be asked if the multiplicity of coexisting views means that people in the organisations have access to network information that is quantitatively and qualitatively different. Or if, while sharing a common pool of information, individuals pick the information they need in a specific situation and interpret it according to the relevance they believe it has for the resolution of that situation

The idea that according to the specificity of the situation, some knowledge gains relevance while other loses it suggested another research question. In fact, it seems useful to understand if relevancy is totally casuistic or if it is possible to find factors that have a continuous impact on the definition of what constitutes relevant knowledge and what does not. Do firm's network theories play any role in that definition? Can they be seen as the 'consensual view of the surrounding network' that Ramos, Ford and Naudé (2005) contend that may be reflected in the individual network pictures? This paper suggests that network views are probable determinants of how firms view and evaluate direct and indirect partners and relationships. And in the context of supplier management, is it possible to define any factors that consistently impact network knowledge and sense making? As referred earlier, an important element of supplier management strategies is the definition of supplier goals and the type of supporting functions – direct and/ or indirect. It was suggested that the knowledge required in each case may be different. Namely when firms are pursuing innovation and network effects they should have wider knowledge of their suppliers' connections, *i.e.* wider network horizon, than when pursuing efficiency effects. Therefore, it seems reasonable to contend that supplier functions may be an important factor in the definition of both network horizon and context and also on the information on suppliers' connections considered relevant by the buying firm and to expect that the buying firm's efforts to collect knowledge is not targeted to all suppliers in the same way.

The last research questions of this paper focus on the interplay between knowledge and interaction. When considering management processes, it is impossible to disregard firms' interactions as it is through them that influence is exerted. The issue of interaction within extended networks seems poorly addressed in the literature. Extant work does not say much about the efforts firms develop to access the activities and resources of their suppliers' partners. Namely, little is known about the reasons, scope and forms that interactions with indirect partners may assume. The reference of Ahonen and Salmi (2003) to an apparent passive attitude of firms in this context seems insufficient to support solid conclusions in this area, leaving space to further research. Thus, the question at stake here is if firms do interact with indirect partners in supplier networks and how do they do it? If extended network knowledge is commonly accepted as useful tool to produce better management decisions and practices, understanding how network knowledge relates to interaction with suppliers may shed some light on the way knowledge impacts management. Does knowledge breed interaction or *vice-versa*?

In order to further existing understanding on the research questions, a framework was built, constituting the research 'agenda' that was used in the empirical phase of this project. Figure 1 synthesises this paper view on how IMP basic concepts can jointly influence the amount and type of firms' knowledge on supplier partners and how it is built, evaluated and used in management strategies and interactions. A brief review of the framework follows in the next paragraphs.

**Figure 1 – Framework for analysis**



This paper suggests that network theories may exert consistent influence on the definition of firms' supplier strategies at firm level and also on individual interpretations of supplier networks. Network theories embody more or less atomized network visions that impact firms' strategies, positioning and attitude towards network knowledge. For instance, it seems reasonable that firms holding interweaved views of the networks and acknowledging the possible impact of indirect partners and relationships will search for extended knowledge on those connections, hold a broader view of their network positioning and develop strategies that take into account those connections in order to monitor or act upon them. Furthermore, according to the evaluation of suppliers, their connections and roles, firms may perceive differently their contribution to its competitive performance and value creation processes and coherently develop distinct strategies to know and manage suppliers and their partners.

According to each firm network theories and positioning, firms set supplier management specific goals, translated in the generic effects (*e.g.* efficiency, innovation, development) they try to achieve by exploring direct and indirect functions of supplier relationships. The definition of goals will influence which suppliers are selected and how activities and resources are organised between both supplier and buyer, partially determining their positioning. Different supplier goals may result in a distinct extension, type and relevance attributed to knowledge on suppliers' connections. The way firms build their own position by establishing their network of suppliers is also interrelated with the latter's strategy, theories and network knowledge. In a very simple way, connecting to the right suppliers is a necessary but not sufficient condition to fulfil strategic goals. Selected suppliers may open the firm

network horizon by linking it to their own connections or exert a mediating or even isolating role, diminishing the need or the possibility of extending network knowledge and interaction. Finally, as new network knowledge is collected, the firm may change its theories about the network, evaluate differently its own and its partners positioning and adapt its strategies, namely by changing its goals and the way it relates to its suppliers to achieve those goals.

## **Research Methodology**

This paper is part of a wider research project, covering other aspects of supplier management, namely buyer-supplier dyads and supplier-supplier relationships. A case study approach was adopted to conduct this multi-level investigation. Two industrial firms were selected and the research included actors from the focal clients and their suppliers. The selection of the cases and the analysis of the collected data followed a process close to the configuration analysis proposed by Ragin (2000). Each case was analysed individually in order to understand how the several dimensions combine in an integrated and coherent way to form different configurations of the same phenomenon, followed by a comparative analysis between the two cases in order to identify and explain their (dis)similarities. The research was mainly based on semi-structured interviews that were taped, transcribed and sent to the informants for revision and confirmation. Data analysis was supported by the use of N\*6 software.

The multilevel nature of research was essential to understand the factors that condition managers' knowledge, attitudes and actions in their suppliers' networks. At the network level (the focus of this paper), data collection followed a two-step approach. There was a first round of interviews designed to uncover the visions and attitudes of focal firms towards suppliers' networks in two ways: identifying the focal firms' network theories and how it reflected on their evolution, interaction experiences and outcomes; to understand how strategies translated in supplier management strategies and interactions. The research followed Strauss and Corbin (1990, 1998) process of theoretical sampling. The process of interviewing included as many informants as those deemed necessary to saturate the conceptual categories being studied. When the interview process was complete, as it was considered useless to include more suppliers in the study, the second step of research process began. All the informants from the focal firms were interviewed again and asked to fill a questionnaire where they should list each supplier's clients and sub-suppliers they were aware of. This second phase was used to define the focal firms' mapping of suppliers' network, to analyse its consistency with the focal firms' visions and attitudes and, finally, to clarify how network knowledge is distributed among firm members.

## **Case Analysis**

As mentioned before, this paper is supported by the empirical investigation of two industrial firms' supplier networks – Adira and Vulcano - that are briefly presented in the next paragraphs.

### ***Case 1 – Adira***

Adira was founded in 1956 and is considered the largest Portuguese machinery manufacturer. During its existence, it has been striving to strengthen its autonomy and independence from its various partners. To do that, Adira invested in creating activities and capabilities backward and forward from its initial manufacturing activities. These investments result from its network theories about how competitiveness is created in its industry. On the one hand, Adira strongly believes that the success of its most reputed competitors is based on their internal set of capabilities and suppliers (even when shared with these reputed competitors) are granted limited relevance on the value creation process. On the other hand, Adira wants to position itself as the sole counterpart of the firms that buy its machines.

In order to do that, it feels the need to have a wide scope of internal knowledge and productive capabilities. This need is reinforced by Adira's view of its business partners (suppliers and distributors) as having very limited technical capabilities. Furthermore, Adira developed an atomized view of the network and believes that, generally, what goes on in the relationships its suppliers have with their own suppliers or clients does not affect it. All these facts explain Adira's preference to hold proprietary control of resources rather than exploring external resources, as it believes this is the best way to build competitive advantages and to enhance its network positioning.

The company has two main types of suppliers: catalogue suppliers and subcontracted suppliers. Catalogue suppliers range from multi-brand representatives to national agents or local subsidiaries of firms like Bosch or Siemens, selling standardized materials and components. Subcontracted suppliers range from micro to medium-size firms that manufacture parts according to Adira's specifications. Adira uses both groups of suppliers to pursue direct/efficiency functions: low costs, high flexibility and sourcing safeguarding. The major benefits the focal company looks for when selecting suppliers are low prices, product quality/reliability, flexibility and availability.

Adira's informants named 39 sub-suppliers and 39 suppliers' clients. In fact, 10 additional suppliers' clients and 10 sub-suppliers were presumed to exist - based on informants' assumptions about the way the industry works and existing relationships among subcontracted suppliers. However, they were later on denied by the suppliers and are not considered here. None of the suppliers' clients identified by Adira was referred by the suppliers as their main clients. There is a clear differentiation between existing knowledge on the business partners of the two groups of suppliers. In the case of component suppliers, the number of identified partners is significantly higher than in the case of subcontracted suppliers. This distinction is especially strong when suppliers' clients are involved - 32 clients of component suppliers were named against 7 clients of the subcontracted suppliers. This differentiation is also clear on the distribution of network knowledge among Adira's informants. There is a clear gap between the knowledge exhibited by the people involved in the management of component suppliers consistently identified more suppliers' partners (CEO- 52 partners, Engineering Manager- 38 and Components Buyer- 30) than the informants that manage subcontract suppliers (the Production Manager identified 18 suppliers' partners, the Logistic Manager identified 9, the Subcontracted Buyer - 2 and the Quality Manager - none).

These differences seem associated with several aspects of suppliers and their relationships with the focal firm. Subcontracted suppliers buy mostly raw-materials (frequently from Adira) and the parts, material and, sometimes, production processes are specified by Adira, enabling a strong control over their purchases and productive processes. The small number of clients identified in the cases of subcontracted suppliers cannot be dissociated from the fact that some suppliers have an almost exclusive relationship with Adira and from the reduced value Adira grants to knowing who their clients are. In the case of component suppliers, some of them are commercial representatives of international manufacturers and, consequently, their sub-suppliers and respective brands and products are necessarily publicized. When components suppliers are themselves the manufacturers, their network connections are much more opaque and only a few of their business partners are identified.

The Engineering manager states that "it is rather invisible (...) we don't have much access to the suppliers of our suppliers. It happens when we disassemble the components and find out that that they are buying here and there, but we don't have much information ... we don't know who they are buying from". However, the fact that the component suppliers do not "exhibit" their suppliers is considered normal, even because Adira has the same attitude. As the same informant explains, "we also don't tell [who our suppliers are]". Suppliers confirm that they are not normally asked about their suppliers and, in some cases, are unwilling to provide that information. One of them expressively says that "no [they don't ask] and I wouldn't tell them! Let them search if they want... Deep down, secrecy is the soul of the business". Adira does not have a systematic strategy to collect information on its suppliers' partners. Generally, this information is collected informally through trade fairs, supplier catalogues or informal conversations with suppliers or other business partners.

This apparent lack of strategy goes along with the lack of relevancy attributed to network knowledge. Adira's view is that although knowing the sub-suppliers may help to have an idea about the quality they can supply, it has indirect and more effective ways of doing it than inquiring the suppliers. Experiences deriving from long-term relationships with suppliers as well as the specification process are seen as an effective way to evaluate the quality of their sources. A good supplier reputation is also considered a good proxy to the quality of sourcing network. Past experience, specification processes and supplier reputation make direct knowledge on supplier networks (especially on the sub-suppliers side) a rather dispensable and low-value resource. Suppliers' reputation is more strongly associated with their clients than with the sub-suppliers. Knowing who the clients are gives Adira a good idea of the suppliers' network positioning, credibility and reliability. This may be important when suppliers or their products are new and, consequently, there is no previous experience that can be used to minimize the risk of adopting them. In a restricted set of situations, the name of some highly reputed clients of component suppliers can be used to guarantee the quality of Adira's machinery and its reputation.

Adira does not interact with any of the suppliers' partners. However, the firm tries to influence those connections, especially in the case of the smaller subcontracted suppliers. These suppliers are defined as "external workstations", expressing their almost complete adaptation and dedication to the requirements of Adira that favors and stimulates this situation. Formally, subcontracted suppliers are only required not to work with Adira's competitors" as it fears that suppliers give them the designs and specifications of its parts. In practice, the small dimension, high diversity and frequent changes of Adira's orders, together with the pressure to consider it a priority leave these suppliers no space to find new customers. In the case of component suppliers, as products are standardized and there is no risk of passing on sensitive information, suppliers are free to work with Adira's competitors. In exceptional cases, when components are adapted to Adira's needs, the firm minimizes the information given to the suppliers. From its long experience with components suppliers, Adira believes that the relationships they have with other clients, including competitors, has no impact on their relationship with Adira and this gives the firm additional reasons not to invest resources in trying to know or to influence them.

### *Case 2 – Vulcano*

Vulcano was founded in 1977 to produce gas-fired hot water systems under a license of Bosch, which presently owns the company. Vulcano has always faced two sources of competition: one arising from the Bosch firms that produced similar products and the other from competitors outside Bosch Group. Consequently, it soon assumes the constant evolution of its capabilities and resources as a fundamental strategy to strengthen its positioning in both competitive arenas. At the same time, its initial link and later integration in Bosch Group offered Vulcano access to a huge pool of resources and capabilities. In 1993, Vulcano was designated Bosch's competence centre for gas-fired hot water systems, making innovation and development capabilities even more central. Since the beginning, the firm assumes that its success depends on its ability to forge links with external actors able to add value to the activities executed in-house. It invests in an external organization that allows it to "integrate suppliers' capabilities as if they were ours". The network dimension is present and considered relevant and interdependence with direct and indirect partners is recognized, evaluated and sometimes explored.

The firm's supplier base is constituted by medium to large-size, local or foreign companies that have or must develop "a minimal structure of resources in quality, logistics, manufacturing, development and management". Traditionally, Vulcano specified all parts' details (functions, materials, dimensions) and suppliers manufactured them. In the last years, Vulcano's development team has been actively seeking suppliers' assistance to develop the parts, especially in areas where it does not hold sufficient productive or knowledge capabilities and does not want to develop them. The focal company expects all suppliers to "proactively produce and suggest new solutions in terms of product specifications, materials or processes". When selecting and evaluating suppliers, aspects like quality, price, flexibility and continuous sourcing are relevant, but dynamic and indirect capabilities are what really differentiate them. In this context, suppliers' networks of customers are an important selection criterion, as they help to evaluate if suppliers have enough critical mass to undertake the investments

needed to support the focal firm's goals. Additionally, suppliers' relationships with other customers are seen as a source of diversity and as learning opportunities that may reflect positively on Vulcano.

The four managers that were interviewed identified partners of all suppliers, in a total of 54 suppliers' clients and 39 sub-suppliers. Network knowledge is consistently higher in the cases of suppliers that are involved in product development processes in opposition to those that are not. The sub-suppliers and suppliers' clients identified by Vulcano match those indicated by suppliers as their main business partners, reflecting a high consonance between their networks pictures. The distribution of knowledge is uneven among Vulcano's managers. Logistics and Quality managers are aware of 11 and 9 suppliers' partners, respectively, Development manager follows with 22 identified partners and Purchase manager leads with 87 identified partners. It must be stressed that while the Purchase, Logistics and Quality managers deal with all the suppliers integrated in this research project, the Development manager only knows and deals with the six suppliers that are involved in the development project he leads, making a linear comparison difficult. The differences of knowledge among managers reflect Vulcano's supplier strategy and also the relative importance of the informants in that context. Purchase management is considered a strategic function: its manager has a predominant role on all the main supplier decisions and supplier information is collected or coordinated mainly by this area. Purchase manager is the only informant with direct responsibility and access to the "Supplier Profile File" that includes information about supplier's main clients, their respective industries and purchases. The "Supplier Profile File" must be updated whenever relevant changes occur. Logistic and Quality informants' lower knowledge is due to the more operational nature of their tasks and also to the firms' policy of making suppliers' fully responsible for managing their own supplier network logistics and quality issues. The higher network knowledge of the Development management seems to confirm the association suggested earlier between the exploration of indirect capabilities required by product development and a wider knowledge of supplier networks.

Suppliers' connections are considered essential for keeping them up-to-date (e.g. technologically) and to foster their ability to innovate. Purchase manager states that the "suppliers' potential to do this or that is determined by their capabilities and many times by their portfolio of clients" that expose them to "new markets, new technologies", new parts and new demands" and assures that "their know-how is constantly being refreshed". Besides the "multiplying effects" that network connections have on suppliers' dynamic capabilities, they also enable them to build a critical mass that make investments in resources and capabilities feasible as they can be used in relationships with several clients. These benefits may be counterbalanced by an eventual loss of the importance of the focal firm vis-à-vis the suppliers due to their commitment to more powerful clients. As this may result in the deterioration of their performance, "suppliers' loyalty" is an important aspect of evaluation and its disruption may result in diminished sales quota or even the elimination of a disloyal supplier. Due to the acute positive and negative effects of suppliers' clients, Vulcano tries to monitor those connections closely.

Sub-suppliers are not granted the same attention. Vulcano believes that their effects are not relevant and that it is possible to control the supplier network fairly well through the specification process. The Purchase manager explains that "we know their supplier structure quite well, but it is not dramatic because all is well safeguarded through our specifications" and adds that "... I really don't care about where he buys, (...) it does not interest me that much as everything is specified right from the start". Furthermore, the experience emerging from the long-term relationships held with most part of the suppliers, the regularity of supplier quality auditing and Vulcano's quality control system give the firm a level of confidence on suppliers' sources that makes further knowledge dispensable. Suppliers confirm that Vulcano does not generally ask them to provide information on the sub-suppliers.

Vulcano has no interaction within its suppliers' portfolios of clients. However, it tries to influence it in two opposite directions. Firstly, it makes clear to suppliers the penalties they risk if they reduce their commitment to Vulcano due to their other clients. Secondly, it stimulates suppliers to find new and different clients, "forcing them to a kind of strategic development". In Vulcano's view, widening the portfolio of clients induces efficiency and innovation capabilities and safeguards the feasibility of investments in resources and new capabilities (as seen earlier). Furthermore, it also develops relational

capabilities, namely the ability to understand the clients' businesses and complementarities, which is considered an essential element of a supplier's value. Vulcano may designate sub-suppliers to suppliers. In some cases, the selection of sub-suppliers is done by the Termo-Technique (TT) division of Bosh that integrates Vulcano. The TT concentrates the purchases of its several firms and negotiates contracts with common suppliers, obtaining major cost reductions that are available to all TT firms and their suppliers. In other cases, Vulcano selects suppliers to develop specific parts of a component and when the development process is over, they become sub-suppliers of the supplier in charge of assembling the component. Suppliers are not obliged to buy from the sub-suppliers designated by Vulcano but if they chose to work with other sources these must be previously approved by the focal firm. As designated sub-suppliers have already passed Vulcano's selection criteria and normally charge lower prices, suppliers are normally willing to accept the client's 'imposition'. Vulcano wishes to keep its interaction with sub-suppliers restricted to the development and negotiation phases. When they become suppliers' sub-suppliers, the former must take full responsibility for the management of the latter. If suppliers call for Vulcano intervention, this is seen as a handicap on suppliers' capabilities that results in added costs and management complexity to the focal firm.

## Research Findings

This section discusses the main findings of the two cases in order to shed some light on the research questions that were formulated earlier. Table 1 synthesises the main dimensions of the cases.

**Table 1– Network knowledge**

	<b>Adira</b>	<b>Vulcano</b>
Suppliers' functions	Direct functions	Direct and indirect functions
Network vision	Atomised	Interweaved
Perceived impact of suppliers' relationships	Very Low	High (positive and negative)
Processes to obtain network knowledge	Informal and rather passive	Active: formal and informal mechanisms
Number of identified suppliers' partners	Clients: 39 Suppliers: 39	Clients: 54 Suppliers: 39
Average number of identified partners per supplier	Clients: 3 Suppliers: 3	Clients: 3 Suppliers: 2.2
Suppliers' partners identified per informant	Maximum: 51 Minimum: 0	Maximum: 87 Minimum: 9

### *Extension and Distribution of Network Knowledge*

Globally firms display network knowledge that is far more extended than the situations described in the works conducted by Blakenburg (1992) and Holmen and Pedersen (2001). But when looking at the individual level, the information on supplier's connections is rather unevenly distributed. It is important to stress that this paper never intended to draw any kind of Netpics. In fact, informants were not asked to interpret or evaluate any specific indirect partner or connection, but just to identify any suppliers' partner they know. Even in the case of Vulcano where network knowledge is substantial this asymmetry of information exists. It seems that knowledge is concentrated in people who play major strategic and technical/development roles in supplier management, meaning that the functions people occupy in organizations are closely related to the knowledge they have on supplier connections.

These findings suggest that network knowledge is not considered an important asset in managing relationships with suppliers at a more operational level and firms do not make any effort to diffuse existing knowledge among people that play interface and management roles towards suppliers. So far, our findings on the extendedness of network knowledge do not confirm the suggested gap between its importance in the literature and management arenas. Let us know see if other dimensions of network knowledge supports this convergence between both fields.

### ***Perceived Impact of Suppliers' Partners and Network Knowledge***

The findings suggest that firms' network theories are a causal factor of the way firms perceive the impact of suppliers' networks. Adira's and Vulcano's network theories are quite different: the former holds a highly atomized view of the network and the latter has a much more interweaved view of the network. At Adira, this atomized perception results in a low acknowledgment of network interdependencies and effects, while at Vulcano they are recognized and considered relevant in many cases. As firms evaluate the impact of suppliers' set of relationships differently, they develop different strategies to monitor them. Vulcano develops an active strategy that is supported by formal and informal mechanisms, while Adira's monitoring strategy is more passive and informal.

The cases also revealed that suppliers' functions condition the way their suppliers' connections with their own clients and suppliers are evaluated by the focal firms. Adira is focused on efficiency effects and the fact that suppliers' relationships are considered irrelevant to produce those effects reinforces its low interest on those relationships. On the contrary, Vulcano's conviction that the ability of suppliers to perform rationalization and development functions is conditioned by their network connections strengthens the firm's interest and alertness to those connections. Vulcano sees suppliers' networks as a reservoir of synergies, knowledge and innovation that can be explored through the suppliers and, consequently adopts an active attitude to identify them.

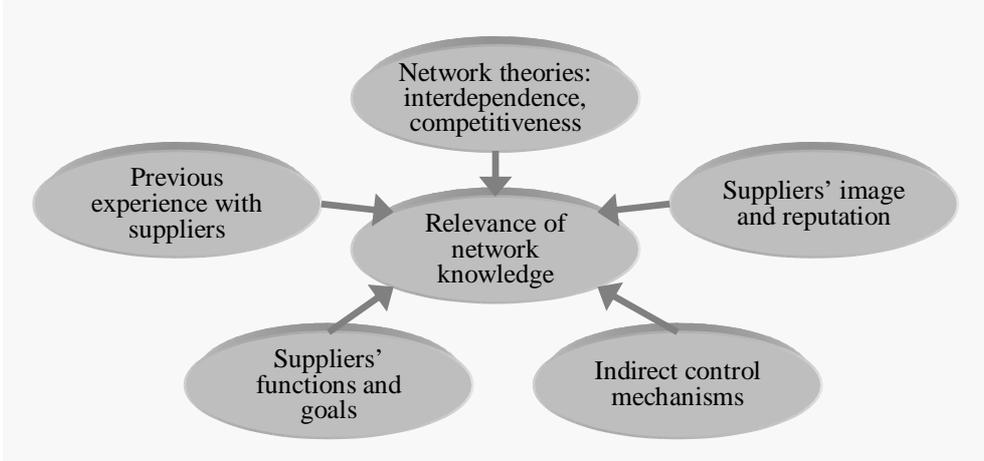
Network knowledge also works as a tool to evaluate the capabilities and performance of suppliers. Both firms believe that knowing who their suppliers' clients are can help to evaluate their static and direct capabilities. For instance, knowing that a specific supplier has demanding clients is considered a good proxy of its performance in quality or logistics. In the same sense, previous experience with suppliers is considered a good indicator of their static capabilities. In fact, Adira is only interested in knowing who its suppliers' other clients are when suppliers or their products are new and, therefore, the firm has no previous experience with them. The suppliers' dynamic and indirect capabilities explored by Vulcano can hardly be evaluated using previous experience or by knowing who suppliers' clients are. Rather it requires wider knowledge that includes the content of suppliers' relationships with other clients. The relevance attributed to sub-suppliers is quite different. None of the firms is interested in knowing who they are. This can be explained by two main factors. First, the image and reputation of suppliers is considered an effective evaluation mechanism of supplier's supply chain. For instance, Siemens' reputation makes knowledge on suppliers useless to evaluate its potential performance. Second, firms use indirect mechanisms of control, like specification processes, that are considered effective and sufficient to evaluate suppliers' supply chains.

As Figure 2 shows, the comparison of both cases revealed the existence of several factors that condition the relevance given to the knowledge of suppliers' networks. The different combination of those factors in each firm influences their attitudes and strategies in that context. Among those factors, the dissimilar views of network interdependence induced by firms' network theories and the types of functions they are looking for in their suppliers seem to be predominant over all other factors.

From the last paragraphs, it is clear that Adira and Vulcano have different views on the relevance of network knowledge and develop monitoring strategies that are consistent with those views. However, the data on Table 1 seems to contradict these findings. Actually, the average number of clients per supplier identified is similar in both cases and the average number of sub-suppliers is higher in the case of Adira. Exactly the opposite that would have been expected considering both firms network

theories and attitudes. However, a deeper look on this data reveals some details that may clarify this apparent paradox. First of all, it is necessary to recall that there are discrepancies between the network drawn by Adira and the one drawn by its suppliers, as some presumed relationships do not exist and others did exist but were already terminated. As such, the apparently large network knowledge Adira does not exactly match their actual network connections. Furthermore, the majority of the sub-suppliers are international manufacturers that are represented in Portugal by four of Adira’s suppliers, making almost impossible to the buying firm not know them. When direct suppliers are themselves the manufacturers, Adira was in some cases unable to identify a single indirect supplier. In the case of Vulcano, the network drawn by the firm is consistent with the connections reported by the suppliers.

**Figure 2 – Factors impacting the relevance of network knowledge**



These findings show how similar network horizons may suggest similar network knowledge, while in fact what the firms know about their suppliers’ networks is quite different. This raises the question of how network knowledge is analysed and of the potential need to consider other variables besides the number of indirect partners identified by the focal firm to get a finer definition of firms’ actual network knowledge, as Ramos, Ford and Naudé (2005) also suggest.

***Monitoring Supplier Networks***

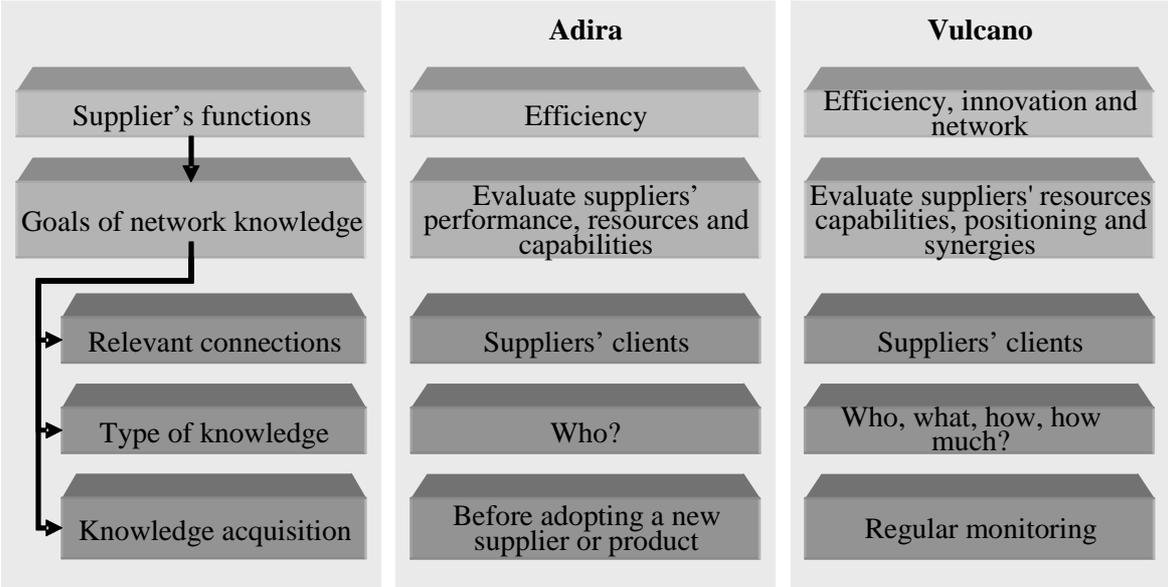
According to the last section, when evaluating network knowledge, the definition of the network horizon as the number of actors identified by the focal firm seems a poor proxy of that knowledge. In addition to the “quantity” of knowledge it is also necessary to consider its “nature”, e.g. the type of information about suppliers’ partners and relationships firms are interested in and actively looking for.

Table 1 and Figure 3 show that the knowledge of suppliers’ clients is in both cases deeper and more relevant than the knowledge of sub-suppliers. The less importance attributed to sub-suppliers is explained by their low value as warrantors of suppliers’ performance or as potential sources of learning. Furthermore, controlling specification processes (parts, materials) allows buying firms to indirectly control the supply sources of their suppliers. Finally, previous experience with suppliers and their products as well as suppliers market image and positioning are considered sufficient to certify the level of their supply chains.

The picture is quite different when suppliers’ clients are considered. The goals and strategies of firms to know them are mainly associated with the evaluation of suppliers. In the case of Adira, only static performance is under evaluation and knowing who the suppliers’ clients are is sufficient to do it. Differently, Vulcano believes that the dynamic performance of suppliers may be fostered by the

synergies produced within their relationships with other clients. However, those same relationships are seen as potentially menacing to the influence the firm might bear over the shared suppliers. In this context, knowing who the suppliers' clients are is considered insufficient to evaluate both positive and negative effects. Vulcano considers useful to know what type of resources and capabilities are suppliers using (or creating) in the relationships with their other clients (what and how) and what is the weight (how much) of those clients in the supplier's business.

**Figure 3 – Supplier functions and network knowledge**



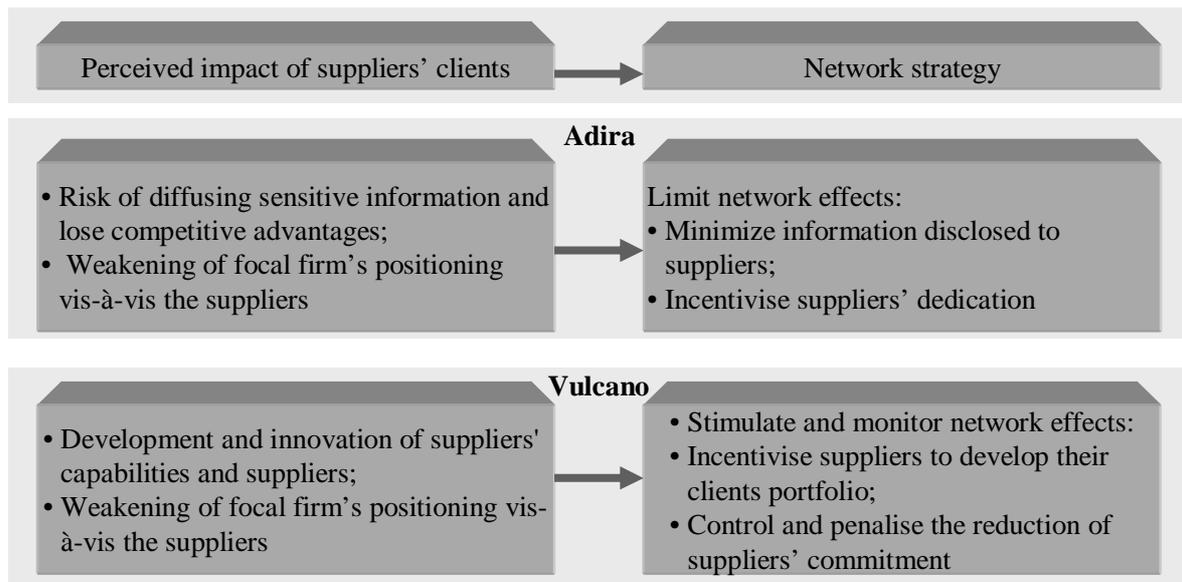
The differentiation of goals and content of network knowledge reflects in the firms' research strategies. Low relevance and "who" knowledge result in a more irregular and passive strategy. Adira has no formal procedures to collect knowledge and only abandons its passive attitude occasionally to reduce the risks associated with the adoption of a new supplier or product. At Vulcano, the efforts to obtain network knowledge are more active and regular and are embodied in formal procedures such as the "supplier's profile" file and suppliers' obligation to update Vulcano about all the relevant changes in their clients' portfolio.

**Network Knowledge and Interaction**

Interaction with suppliers' partners is a marginal phenomenon. In fact, the only regular interaction is associated with the appointment of sub-suppliers by Vulcano. Consequently, as there is no interaction with indirect partners and relationships, the only possible way to influence them is through the dyadic relationships with suppliers. The willingness to exert this indirect influence seems to depend on the perception that focal firms have of the network effects and their evaluation of the possibility and utility of interacting with suppliers' partners. Both firms consider that sub-suppliers produce limited effects on the focal firms' business. As Figure 4 shows, their attitude towards suppliers' portfolios of clients is different and is mainly associated with two types of network effects: the creation and diffusion of innovation and the changing of the relative positioning vis-à-vis the suppliers. Regarding innovation, firms interpret those network effects in a dissimilar way. Adira thinks that the innovative knowledge that generates competitive advantages is created inside the company and that it must be protected from being diffused through suppliers.

At Vulcano, the diversity present in the suppliers' network is seen as a source of knowledge and innovation. Suppliers are stimulated to find new clients from different business contexts in order to foster the "multiplying effects" of network diversity. Additionally, the fact that knowledge and innovation are considered to be partially produced in the network, by suppliers or co-produced with them makes the control of its diffusion a difficult process. Significantly, all the interviewees from Vulcano and its suppliers consider that it is becoming more and more difficult to isolate knowledge and that protection mechanisms (as patents and trademarks) are becoming less and less effective.

**Figure 4 – Perceived network impact and network strategy**



Regarding positioning Figure 4 reveals that the connections of suppliers with other clients are seen as a potential threat to their commitment to both the focal firms. Despite this common perception, firms deal with this threat in a different way. At Adira, it reinforces its intent to limit network effects, pressuring the smaller suppliers not to have other clients. Vulcano faces a paradox: how to conciliate network potential (that is fostered by the development of suppliers' network of clients) and to simultaneously assure suppliers' commitment? Vulcano tries to solve this paradox in a variety of ways: building relationships that interest and mobilize the suppliers, monitoring changes in firm-supplier positioning and penalising 'disloyal' suppliers by reducing their supply "quotas" or even by eliminating them.

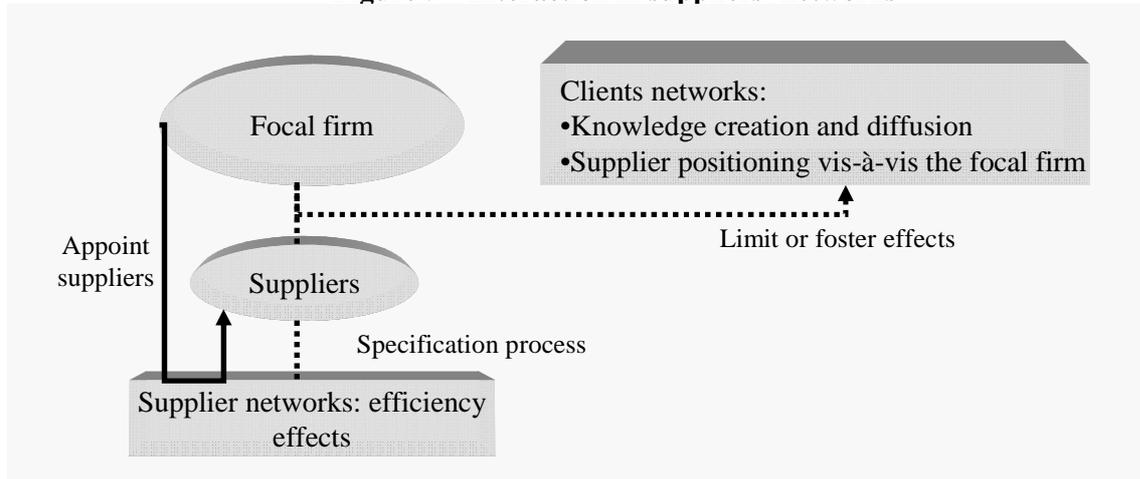
### ***Network Relevance and Interaction: A Paradox***

The cases also uncovered another paradox: the focal firms' efforts to interact in their suppliers' networks of suppliers and networks of clients seem inversely proportional to the importance associated with the effects of each of them. Figure 5 synthesises the focal firms' actions in this context.

As Figure 5 shows, the strategies adopted in each of the networks are distinct: more direct in the case of sub-suppliers than in the case of their clients. The connection with sub-suppliers can be direct through their appointment to the suppliers (Vulcano). It can also be indirect through the specification process of parts or materials (Vulcano and Adira). Due to the fluxes of activities and resources that link all the participants of the supply chain, the impact of sub-suppliers in the suppliers' performance and, consequently, on the performance of the focal firm is rather straightforward and visible. This chain of impacts seems to legitimise an eventual intervention of the focal firm and explains why

suppliers accept, and sometimes welcome, that interference. Regarding suppliers' clients the situation is quite different. The less visibility of relationships and the lack of operational connections and of fluxes of resources seems to withdraw legitimacy to any direct intervention. Consequently, actions at this level are always indirect and assume the nature of an "empowered influence" designed to mobilise suppliers to adopt a network posture that is adequate to the interests of the focal firms.

**Figure 5 – Interaction in suppliers' networks**



But, as a general rule, firms are not willing to intervene directly in the relationships suppliers hold with their business partners. That intervention is considered undesirable for two different reasons. First, it collides with the efficiency goals that both firms pursue, as dealing with suppliers' partner is resource consuming and adds to the complexity of supply management. Second, the need to intervene indicates a limitation of suppliers' indirect capabilities, namely their relational capabilities. Normally, firms expect suppliers to be able to perform some kind of isolation role (Holmen and Pedersen, 2002) between the client and its own networks. To perform this isolating role, suppliers must be able to filter and transmit to the client only the information and knowledge that is adequate and useful to its specific context. In addition, suppliers must also be able to manage their relationships within their networks in a way that fits or, at least, does not harm the client's interests. The inability of suppliers to perform one of these or both tasks may originate costs and problems to the focal firm and contribute to the devaluation of suppliers.

## Conclusions

This paper introduces two critical issues that deserve the attention of both researchers and practitioners: the concept of "selective myopia" and the paradox between network relevance and level of interaction.

Firstly, the individual and comparative analysis of the cases revealed that firms adopt a kind of 'selective myopia' as they only search for and/or consider the information considered relevant to their own goals and disregard all aspects considered non relevant in that context. In fact, firms' network knowledge is neither erratic nor random. Firms decide what they want to know about their suppliers' networks and design the adequate research instruments to obtain it. If indirect, more economic and equally effective monitoring mechanisms are available, firms will tend to use them. In the case of sub-suppliers, as an effective sourcing control may be performed through specification processes, relationship experience and quality control, firms feel no need to have direct and detailed knowledge on this part of supplier networks. As such, an apparent lack of strategy may, in fact, be perfectly

consistent with a firm's supplier goals and with the value attributed to network knowledge. This parsimony regarding network knowledge is also reflected in the way it is distributed among firm members and used in supplier relationships. Knowledge on suppliers' connections is clearly concentrated in people playing strategic or development roles and is not passed on to other people as it is not considered a valuable resource to their operational activities.

This study uncovered several factors that condition the relevance attributed to network knowledge. Firms' network theories are a strong determinant, constituting a durable framework that guides cognitive and interaction processes in networks. For instance, a view of the network as an interdependent web of actors and relationships with impact on the firm business favours the adoption of active strategies to know and understand it, both at firm and individual level. Despite the fact that this research project was restricted to supplier networks, the importance of network theories will probably stand in other settings. Besides network theories, the type of supplier functions and the evaluation of indirect effects on the buying firm's position are also factors that explain the relevance of network knowledge and the efforts developed to obtain it. Actually, as suggested earlier, the exploration of suppliers' indirect and dynamic capabilities requires network knowledge that is wider and deeper than the knowledge needed to access direct and static capabilities. Nevertheless, this difference does not translate so much in the type (client, supplier) and number of indirect partners that firms identify (network horizon) but rather in the nature of the knowledge they have on the relationships that suppliers maintain with those partners. As such, the findings of this paper support the idea that supplier goals do not necessarily result in substantially broader or narrower network horizons, but rather on different boundaries of network contexts or focal nets: broader in the cases of dynamic effects like innovation and narrower in the case of static effects like efficiency.

In this context, extendedness of network knowledge, while being useful to set firms network horizons, *i.e.* how far they see, it is an insufficient clue to what they effectively know about their indirect partners. In fact, similar network horizons may 'hide' knowledge that is substantially different in its nature. In order to have a clear picture of what firms really know other aspect besides the number of indirect partners or suppliers must be included namely the nature of the resources and activities used and the type of relationships connecting the actors. The findings of this paper are in line with the suggestions formulated by Ramos, Ford and Naudé (2005) that could be used to enrich the concept of network horizon making it a more useful tool to analyse networks.

The second main conclusion has to do with the paradox between network relevance and level of interaction. As a matter of fact, evidence was found that knowledge does not bread interaction, but, in fact, they seem to be inversely proportional. Paradoxically, firms tend to interact less with indirect actors on whom they have more information and consider more relevant. Suppliers' clients are considered especially relevant due to the positive effects they can have on suppliers' capabilities and resources and to the negative effects they can have on suppliers' commitment to the focal clients. However, inasmuch as they are located outside the focal firms' supply chains and have no direct impact on their performance, the legitimacy to act upon them is severely restricted. While sub-suppliers are not granted the same relevance, the fluxes of activities and resources linking the actors in the same supply chain make it easier and more acceptable for focal firms to intervene directly or indirectly in this context.

Generally, interaction with indirect actors is a marginal phenomenon. In fact, knowledge and relevance do not bread interaction. There is a distinction between the actors that firms see as relevant and the actors that they are interested, willing or able to interact with. In order to have a clearer picture of industrial networks and the way they are organised, interpreted and acted upon by firms, it could be useful to make this distinction more obvious. As such, adding a new layer to the 'onion' structure of networks could be a good way to do it. An 'interaction net' can be identified corresponding to the set of actors firm are aware of (network horizon), see as relevant (network context) and, additionally, interact with.

Restricted interaction corresponds to the firms view on how connections among business actors should be organised and managed. In fact, firms are not willing to interact with their suppliers' partners as this adds complexity and costs to supplier management. They expect suppliers to perform a mediating or, preferably, isolating role between them and the suppliers own connections and to be able to interpret and represent their needs in the network. The failure to do that is seen as a limitation of suppliers' capabilities that diminishes their value. However, if firms are not willing to invest in direct interaction with suppliers' partners, this does not mean they are not interested in influencing them. As they are not willing or able to do it directly, they try to do it by pressuring suppliers to develop those relationships in the sense that best fits their interests. When suppliers' partners are thought to have beneficial effects, suppliers may be stimulated to expand their network connections. When effects are seen as negatives, *e.g.* by menacing focal firms' positioning *vis-à-vis* the suppliers, focal firms try to minimize them, either by restricting information or by making penalties to the loss of commitment and by enforcing them if needed.

To sum up, this paper has hopefully shed some light on the actual importance of network knowledge in supplier management. The gap between literature relevance and managerial relevance suggested in other studies was not confirmed. However, the paper revealed that network knowledge is not equally important to all firms and is not evenly distributed among firm members. The value and usage of network knowledge and the strategies to create it are specific to each firm. Within each firm, these strategies are also differentiated according to the specific goals suppliers are supposed to fulfil and also by the existence of indirect, less costly and equally effective control mechanisms. While extended and deep knowledge can be necessary and valuable in some cases, in other cases it seems to bring no clear added value to the firms' business. As such, there are no 'right' or 'wrong' strategies in this field as in others, and each firm must chose the most adequate strategy to achieve its goals.

### ***Theoretical Contributions***

This paper contributes to a better insight on the issue of network knowledge and its impact on supplier management. It also furthers the knowledge and understanding of firms' attitudes and actions in this field. Namely, the paper identifies some factors that may lead the buying firm to adopt a more passive or active behaviour concerning the collection of knowledge and monitoring of suppliers' connections. Network theories, supplier functions, evaluation of network positioning and the existence of indirect monitoring mechanisms are some of those factors.

The paper also enhances the existing knowledge on firms' interaction with third parties, revealing how limited it is and presenting some explanations to this fact. Finally, it suggests a redefinition of the network concepts, proposing a distinction between 'network context' and 'interaction net' that would make clear the difference and distance (quite a paradox) between relevancy and interaction.

### ***Managerial Contributions***

This paper stresses the potential impact of supplier's networks on their clients' business and network positioning. As such, clients should monitor the evolution of suppliers' relationships in order to foresee possible problems or opportunities and how they can be dealt with. However, as acquiring network knowledge may be an expensive, difficult and time consuming process, firms may find alternative and more economic ways to get it. As collecting and information is costly, firms should evaluate the costs and benefits of doing it and adopt the strategy that best fits their goals and strategies.

However, as networks are dynamic by nature and potentially important changes may occur outside the restricted field of interaction of firms, it is probably wise to conduct a systematic monitoring of networks from time to time. This will enable firms to verify if their network views still correspond to reality or if new actors, resources, activities and connections with potential impact have emerged, and to evaluate how their strategies should be changed accordingly. It may also help firms to understand

the views of their counterparts, how valuable they (still) are to those counterparts and how to influence them to their benefit. As in most cases firms are unwilling or unable to interact with their suppliers' partners, the possibility of exploring the benefits or minimizing the dangers of suppliers' networks lies on the client's ability to influence the way suppliers develop those relationships. Exploring how this corresponds to suppliers' strategies in other relationships is probably an important step to do it and will probably have more durable effects than the usage of purely coercive mechanisms.

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