

A Model for the Understanding of Supply Chain Networks

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Abstract

This paper aims to develop a framework for the understanding of why and how supplier management influences the buying company's strategy and performance. These are highly dependent on suppliers' actions and on the way the relationships with them are managed by the buying company. Authors have developed extensive and valuable research on the impact of supplier relationships in a network context. However, important issues regarding supply management and its effects on the performance and strategy of the buying firm seem not to be fully investigated. In this context, this paper encompasses a model of supply chain networks developed on the basis of the conceptual framework of the IMP group.

INTRODUCTION

Over the past few years, liberalization and globalisation of production and trade caused the intensification of competition in most industries. Reacting to this process, firms try to develop and sustain a relevant market positioning through a growing specialization around their core resources and competencies (Hartmann et al. 2001), and acquire to other organizations goods and services not essential to those competencies (Cousins and Spekman 2000; Möller and Törrönen 2000). Simultaneously, both the importance of the value and content (Gadde and Håkansson 2001) of industrial purchasing is growing and leveraging purchasing and supply management to a strategic level (Gattorna and Walters 1996).

Due to specialization, the activities needed to produce any value offer are scattered among a larger number of entities, connected and structured in complex supply chains that Möller and Törrönen (2000) define as value creation networks that compete between them (Morgan and Hunt 1994; Cousins and Spekman 2000). The evolution of inter-organizational relationships is a cause/effect of redesigning analysis and management models. The traditional perspective, well illustrated by the marketing management school, seems inadequate to deal with these new realities. In this context, the interaction and industrial networks approach has gained increased currency.

Based on a doctoral research project, the purpose of this paper is to contribute to a better understanding of why and how supplier management influences the buying company's strategy and performance. Departing from the conceptual framework of the IMP group, it encompasses a model to further analyze supply networks in industrial settings.

This paper is divided in four sections. The first section briefly reviews the traditional management perspective and addresses some of its most important weaknesses. The second section presents the interaction and industrial network approach's basic concepts and attempts to highlight some relevant issues of extending the use of a network perspective to supply chain management. The third section presents a model of supply chain networks that results from a reflection on the existing literature and how it can be furthered to explore some relevant issues that still remain relatively obscure. In the last section, we present some conclusions and a number of suggestions for future research.

THE TRADITIONAL PERSPECTIVE

In their book "Principles of Marketing" first edited in 1996, Kotler et al. (1999, p. 16) define *marketing management* "as the analysis, planning, implementation and control of programs designed to create, build and maintain beneficial exchanges with target buyers for the purpose of achieving organisational objectives" and add that "exchange is the core concept of marketing" (op. cit., p. 12) and "transaction is marketing's unit of measurement" (op. cit., p. 13). This concept of marketing is based on the idea that companies' gains and losses emerge from single transactions whose profits should be maximized each time. Consequently, firms tend to assume an opportunistic behaviour in order to get maximum benefit from each transaction and to protect themselves from a similar behaviour from business contenders.

Sheth and Parvatyar (2000) argue that one of the laying concepts of transactional marketing is the belief that competition and self-interest drive value creation – the enlarged consumers' choice created by competition forces marketers to create in their self-interest a more valuable offer.

This view is reflected in the concept of purchasing as a center of costs of administrative nature (Gattorna and Walters 1996), whose fundamental task is to choose the suppliers who are likely to provide the largest financial advantages to the company (Gadde and Håkansson 2001). The traditional perspective is criticized as it seems no longer possible to assume markets dominated by sellers, who define the combination of variables applied to a faceless market that merely responds (Easton 1992). Business markets are even less fitted to this picture of a faceless world made up of independent actors that exchange goods and services at equilibrium prices (Easton and Araújo 1994). In fact, buyer-seller relationships are substantially different. They reflect interaction processes through which companies and other actors are active parts in their dyadic relationships established and developed through individual episodes of action and reaction, but integrated in dynamic processes where time plays a crucial role (Håkansson and Johanson 1992; Easton and Araújo 1994; Ford 1998).

The questioning of both the theoretical and empirical validity of the marketing management model has stressed the need to develop other perspectives. The network approach provides very useful tools to understand the complexity of such business realities, in particular in terms of supply chains.

A NETWORK PERSPECTIVE ON SUPPLY CHAIN MANAGEMENT

Basic Concepts

In industrial contexts, actors tend to be strongly and mutually interdependent to effectively coordinate their resources and activities. As Mattson (1997) puts it, interdependence is likely to increase with the deepening of the specialization process. The development of relationships is strongly affected by actors' views, interests and expectations as well as their mutual efforts in the interaction process.

From a network perspective, strategy, network positioning and network theory are interrelated concepts that influence actors' behaviour. Network theories reflect actors' vision and

intentions in the network. They are influenced by their conceptual frameworks that allow them to understand and act in the network, and to set network boundaries by including/excluding actors. According to Mattsson and Johansson (1992), actors' positioning is determined by their exchange relationships, and it forms the basis for strategic action. More recently, Araújo and Easton (2002, p. 12) contend that positioning *may* be seen as conjectures that actors make about their own roles, always subjected to multiple and provisional interpretations that have to be discovered and tested in action. Finally, strategy tends to evolve gradually as firms interact, explore and adapt to new circumstances. Strategic actions translate in actors' efforts to influence, by changing or preserving, their network positioning. The evolution of networks theories, positioning and strategy is conditioned by the firms network knowledge that affects the way they set the boundaries of what they consider to be their relevant network (i.e. their focal net), and the conceptual frameworks that shape their network theories. To assure an effective management of its relationships (e.g. with suppliers) companies must have an extended knowledge about the networks in which they are embedded (Ford 1998; Möller and Halinen 1999).

Besides the effects of their dyadic relationships, firms also endure the indirect effects of their counterparts' own relationships, that flow across the network through interconnected relationships. As Hertz (1992) puts it, since each relationship may affect other relationships positively or negatively, the degree of interdependence in a network varies with the content, intensity and symmetry of the relationships.

During the last decade, a number of authors have studied relationship functions and effects, highlighting some aspects of these problems. For instance, Anderson et al. (1994) distinction between primary and secondary functions may be partially associated with Möller and Törrönen (2000) definition of direct and indirect effects. Holmen and Pederson (2002) extended Anderson et al. notion of indirect functions to the understanding of how direct partners mediate between the focal company and the network. Håkansson and Snehota (1995) argue that relationships, depending on several factors, may produce different effects on both partners involved, but also at the relationship and network level. As Ford and McDowell (1999) contend, relationship effects may be (un)intended, (un)predictable and differently evaluated by participants and other actors; and moving from the relationship to the network level leads to more complex and less immediate effects. These different perspectives and the distinction between relationships functions and effects may help to establish a global

framework for relationship potential. Table 1 represents an attempt to organize these perspectives.

Authors	Effects on actors	Effects on relationships	Effects on portfolios	Effects on networks
Anderson et al. (1994)	Primary functions	Secondary functions		Secondary functions
Häkansson and Snehota (1995)	Function for the individual actor	Function for the dyad		Function for the network
Ford and McDowell (1999)	Effects in the relationship	Effects on the relationship	Effects on a portfolio	Effects on a network
Möller and Törrönen (2000)	Effectiveness and efficiency functions	Effectiveness function		Effectiveness and network function
Holmen and Pederson (2002)	Joining, relating, insulating functions	Joining, relating, insulating functions		Joining, relating, insulating functions

Table 1 - Relationships Functions and Effects

In this context, it is impossible to consider a relationship in isolation, and firms should consider those connections when choosing their partners (Ritter 1999). Moreover, firms should also consider the functions and effects they expect to achieve with those relationships and how they may effectively manage them. This means that the selection and management of suppliers should not be reduced to the collection of a portfolio of dyadic relationships. Rather, the interactions between those dyadic relationships must be considered, managed and, in some cases, fostered.

Networks and Supply Management

As firms become more specialized, borders between the buying company and its suppliers tend to become blurred. Firms should consider not only the resources and activities they own, but also the resources, activities and actors they control throughout the network. Araújo et al. (1999, p. 499) contend that “firm’s competitive advantage resides not only within the frontiers of what it owns and controls, but also on the idiosyncratic interfaces that it develops with

other firms, e.g. its suppliers”. Less integrated companies feel a greater need to expand its resources through the access and control of suppliers’ resources. Managing suppliers must focus on the development of a network of external resources or a supplier network (Hartmann et al. 2001).

Dubois and Pederson (2001) illustrate the connectivity present in industrial markets with the network of interdependencies needed to create an individual product. Products can be seen as the output of a given structure of activities and the input of other structures of activities. Acquiring the character of a “network entity”, they result from the connections established among suppliers and other actors, i.e. from the way that upstream activities are coordinated and resources combined in order to result in specific products. This means that the performance of a supply chain depends not only on the conditions of the firms that integrate it, but largely on the way its activities and resources are related to those of other supply chains (Gadde and Håkansson 2001).

In this scenario, the virtues of buyer-supplier adversarial, competitive and distant relationships are giving way to more collaborative links. However, the benefits of strengthening relationships depend on the effects of those close and lasting relationships. As Backhaus (1997) argues, strong relationships can be seen as assets but can also represent heavy liabilities to the firms involved. Freytag and Kirk (2001) defend that any client or supplier portfolio is always a combination of transaction and relational markets. For Hartmann et al. (2001), the central issue in purchasing is to determine what type of cooperation (and in which circumstances) should a company develop with its suppliers. Thus, relationships should be established and developed according to what the buying company expects from them, what is invested on them and what effectively happens in them (Ford 1998).

But, as stated before, supplier relationships should not be considered in isolation – they have different functions and effects and their contribution to the buyer performance may be reflected at different levels: buyer, relationship, buyer’s relationships portfolio, and network. This means that when supplier relationships have relevant effects the buying company should reinforce its investment on them. However, relationships depend on the will of both buyer and supplier and the existence of suppliers potentially interesting to the buying company does not necessarily revert in its favour. As Axelsson (1992) argues, actors are not totally free to choose their partners and relationships cannot be established or developed without the joint

effort of at least two actors. Then, the buying company should identify critical actors in the network and analyze how to mobilize them in order to access the resources and activities it needs.

On the other hand, mobilization ability varies according to the company's interacting partners and that it depends on its positioning both at network and relationship level. This means that suppliers differ not only in terms of the type of interest the buyer is looking for and their potential to provide those benefits, but also on the latter's ability to foster their interest and investment in the relationship. In this sense, Gemunden (1997) argues that as no company is ever able to define each detail, network management is sometimes to actively manage and sometimes it is to be managed.

As in all business relationships, buyer-supplier relationships have effects on actors, resources and activities levels. Gadde and Håkansson (2001) state that supplier strategic management requires a thorough analysis of suppliers' roles and the buying company's positioning on all these dimensions. The basic issue is to determine which activities must the focal company maintain and which ones should it trust to other actors. This determines the type of control (proprietary or indirect) the company holds on activities and resources and how to use them. Any decision to produce or to purchase must take into account its impact on network identity and positioning rather than the more immediate effects of cost minimization that traditionally have oriented the make-or-buy decision.

When managing supply it is not enough to look if the functions that arise from the specialization of activities and resources are complementary or not. Buying companies must try to identify suppliers that, due to their characteristics and capabilities, may leverage their own resources and activities and foster their ability to deliver superior value to customers (Cousins and Spekman 2000). Furthermore, the evaluation of supplier potential should include the analysis of its relationships within other supply chains and the value that these connections may bring to the buying company.

In terms of activities, it is wise to consider the activity chain (pattern of sequential activities) and how it may be modified or improved to benefit the company's objectives, e.g. through the elimination or transfer of activities, the increase of coordination, and the chain replacement. In terms of resources, it is important to identify the critical resources, how they are distributed

among the actors, how they can be accessed, and to consider the design of the adequate interfaces because the value of resources is determined by the way they fit both the producer (supplier) and user (buyer) contexts (Araújo et al. 1999).

In short, given that supply chains influence companies' network positioning, buyers tend to act with the strategic purpose of reinforcing their network effectiveness and developing the basis for their future actions. In this sense, the selection, structuring and management of supplier relationships cannot be viewed as a means to attain short-term results, but as a way to strengthen network positioning. This network perspective provides a way to understand buyer-seller relationships as well as the network in which they are embedded. However, despite the extensive and valuable research produced so far, important questions regarding supply management and its impact on the performance and strategy of the buying firm seem not to be fully studied. The next section addresses some relevant issues in order to develop a comprehensive model that encompasses the three levels that authors usually consider relevant: dyads, portfolios and networks.

TOWARDS A MODEL OF SUPPLY CHAIN NETWORKS

Making Things or Getting Things Done

In industrial markets, company's positioning is broadly defined by "what" it makes and "with whom" it makes it. The "what" depends on its activities and resources and the "with whom" defines the set of actors, activities and resources it is able to mobilize. The questions "who are we?", "what do we make?", "who do we want to be?", and "what do we want to make?" are settled in networks and, in a more narrow angle, in focal nets. Nonetheless, these questions are connected: what the firm is and makes depends on its capability to mobilize other actors' resources and activities, which, in turn, depends on how valuable its own activities are to those other actors.

At this point, Loasby's (1998) concepts of direct and indirect capabilities defined as knowing how to "make things" and how to "get things done by others" are likely to provide useful insights. Indirect capabilities are necessary to use the company's own capabilities effectively. Loasby (1998, p. 154) argues "that the knowledge required to make and sell any firm's products resides in the structure of direct and indirect capabilities within that firm,

supplemented by the structure of indirect capabilities that connects it with other firms". To access other firms' capabilities, firms must do appropriate investments and develop their external and internal organisation.

Loasby ideas are related to the work developed by Araújo et al. (1999) on interface management. It shows that internal control of resources and/or access of suppliers' resources is conditioned by buyer-supplier interfaces. These, in turn, have different effects on the parties (directly or indirectly) involved. Furthermore, rather than evaluating suppliers' current offers that express their static efficiency, buyers should evaluate suppliers' capabilities that shape their dynamic efficiency and condition their potential to add value to the client's business. Loasby (1998, p. 144) also addresses this issue, stating that "capabilities are in large measure a by-product of past activities, but what matters at any point of time is the range of future activities which they make possible" and "the possibility of shaping capabilities".

If we introduce these ideas in supplier networks issue, the question of "how to get things done by others" must also consider "what things to get done by others", i.e., what type of suppliers' capabilities is the buying firm looking for. Exploring suppliers' capabilities requires different investments in internal and external resources and activities. If capabilities are seen as conditions to perform specific functions or effects (as those presented earlier), it becomes clear that relationship functions and relationship type are closely associated. Defining and managing relationships with each supplier in order to benefit from a specific function or effect is a crucial "indirect capability" in a network setting.

However, the ability to "get things done by others" is strongly dependent on the buying firms' network position. As referred before, the mere existence of a potentially adequate supplier does not assure the possibility of (i) establishing a relationship and (ii) developing that relationship in the sense that best fits the buying company's interests. Moreover, since control is a result of both positioning and interaction, the possibility of indirectly controlling suppliers resources depends on the buyer's firm micro and macro positions and on its capability (with their agreement or despite of them) to "get others to do the types of things it wants them to do".

Managing Supplier Relationships

Firms get different things from different suppliers - products, capabilities and other intangible assets, such as knowledge and access to new networks. Suppliers' functions and effects derive from their resources and activities and the way each supplier relationship fits the focal company's own activities and resources. Moreover, these potential functions and effects may be enhanced or jeopardize by the buyer's capability to design the right relationship type for each supplier, to invest the adequate amount of resources to develop it, and to induce suppliers to behave in a way that best fits its own interests. Thus, the set of a firm's supplier relationships may present a high level of differentiation arising from several factors, namely the contribution of suppliers to fulfil the buying company's goals and strategies, the types of existing buyer-supplier relationships and the different positions (e.g. power/dependency) of both parties in those relationships.

Effectively managing this diversity is a complex task. Firms have finite resources and it is usually suggested to concentrate them on relationships with strategic suppliers. But, the question is: what makes a supplier strategic in nature? Some authors state that it is allowing the control of resources and activities that are critical to the focal company (Brito 2001), or having specific capability profiles (Möller and Törrönen 2000; Möller et al. 2001). However, these definitions are not easy to operationalize. This difficulty arises from the potential effects and functions of relationships and the fact that suppliers' relevance is, at least, partially defined by the type of effects they expected to produce. Still, the underlying logic of searching some functions and effects instead of others and of choosing some relationship type instead of others is still missing.

Managing Suppliers Portfolios

Managing complexity is even stronger if we consider the potential cross effects of suppliers' relationships at a portfolio level. Literature prescribes that the buying company must evaluate the effects on the existing portfolio of a new relationship/ supplier or a change on an existing relationship. However, besides the work of Ford and McDowell's (1999) and Araújo et al. (1999), there is a lack of integrated studies, going beyond the collection of dyadic relationships and analysing interdependencies and connections between them.

Coordination and interaction processes among suppliers add another layer of complexity to supply management. Besides the vertical bonds between the focal company and its suppliers, there are horizontal bonds between suppliers. They may interact with each other due to and

through the mediation of the focal company. This means that the buying company will hardly be able to decide and implement unilaterally interaction mechanisms among its suppliers. The higher the number of actors involved, the harder will be managing those processes due to their specific and potentially conflicting characteristics and interests.

Managing Supplier Networks

Managing supplier networks beyond direct suppliers deals with the invisibility of many indirect relationships and the intricate web of actors with competing and/or cooperating goals and interests. This level is directly related to the determination of suppliers' network value and to the indirect functions they may perform. As referred before, network knowledge is essential to the development of "network theories" and to the network positioning and strategic action. But, as Holmen and Pederson (2002) work shows, this knowledge is very limited, especially on the supply side of the company, where it seems almost non-existing. If this sort of blindness is voluntary or caused by lack of resources and capabilities or even by mere ignorance of network potential, is an issue that deserves more attention.

These considerations show that moving from the dyadic level to the network level introduces a higher level of management complexity, and demands wider network knowledge. Such a complexity is deepened by the fact that firms' interaction effects become more diffuse as one considers larger units. At the same time, the focal company's ability to mobilize other actors through its suppliers becomes more difficult as the distance between them increase and relationships become more and more opaque. In this context, literature seems less able to explain "why" and "how" interaction takes place between the focal company and its suppliers.

Figure 1 illustrates how these levels are associated with some gaps on literature that we believe not to be fully explored.

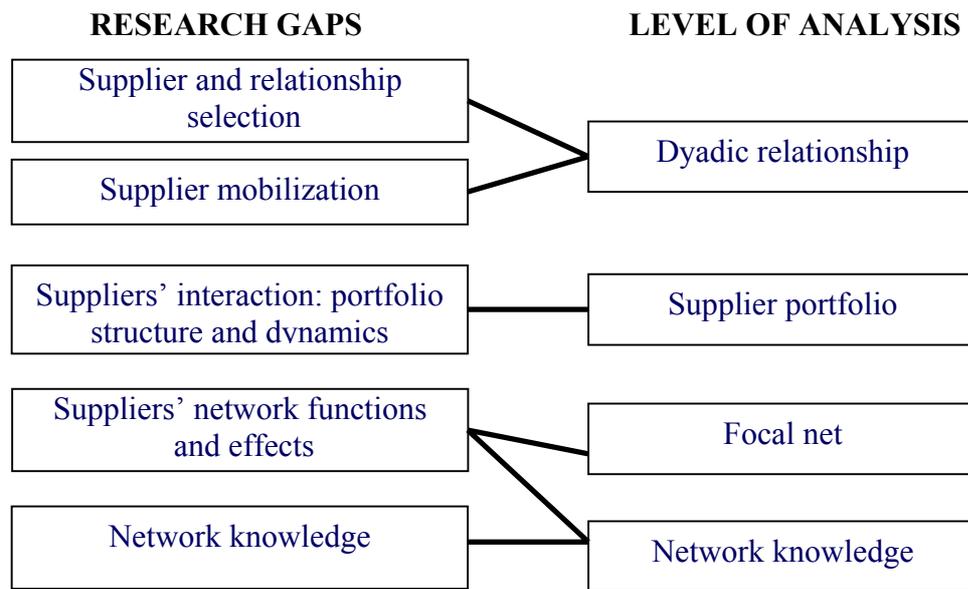


Figure 1 – Research Gaps

Departing from the dyadic level, we have in a progressive way enlarged the scope of analysis till reaching the network level. Each level leaves room for further research in order to explore issues that seem driven by the application of a network perspective to supply management. The next paragraphs present the key issues of our research project.

Firstly, at the lower level, relationship types are deeply investigated, but an understanding of the logic behind relationship choice and management is still missing. Future research should explore (i) the links between relationship type and relationship functions and effects, (ii) the impact of firms' micro-positions on relationship choice and management and (iii) how the focal company mobilizes its partners in those different cases.

Secondly, at the portfolio level, another important field of investigation concerns the establishment and development of interaction amongst different suppliers, the coordination and adaptation mechanisms, and the roles participants play in such a process. Research may focus on (i) the type of effects dyadic relationships with suppliers have on the portfolio, (ii) how the interaction processes amongst suppliers are initiated and developed, and (iii) how the portfolio dynamics affects both the positioning and strategy of the actors involved.

The last level refers to the network. In this case, the “network” corresponds to the concept of “network context” suggested by Andersen et al. (1994) and Holmen and Pederson (2002) or the concept of “focal net” referred by Möller and Halinen (1999) – i.e. the limits of the network are set according to the focal company’s perception about the relevance of other actors. In this context, it seems important to study (i) the knowledge companies have on supply networks – i.e. how far it goes, and how valuable it is considered to be, (ii) the reasons for relating with suppliers and the type of interaction adopted, and (iii) the impact of knowledge about and interaction with indirect counterparts on the positioning and strategic actions of the focal company, namely through its network theories.

The three-level model depicted in Figure 2 integrates the links between these research issues and their respective levels of analysis into a conceptual framework that offers a comprehensive vision of their underlying logic.

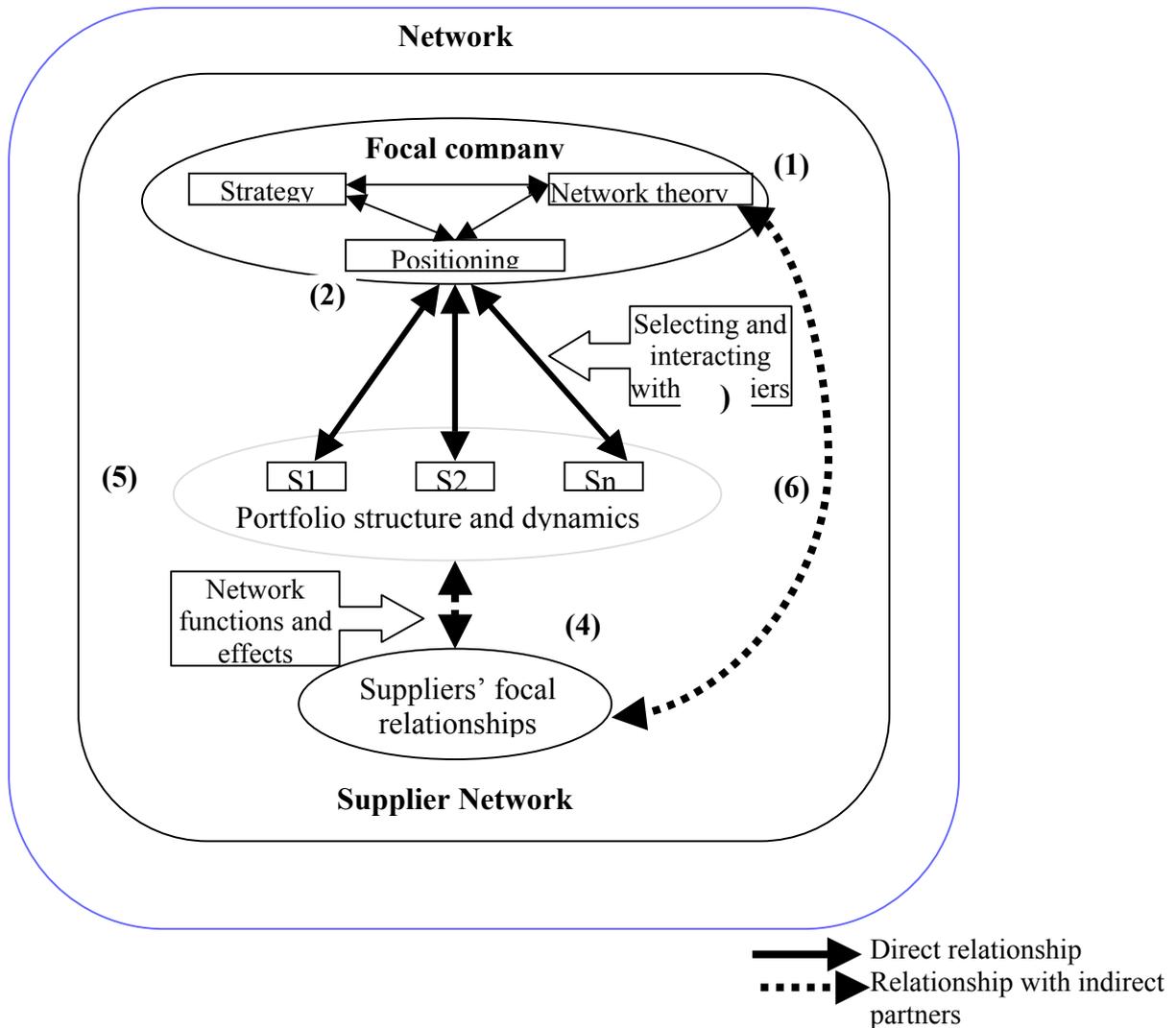


Figure 2 – The Three-Level Model

Figure 2 encompasses a number of issues that deserve an explanation. Firstly, strategy, network theories and positioning (1) are interrelated concepts that condition and are conditioned both by the dyadic relationships (2) the company establishes with its suppliers. Secondly, supplier portfolio (3) may influence the focal company and the net of suppliers at two levels. On the one hand, each dyadic relationship may endure the impact of other relationships with suppliers through the mediation of the buying company and, simultaneously, these changes may also condition its positioning and strategy in each of the dyads and its capability to act according to its objectives and expectations. On the other hand, suppliers may establish or develop horizontal relationships among them outside the influence

of the buying company. These interactions may have profound effects on both the focal company and their suppliers.

Thirdly, besides the interaction with its direct suppliers, the focal company is also influenced by the suppliers' suppliers (4) that can work either in its favour or against it. The relationships between suppliers and their respective suppliers (5) enhance their network functions and effects. The possibilities of the focal company to take advantage of them deeply depends on its network knowledge, its macro and micro positioning and also on its direct suppliers macro and micro positions, i.e. on their ability to mobilize their own focal relationship actors. Finally, regardless of the existence of direct or indirect interaction between the buying company and its suppliers' suppliers, they are likely to influence the focal company's network theories and consequently its strategy and positioning (6).

CONCLUSION

Supplier management has received an increasing attention due to its impact on companies' performance. At the same time, new forms of inter-organizational relationships have emerged, creating the need to review the theories and models that have oriented the old ways. The network approach is likely to provide a coherent conceptual basis for the understanding of the complexity of this intricate web of relationships, interests and behaviours.

The model proposed in this paper aims to deal with some specific issues associated with managing supply chains in industrial networks. The literature review highlighted that dyadic relationships have intensely been studied over the past few years. However, the logic behind them and the more complex levels of supplier portfolios and supplier networks present a number of issues that deserve more attention. The model suggested in this paper attempts to provide a better understanding of how supplier's functions and effects influence the buying company.

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