Factors Affecting Knowledge Sharing in Strategic Alliances

The Role of Knowledge Sharing as Strategic Control Behavior among Multinational Enterprises
Factors Affecting Knowledge Sharing in Strategic Alliances: The Role of Knowledge Sharing as Strategic Control Behavior among Multinational Enterprises

Key words: knowledge, knowledge sharing, cooperative alliance partners, strategic alliances

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Dedicated to my parents
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Vaasa Finland, October 10th, 2011.
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INTRODUCTION

1.1. Background of the study

International strategic alliances (ISAs) have become increasingly important for the stability, growth, and long-term viability of modern business organizations (Beamish and Delios, 2005). Alliance partnerships as inter-firm cooperative ventures represent an influential mechanism for asserting corporate strategic control among autonomous multinational enterprises (Drucker, 2001). ISA combine the cross-border flows and linkages that utilize resources, knowledge and governance structures from autonomous organizations for the joint accomplishment of individual strategic goals linked to the corporate mission of each (Hitt et al., 2000; Parkhe, 1993). Strategic alliances are now acknowledged as a centerpiece of contemporary corporate strategy (Bamford, et al, 2003).

A strategic alliance involves at least two partner firms that: (1) remain legally independent after the alliance is formed; (2) share benefits and managerial control over the performance of assigned tasks; and (3) make continuing contributions in one or more strategic areas, such as technology or product (Yoshino and Rangan, 1995:5). There could be variety of strategic alliances (e.g., contractual alliances, minority-equity, equal equity or majority equity JVs alliances) as inter-firm cooperative arrangements. These cooperative arrangements are made of equity investment or contractually based partnership strategic alliances. Different alliance forms represent different approaches that partner firms adopt to control their mutual dependence on the alliance and on other partners (Knoke, 2001).

Previous studies have analyzed why some partnerships are built through a simple contractual controlled alliance, whereas others are formed as result of joint equity investment controlled alliances (Harrigan, 1988). Studies within transaction cost economics (see Williamson, 1979, 1985) and other industrial organizational approach based strategic alliance literature (Pisano et al, 2007; Pisano et al, 1989; Gulati, 1995; Oxley, 1997, 1999; Gulati et al, 2009) have analyzed the choice between equity control forms (i.e., joint ventures and acquisitions of minority shareholdings) and contractual arrangements (non-equity based control forms). Firms resort to equity control agreements in order to economize on transaction costs when there is some risk of opportunism, but this risk is not so great as to mandate hierarchical internalization (Hennart, 1988; Williamson, 1991). The above studies in general also clarify that equity based ownership forms are relatively more suitable for complex alliances (i.e., complex alliances are those that link together several partners and/or have broad product, technology, or activity scope) and for alliances that have a technological component.

Ownership as a primary mechanism of control has been a dominant perspective in the economic literature, in which ownership is defined as “residual rights of control” or the rights to make any decision concerning an asset’s use that is not explicitly assigned by law or contract to another party (Milgrom & Roberts, 1992, p. 602). Grossman and Hart (1986) explicitly posit that the extent of ownership equals control. They suggest that decisions regarding the choice of ownership position depend on the relative importance of the investment of one firm to that of another firm in gaining an ex post return on investment. Anderson and Gatignon (1986) share a similar view. Drawing on transaction cost theory, they suggest that ownership equals control. The choice of desired ownership level reflects interplay between the firm’s desire to secure control and its attitudes towards investment risks. However, other studies have criticized the
ownership-control relationship for a variety of reasons. For instance, control can be exercised through non-ownership mechanisms such as formal contracts, management teams, and other more informal control methods (Beamish & Banks, 1987; Yan & Gray, 1994; Mjoen & Tallman, 1997).

Equity based control mode alliances allow firms to deal more effectively with the contractual and appropriability hazards (Oxley, 1997; Luo, 2005). These hazards are inherent in the problems of development, sharing, and exploitation of knowledge among partners (Nickerson and Zenger, 2004). Hence, shared ownership based control (e.g., financial investment of partner to form JV based control alliances) is likely to provide an autonomous formal managerial hierarchical control (Hennart, 1988; Williamson, 1991) capable of superior monitoring for knowledge sharing among partners. Figure 1 further clarifies the relationship between the degree of control and need for knowledge sharing (Inkpen and Dinur, 1998). Based on this, we could safely argue that the incremental increase in the need for knowledge sharing could influence the greater degree of mutual equity based investment control among partners (Inkpen and Beamish, 1997).

![Diagram of the relationship between need for knowledge sharing and degree of control](image)

**Figure 1**  Relationship between need for knowledge sharing and degree of control

Figure 1 shows that the need for knowledge sharing is positively related to the increase in equity investment based JV alliances (Inkpen and Beamish, 1997) until full-fledged M&As. On one side of the figure we have a classic market price mechanism whereas the M&As are before the other classic end. In imperfect market conditions, the mutual strategic motives of partners in the strategic alliances could be for (a) gaining market power (b) access to complementary resources (e.g., Kogut, 1988), and (c) new competencies (e.g., Baum & Oliver, 1991; Hennart, 1998) In a so-called "classic perfect market model" the firm does not need to have contractual or equity based investment contractual relationships for the exchange of value, as a price mechanism exists. However, perfect markets do not exist in reality and thus the firm's cooperative
relationships and subsequent strategic control orientation are needed due to market imperfections (Coase, 1937).

Contractual or JV alliances do not themselves clarify whether the relationships between firms are strategic in nature. Therefore it is important to understand how the focal-firm could achieve the desired strategic motives either through a contractual strategic alliance or JV strategic alliance, and what are the dynamics for aligning and achieving the strategic motives of partners in these alliances in order to build successful partnerships. Successful partnerships in the study mean partnerships which can align and achieve the strategic motives of partners in different types of partnerships (e.g., contractual alliances, JV alliances). Therefore, the point of departure in the present study emphasizes that the choice of alliance form is driven by considerations based on the joint strategic value maximization between partners (Zajac and Olsen, 1993). In the study firms jointly decide the amount of relation-specific investments (e.g., a contract, financial investment, knowledge sharing) they will commit to a collaboration, depending on (i) the strategic motives which the partners are pursuing, and (ii) how far it is feasible to increase the possibility of aligning them (Park, Rongxin and Gallagher, 2002). The strategic motives are aligned and control is achieved through joint financial investments in the case of a JV. As an alternative to financial investment, knowledge sharing could play a role as strategic inter-firm control in the present study, if it could align the strategic motives of the partners.

The existing literature clarifies that partnerships represent a combination of inter-firm control through both a contract and joint financial investment to build a contractual structure or a semi-ownership structure as an alternative to a contract (e.g., JVs, consortia). Hence, the present study maintains that as contracts are incomplete, we are therefore required to maintain mutual dependence based control mechanisms in addition to a contract. For example, mutual dependence based control mechanisms could be joint financial investments and building an ownership structure between the parties (e.g., JVs). However, the present study clarifies that subsequent inter-firm control is also exercised through inter-firm knowledge sharing.

The strategic motives in strategic alliances are largely influenced by the characteristics of the partners so as to evaluate the expected pay-off of the alliance (Saxton, 1997). Further it is difficult to directly observe the strategic motives of the partners. Figure 2 shows how partners’ characteristics are linked to partners’ strategic motives. The strategic motives and characteristics of the partners are closely interlinked to each other when analyzing the strategic interests or strategic needs of the potential partners. Figure 2 is drawn on the literature based on Saxton (1997).

![Figure 2: Strategic needs of partners](image-url)

Some researchers have actually focused on the partner characteristics as an explanation for alliance strategic behavior (Saxton, 1997) and see alliances as alternative forms to
markets or hierarchies for addressing specific strategic needs linked to partners’ characteristics and their subsequent strategic motives. Based on this, we will also keep a similar focus in the present study as the partners’ characteristics and strategic motives are closely related to each other. For instance, the resource exchange and the value of resources accessed in an alliance are of central concern (Peffer & Salancik, 1978; Thorelli, 1986). The present study will view the strategic motives of the partners via characteristics of the partners. In the study, the strategic alliance partner characteristics could be either (a) relationship characteristics or (b) resource characteristics, as mentioned in Figure 3. The research question in the forthcoming section should be understood within the context of both the external and internal resources that are exchanged through knowledge sharing. In the study, the exchanged resources are presented on the bases of relationship characteristics and resource characteristics, respectively. Thus, strategic alliance partner characteristics are the basis for further analyzing the strategic motives of alliance partners in the conceptual and empirical part of the present study.

Figure 3  Relationship between partners’ characteristics and strategic motives

The discussion in this section clarifies the gap in the literature about conceptualizing knowledge sharing as strategic inter-firm control behavior. Knowledge is seen as an additional inter-firm control along with a contract and joint financial investment. In the next section the key terms of the study are discussed before presenting the research question and objectives of the study.

1.2. Key terms of the study

In the following section concepts such as “knowledge”, “knowledge sharing”, “cooperative alliance partners”, and “strategic alliances” are defined within the context of the present study:

(a) Knowledge

The concept of knowledge in organization theory and strategy theory is mostly regarded as a function, or a managerial tool for performing a task in relation to an environment (see, e.g. Johanson and Vahlne, 1977; Hedlund, 1994; Nonaka, 1994; Nonaka and Takeuchi, 1995). The concept of competence has therefore gained some attention. Organization theorists distinguish competence as an organizational feature. Competence is often regarded as the link between knowledge and strategy, as the ability (pouer) of an organization to implement or to act relative other organizations. Selznick (1957) defines competence in relation to organizations as “distinctive competence”, something like the competitive advantage of an organization. Prahalad & Hamel (1990)
build on the same tradition when they include the technical and managerial skills that enable an organization to survive, and call it “core competence”. The concepts of distinctive competence or core competencies are not directly utilized in the study. However, these concepts are important to understand the term knowledge as new knowledge provides the basis for organizational renewal and competitive advantage (Prahalad & Hamel, 1994).

(b) Knowledge sharing

Knowledge-based resources differ from physical resources in several ways, which make their development, access, and integration with other resources challenging. First, knowledge-based resources may be tacit, or difficult to codify (Chowdhury, 2005; Nonaka, 1994). Because tacit knowledge cannot be written down or captured in an explicit form, it creates characteristic ambiguity that restricts the firm’s ability to identify and control relevant variables that can lead to rapid accumulation of knowledge, and its transfer is impeded both within and between firms (Simonin, 1999; Szulanski, 1996). Because tacit knowledge is difficult to transfer, it is grounded in action and developed through experience (Cook and Brown, 1999; King and Ranft, 2001; Polanyi, 1962).

Another definition of knowledge used by Kogut and Zander (1992) is that it incorporates both the relatively tacit ‘know-how’, defined as ‘the accumulated practical skill or expertise that allows one to do something smoothly and efficiently’ (Kogut and Zander, 1992 page 386) and, information or ‘know-what’, which accommodates more articulated dimensions of knowledge. The concept of transfer is also difficult to capture. The issue here is that no definite distinction between transfer of knowledge and creation of new knowledge exists (Granstrand, 1982; Sahal, 1981). As Zander (1991) observes, recipients would normally be obliged to devote substantial resources to assimilate, adapt, and improve upon original technology. The modification and further development of technology are thus very often an integrated part of transfer according to the degree of change the knowledge is subjected to during transfer. Thus, a literature search reveals that what some call knowledge transfer, others define as knowledge combination, knowledge creation, sharing or learning (see, e.g. Bartlett and Ghoshal, 1989; Westney, 1993; Hedlund, 1994; Nonaka and Takeuchi, 1995). For the purpose of the present study, I use the term knowledge sharing only. Knowledge may be shared or transferred back and forth among cooperative partners who have agreed to enter a strategic alliance.

The knowledge-based perspective postulates that the services rendered by tangible resources depend on how they are combined and applied, which is in turn a function of a firm’s know-how (i.e., knowledge). This knowledge is embedded in and carried through multiple entities, including organization culture and identity, routines, policies, systems, and documents, as well as individual employees (Grant 1996a, 1996b; Nelson and Winter 1982; Spender 1996). However, the prominent feature of knowledge based view of the firm (e.g., Grant 1996 a & b; Spender, 1996) treats the knowledge held by employees as a primary source of value. The same view is also conceptualized and utilized in the present dissertation.

(c) Cooperative alliance partners

As the term suggests, “cooperative partners” involves allying two or more partner firms. The key features setting strategic alliances apart from other single-firm strategies are the element of inter-firm cooperation (Ariño, 2003; Burckley & Casson, 1988; Doz,
We define partner firms as pursuing mutually compatible strategic interests in the alliance rather than acting opportunistically. This definition is based on theorists who believe that “cooperation is obviously superior to individual action at achieving virtually all goals” (Maitland, Bryson, & Van de Van, 1985:59).

Compatible strategic interests in strategic alliances are the acquiring of (a) capabilities, and (b) market power. Within this view, knowledge sharing is significant to gain access to other firms’ capabilities, supporting more focused, intensive exploitation of the existing capabilities within each firm (Grant and Baden-Fuller, 1995 & 2004; Nakamura, Shaver, and Yeung, 1996). As a result of acquiring firm-specific knowledge, and the subsequent acquisition of capabilities and cooperative partner specific market relationships, cooperative partners can gain market power in comparison to their major suppliers, customers and also competitors.

Knowledge-based resources are usually difficult to imitate unless otherwise deliberately shared among specific firms. The benefits embodied in tangible resources are not available to just any firm that purchases them. But firms (e.g., cooperative partners) which learn about the resources they use (e.g., knowledge sharing) exploit these resources more profitably than others (Penrose, 1959). Through idiosyncratic resources (e.g., firm-specific knowledge acquisition), firms can build distinctive competence, which is a firm’s ability to do something better than its competitors can (Prahalad and Hamel, 1990); Hofer & Schendel, 1978; Selznick 1957). This ability is a source of competitive advantage and above-normal profits when it enables a firm to offer unique (and valued) products or services or to achieve higher performance on common criteria, such as quality, costs, or timeliness (Conner, 1991; Peteraf, 1993).

A firm sustains competitive advantage from a distinctive competence as long as rivals cannot match its level of performance or offer more desirable criteria. Competitors may replicate or surpass a firm’s performance by copying its unique practices or technologies, or by finding substitutes for them. To prevent this, a firm is likely to protect its knowledge as a barrier to its capabilities substitution. Substitution is the use of alternative resources or capabilities to achieve a given criterion or to produce outcomes that make that criterion obsolete (Barney, 1991). A substitute competence is one based on an alternative set of management practices, technology, and/or business model. Hence, knowledge sharing only within specific firms can result in the protection of knowledge from other suppliers and buyer firms and also competitors.

(d) Strategic alliances

We need to understand which cooperative relationships are strategic alliances or types of strategic alliances within the context of the study:

In a review of some of the theoretical explanations for the formation of joint ventures strategic alliances, Kogut (1988) highlights two main motivations, which are broadly applicable to the definition of alliances utilized in the present study: (i) strategic behavior that leads firms to try to enhance their competitive positioning or market power, and (ii) a quest for organizational knowledge (e.g., firm specific knowledge), (Penrose 1959). As a result, some learning (e.g., acquisition of firm knowledge) results when one or both partners want to acquire some unique knowledge from the other or one partner wants to maintain its capacity while seeking another firm’s knowledge (Gulati, 1998).
For the purpose of the study, strategic alliance includes (a) a contractual arrangement without equity investments of partners, and (b) equity investment alliances which are likely to create a separate entity in some cases. But they are more likely to offer sponsoring firms the strategic impact of the alliance form of knowledge sharing inter-firm control because they do not involve majority equity investment or a full-fledged merger as a mechanism of inter-firm control.

Table 1 further describes the forms of strategic alliances studied (in the present dissertation) within the context of the role of knowledge sharing as inter-firm control among partners.

**Table 1  Forms of strategic alliances analyzed in the dissertation**

<table>
<thead>
<tr>
<th>Inter-organizational Form</th>
<th>Description</th>
<th>Representative studies &amp; conceptual contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractual alliances</td>
<td>Loosely coupled arrangement between two or more firms that establishes an exchange relationship, but has no joint ownership involvement</td>
<td>Das, Sen, &amp; Sengupta, 1998; Deeds &amp; Hill, 1996; Dickson &amp; Weaver, 1997; Doz &amp; Hamel, 1998; Osborn &amp; Hagedoorn, 1997; Hagedoorn, 1993; Saxton, 1997</td>
</tr>
<tr>
<td>Joint venture alliances</td>
<td>Tightly coupled: an entity that is created when two or more firms pool a portion of their resources to create a separate jointly owned firm.</td>
<td>Garcia-Canal, 1996; Inkpen &amp; Crossan, 1995; Park &amp; Russo, 1996; Koh &amp; Venkatraman, 1991; Oliver, 1990; Harrigan, 1986, 1988</td>
</tr>
<tr>
<td>Consortia alliances</td>
<td>Tightly coupled: specialized joint ventures encompassing many different arrangements. Consortia are often groupings of firms oriented towards problem solving and technology development, such as R&amp;D consortia.</td>
<td>Aldrich &amp; Sasaki, 1995; Brooks, Blunder, &amp; Bidgood, 1993; Child &amp; Faulkner, 1998; Evan &amp; Olk, 1990; Kanter, 1989.</td>
</tr>
</tbody>
</table>

Source: Adapted from Barringer and Harrison (2000) page 383

**1.3. Research question and research objectives**

The strategic alliance literature in the present study will primarily link the characteristics of partners and their subsequent strategic motives to the role of inter-firm knowledge sharing. The partners characteristics could be relationship and resource characteristics which are linked to the strategic motives of the partners. As a contextual view, the role of knowledge sharing is analyzed as strategic control behavior.
for aligning the strategic motives among alliance partners for building successful partnerships with or without joint equity investments. Hence, the formation of inter-organizational relationships and subsequent knowledge sharing in alliances are a manifestation of incomplete contracts. Therefore, incomplete contracts could be more complete if the strategic motives of the partners could be communicated and well understood among them. Thus, the aligned strategic motives among partners are likely to be addressed in the implementation stages of partnerships. In the study knowledge sharing plays an important role for clarifying and aligning the mutual strategic interests or strategic needs of partners for the formation and implementation of successful partnerships in the presence of incomplete contracting hazards. Based on this the research question of the study is given as;

Q. What are the factors that influence the sharing of knowledge between alliance partners and how these influence inter-firm control behavior?

In partnerships with key players within an industry, a "knowledge sharing link" is likely to create effective control of the firm’s market factors of supply and demand (e.g., factors of supply and demand linked to customers, suppliers and competitors). This view is consistent with classic industrial organization and resource dependence theory (Pfeffer and Salancik, 1978), which emphasizes the use of alliances as a means of reducing competition and uncertainty (maintaining strategic relationships or competitive positioning for market power). In a knowledge based view (Selznick, 1957; Hagedoorn, 1995; Tyler and Steensma, 1995) the "knowledge sharing link" is for accessing the external complementary knowledge assets of another organization, internalizing the other firm’s capabilities likely to enhance the core capabilities of the focal-firm. This union in the present research analytical framework is also strongly supported by Prahalad and Hamel (1990). They state that distinctive competencies when combined with the strategic motives of the partnerships can result in performance superiority (Prahalad and Hamel, 1990). For example, a firm’s distinctive competencies of accessing the external complementary knowledge assets of another organization, and internalizing the capabilities is likely to enhance the core capabilities of the focal-firm and contribute to strategic relationships for access to new capabilities. Resource dependence theory regards power as the primary control form in relationships based upon asymmetries in the parties’ control of valuable resources. Resource dependency theory regards the firm’s external resources as a source of superior organizational performance, whereas resource and knowledge based theories of the firm regard the firm’s internal resources as a source of competitive advantage. In the study, the dimension of resources is related to the external resources and internal or firm specific resources. Therefore, the research question should be understood within the context of both external and internal resources exchanged through knowledge sharing. In the study the external and internal resources in exchange are presented as relationship based and resource based knowledge sharing factors.

In the presence of imperfect market conditions it is important to build contracts (e.g., contractual alliances, JVs) which are superior to market relations such as buyer and supplier relationships. Hence, the contacts are also incomplete and contract hazards likely to negatively influence the success of partnerships among alliance partners. In this view the written contracts or equity investment contracts between firms are just the beginning of building strategic relationships. Therefore, in the study the role of knowledge sharing is seen as an alignment process among the different strategic motives of partners as a mechanism of strategic control, thus strengthening the inter-firm control through non-equity means (e.g., knowledge sharing). As mentioned earlier that the partners characteristics could be relationship and resource characteristics. In
this view knowledge sharing could be seen within the context of relationship and resource based factors which are linked to perceive network uncertainty and perceived deficiency of resources respectively. It is important to clarify here that external and internal resources in exchange are referred to relationship based and resource based knowledge sharing factors, respectively.

Based on this discussion, the research objectives of the study are presented as:

What relationship based knowledge sharing factors affect perceived network uncertainty in alliance formation and subsequent knowledge sharing as inter-firm control behavior?

What resource based knowledge sharing factors affect perceived deficiency of resources in alliance formation and subsequent knowledge sharing as inter-firm control behavior?

These dimensions of control e.g., research objectives 1&2 are likely to differ in various inter-firm alliance situations between a focal-firm and its partners. The theoretical view of the study about the characteristics of partners and subsequent strategic motives (e.g., factors effecting knowledge sharing) are built on (i) resource dependency theory, and (ii) knowledge based view of the firm. The model and a priori assumptions introduce the factors to clarify the need for analyzing the role of knowledge sharing within the context of inter-firm strategic control behavior. Finally, the empirical part of the study provides an extended contextual perspective of the partners’ characteristics, their strategic motives and the role of knowledge sharing in aligning these strategic motives for building inter-firm strategic control. In this view the empirical part of the study evaluates both vertical and horizontal strategic alliances (e.g., contractual and JV alliances) and the knowledge sharing behavior of the focal-firm to analyze variations in control orientation as presented in the research objectives.

1.4. Positioning, contribution and limitations of the study

Contract hazards further support the significance of the study in analyzing the role of knowledge sharing for bringing consistency in partners’ strategic motives for building successful partnerships. However, when it is difficult to share the desired level of knowledge among partners, the joint equity investment are likely to play an important controlling role in building successful partnerships. Hence, the present study introduces specifically the role of knowledge sharing as inter-firm control, which is investigated within the context of the partners' characteristics and their subsequent strategic motives (e.g., factors affecting knowledge sharing). In the study we assume that partners’ characteristics and strategic motives are closely related to each other (Saxton, 1997). For example, partners with specific characteristics are likely to formulate certain strategic motives, or vice versa. As mentioned earlier, it is difficult to directly observe the strategic motives of potential partners. Therefore, the knowledge sharing link also clarifies what the characteristics of partners and their strategic motives are (e.g., factors affecting knowledge sharing). However, in this view a specific level of knowledge sharing is necessary as a prerequisite for some degree of understanding about partners’ characteristics and subsequent strategic motives among potential partners. When some common knowledge exists, an understanding about the mutual strategic motives between partners could initiate further knowledge sharing and subsequent alignment in the strategic motives of partners, and vice versa.
The study is conceptualized within the broader literature on inter-organizational cooperative relationship. The theoretical literature on inter-organizational cooperative relationship formation is fragmented, with several disciplines contributing to the field (Contractor & Lorange, 1988; Koza & Lewin, 1998; Osborn & Hagedoorn, 1997). The fragmented nature of the studies in different approaches (e.g., see Figure 4) reflects the multifaceted nature of inter-organizational cooperative relationship.

The six theories describe in Figure 4 fall along a conceptual continuum from a reliance on economic rationale for inter-organizational relationships to a reliance on behavioral rationale.

![Diagram showing the theoretical foundations of Inter-organizational Relationships](source: Barringer and Harrison (2000), page 382)

In figure 4 Transaction cost economics and resource dependence represent economic explanations for inter-organizational relationship formation, while institutional theory falls on the behavioral end of the continuum. Learning theory, while largely a behavioral discipline, has economic edge to reduce costs or in other ways enhance revenues and profitability. Strategic choice and stakeholder management fall in the middle. Strategic choice is based on a primarily economic tradition but is increasingly embraced by behavioral theories. Stakeholder management deals first with relationships; however, writers on the topic frequently turn to economics as a source for debate and theoretical justification.

Each of the six theoretical paradigms offers a unique perspective on the formation of inter-organizational cooperative relationships. Consequently, this study can benefit from considering each of the paradigms when designing studies. However, blending some of the theoretical paradigms together may provide an even more useful means of understanding the formation of inter-organizational cooperative relationships (Barringer and Harrison, 2000). The present study combines resource dependency theory and learning theory (e.g., knowledge based view of the firm) to analyze the differing nature of strategic alliances as presented in the research objectives. Table 2 (Barringer and Harrison, 2000, page 370) explains the different theories which are analyzed to explain inter-organizational relationships. Resource dependency theory is linked to first research objective to analyze perceived business network uncertainty. Whereas organizational learning theory or knowledge based view of the firm is linked to the second research objective to analyze perceived deficiency of resources.
<table>
<thead>
<tr>
<th>Theoretical Paradigm</th>
<th>Description</th>
<th>Rationale for Inter-organizational Relationships (IR)</th>
<th>Representative Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Cost Economics</td>
<td>Focuses on how an organization should organize its boundary-spinning activities so as to minimize the sum of its production and transaction costs.</td>
<td>Minimization of the sum of production and transaction costs. IRs can reduce costs associated with establishing a hierarchy.</td>
<td>Beamish &amp; Banks (1997); Faulkner (1995); Hennart (1988); Hill (1990); Madhok &amp; Tallman (1998); Parkhe (1993); Thorelli (1986); Williamson (1975, 1985, 1991)</td>
</tr>
<tr>
<td>Resource Dependence</td>
<td>A theory rooted in an open system framework that all organizations must engage in exchanges with their environment to obtain resources.</td>
<td>Organizations from IRs to exert power or control over organizations that possess scarce resources. Alternatively, an organization may enter an IR in an effort to fill a perceived resource need.</td>
<td>Bartholomew (1997); Das &amp; Teng (1998b); Das, Sen, &amp; Sengupta (1998); Deeds &amp; Hill (1996); Mitchell &amp; Singh (1996); Pfeffer &amp; Salancik (1978); Sinha &amp; Cusumano (1991)</td>
</tr>
<tr>
<td>Strategy Choice</td>
<td>Study of factors that provide opportunities. For firms to increase in competitiveness or market power. Profit and growth are typically the major firm objectives that drive strategic behavior.</td>
<td>An organization will enter into an IR if the financial benefits of doing so exceed the costs. IR strategies may increase the ability of a firm to deliver superior products and services efficiently or work to decrease competition in an industry.</td>
<td>Bakman (1965); Berg &amp; Friedman, (1977); Harrigan (1988); Mead (1967); Koh &amp; Venkatraman (1991); Rockwood (1983); Shan &amp; Hamilton (1991)</td>
</tr>
<tr>
<td>Stakeholder Theory of the Firm</td>
<td>Organizations are at the center of an interdependent web of stakeholders and have responsibility to consider the legitimate claims of their stakeholder when making decisions and carrying out business transactions</td>
<td>Organizations forms alliances, also called networks or constellations, to align their own interests with the interests of stakeholders and also to reduce environmental uncertainty.</td>
<td>Axelrod, Mitchell, Thomas, Bennett &amp; Bruderer (1995); Freeman (1984, 1994); Harrison &amp; St. John (1996); Jarillo (1988); Jones, Hesterly, &amp; Borgatti (1997); Lorenzoni &amp; Ornati (1988).</td>
</tr>
<tr>
<td>Organizational Learning</td>
<td>Concerned with the processes that lead to organizational learning. A key factor is absorptive capacity, which is defined as a firm’s ability to recognize the value of new knowledge, assimilate it, and apply it in a business setting.</td>
<td>Absorb as much knowledge as possible from IR partners, thus increasing organizational competences and ultimately adding value to the organization.</td>
<td>Doz (1996); Gulati (1999); Hamel (1991); Inkpet &amp; Crossan (1995); Lane &amp; Lubatkin (1998); Larsson, Bengtsson, Henriksson, &amp; Sparks (1998); Mowery, Oxley, &amp; Silverman (1996); Powell, Koput, &amp; Smith-Doerr (1996); Kumar &amp; Nii (1998); Simonin (1997)</td>
</tr>
<tr>
<td>------------------------</td>
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</tr>
<tr>
<td>Institutional Theory</td>
<td>Suggests that institutional environments impose pressures or organizations to appear legitimate and conform to prevailing social norms.</td>
<td>Organizations from IRs to obtain legitimacy or as a result of succumbing to isomorphic pressures by mimicking firms that have established IRs.</td>
<td>Baum &amp; Oliver, 1991; DiMaggio &amp; Powell (1983); Kraatz (1998); Madhavan, Koka, &amp; Prescott (1998); Meyer &amp; Rowan (1977); Scott &amp; Meyer (1983)</td>
</tr>
</tbody>
</table>

Source: Barringer and Harrison (2000), page 370
The positioning and limitations of the present study is more specifically defined in relation to the studies in table 3 (Barringer and Harrison, 2000, page 385). The studies which are relevant for defining the positioning and limitations of the present study are as follows: knowledge sharing is needed for gaining access to particular resources, learning and speed to the market. The present study is linked to the above-mentioned categories of studies (Barringer and Harrison (2000) by prioritizing the need to study the role of knowledge sharing as inter-firm strategic control behavior among MNEs:

In the present study we have analysed the firm’s external resources in exchange among inter-firm cooperative relationships to overcome perceived network uncertainty. Firms with complementary skills, such as one firm that is technologically strong and another that has market access, partner to increase speed to the market in hopes of capturing first-mover advantages. In the present study we analysed the firm’s external resources within the context of relationship based knowledge sharing factors in alliance formation and subsequently, knowledge sharing as inter-firm control behaviour. Within the context of the first research objective, the resource dependency theory is applied to analyse the control behaviour of the firm.

Firms form inter-organizational relationships to gain access to a particular resource, such as capital, employees with specialized skills, knowledge of the market, or a modern production facility. Further inter-organizational relationships provide the participants the opportunity to learn from their partners. This learning is often about manufacturing, product development or human resource management. Within both categories of the study it is clear that the perceived deficiency of resources is related to the possibility of acquiring another firm’s internal resources through an inter-organizational relationship. In the present study we analysed a firm’s internal resources within the context of resource based knowledge sharing factors in alliance formation and subsequently, knowledge sharing as inter-firm control behaviour. Within the context of the second research objective, the resource and knowledge based view of the firm is applied to analyse the control behaviour of the firm.

The framework in the present study is based on resource dependency theory. Resources and a knowledge based theory of the firm provides the opportunity for building new understanding for analysing the factors that influence the sharing of knowledge between alliance partners and how these influence inter-firm control behaviour. The present study combines the literature from resources and knowledge based view of the firm within the context of resource dependency theory to extend the analytical discussion based on the research problem and objectives of the study. We believe that combining these theories is an opportunity to theory development which is a necessary step to sufficiently handle the research objectives in the theoretical and empirical parts of the study.
<table>
<thead>
<tr>
<th>Potential Advantage</th>
<th>Description</th>
<th>Representative Studies and Conceptual Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain access to a particular resources</td>
<td>Firms from inter-organizational relationships to gain access to a particular resource, such as capital, employees with specialized skills, intimate knowledge of a market, or a modern production facility.</td>
<td>Chi, 1994; Blodgett, 1991; Faulkner, 1995; Hagedoorn, 1993; Harrigan, 1986; Hennart, 1988; Berg, Duncan &amp; Friedman, 1977</td>
</tr>
<tr>
<td>Economics of scale</td>
<td>In many industry, high fixed costs require firms to find partners to expand production volume.</td>
<td>Harbison &amp; Pekar, 1988; Grandori, 1997; Mohr &amp; Speckman, 1994; Culpan, 1993; Larson, 1991; Contractor &amp; Lorange, 1988; Hennart, 1988.</td>
</tr>
<tr>
<td>Risk and cost sharing</td>
<td>Inter-organizational relationships allow two or more firms to share the risk and cost of a particular business endeavour.</td>
<td>Bartholomew, 1997; Hamel, Doz, &amp; Prahalad, 1989; Kogut, 1988; Contractor &amp; Lorange, 1988; Ohmae, 1987; Mariti &amp; Smiley, 1983; Rockwood, 1983.</td>
</tr>
<tr>
<td>Gain access to a foreign market</td>
<td>Partnering with a local company is often the only practical way to gain access to a foreign market.</td>
<td>Doz &amp; Hamel, 1996; Lianeze &amp; Garcia-Canal, 1998; Parkhe, 1993; Hara &amp; Kanai, 1991; Tallman &amp; Shenkar, 1994.</td>
</tr>
<tr>
<td>Product and/or service development</td>
<td>Inter-organizational relationships provide firms the opportunity to pool their skills to develop new products and/or services.</td>
<td>Deeds &amp; Hill, 1996; Kotabe &amp; Swan, 1995; Hatfield &amp; Pearce, 1994; Hamel, Doz, &amp; Prahalad, 1989; Morris &amp; Hergert, 1987.</td>
</tr>
<tr>
<td>Learning</td>
<td>Inter-organization relationships often provide the participants the Opportunity to &quot;learn&quot; from their partners (e.g. lean manufacturing, product development, human resource management in an unfamiliar country).</td>
<td>Bartholomew, 1997; Doz, 1996; Fowells, Koput, &amp; Smith-Doerr, 1996; Inkpen &amp; Crossan, 1995; Hamel, 1991; Hamel, Doz, &amp; Prahalad, 1989; Kogut, 1988</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>References</td>
</tr>
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<td>--------------------------------</td>
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</tr>
<tr>
<td>Speed to market</td>
<td>Firms with complementary skills, such as one firm that is technologically strong and another that has strong market access, partner to increase speed to market in hopes of capturing first-mover advantages.</td>
<td>Doz &amp; Hamel, 1998; Faulkner, 1995; Badaracco, 1991; Larson, 1991; Hamel, Doz, &amp; Prahalad, 1989.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Inter-organizational relationships provide a valuable alternative to markets and hierarchies, and are subject to fewer regulatory concerns than acquisitions.</td>
<td>Badaracco, 1991; Hennart, 1988; Jarillo, 1988; Kanter, 1989; Powell, 1990; Segil, 1998.</td>
</tr>
<tr>
<td>Collective lobbying</td>
<td>Organizations from inter-organizational relationships to increase their collective clout and pressure their governments into adapting policies favourable to their industries.</td>
<td>Aldrich &amp; Mueller, 1982; Alter &amp; Hage, 1993; Gupta &amp; Lad, 1983; Kanter, 1989; Oliver, 1990.</td>
</tr>
<tr>
<td>Neutralizing or blocking competitors</td>
<td>Through an inter-organizational relationship, firms can gain the competencies and market power that is needed to neutralize or block the moves of a competitor.</td>
<td>Badaracco, 1991; Koh &amp; Venkatraman 1991; Shapro &amp; Willing, 1990; Ohmae, 1989; Contractor &amp; Lorange, 1988.</td>
</tr>
</tbody>
</table>

Source: Barringer and Harrison (2000), page 385
It is expected that the control dimension(s) are likely to differ in the case of vertical and horizontal alliances. Figure 5 shows vertical alliances which occur when firms cooperate across different levels of the value-added chain. Figure 6 shows horizontal linkages occurring at the same level. Vertical linkages are distribution or out-sourcing arrangements. Common horizontal linkages would include R&D consortia, patent swaps, knowledge transfers, and cooperative arrangements, which would be likely to supplement the internal knowledge base among cooperative partners. Alliances between competitors are also referred to as horizontal alliances (Burgers, Hill and Kim, 1993). They can be distinguished from vertical alliances between firms operating in the adjacent stages of a value chain (Harrigan, 1988). Hagedoon (1993) estimates that R&D horizontal consortia and research cooperation, including joint R&D agreements and equity investments, are in over 85 percent of cases motivated to improve the long-term technological prospect of the product market combinations of the companies. On the other hand, only a small portion of vertical linkages and distribution agreements are designed for such a purpose.

Figure 5 Inter-organizational relationships in a vertical alliance

Figure 6 Inter-organizational relationships in a horizontal alliance

The empirical setting of the study will analyze the elements of inter-firm control presented in the research objectives. Based on current literature, the inter-firm control element in vertical alliances is likely to be characterized as dealing with perceived deficiency of resources. Whereas the control element in horizontal alliances is likely to characterized as dealing with perceived business network uncertainty.
1.5. Structure of the study

The first chapter began with a presentation of the background and importance of the present study. In the next sections key terms of the study are discussed (a) knowledge, (b) knowledge sharing, (c) cooperative alliance partners, and (d) strategic alliances. After this the research question, research objectives are analyzed. This is followed by the scope, positioning and limitations of the study. The last section of this chapter presents the structure of the study.

In the second chapter the theoretical approaches dealing with the perspective of firm boundary decisions (e.g., contractual alliances or JVs alliances) are analyzed. These theoretical approaches are transaction cost economics, network approach, resource/knowledge based perspective of the firm, and resource dependency theory. This analysis reveals that the learning theory or knowledge based perspective of the firm and resource dependency theory are the most suitable theories for analyzing the research problem and objectives within the presented scope and limitations of the present study.

In the third chapter the perspective of knowledge sharing as firm boundaries and inter-firm cooperation in strategic alliances are presented. First sections of the chapter deals with knowledge sharing in inter-firm cooperation and knowledge sharing in inter-firm JV strategic alliances. This is follows by knowledge based perspective of strategic alliance inter-firm knowledge sharing. The last sections of the chapter deals with strategic alliances and inter-firm control as firm boundaries and types of control in joint venture and contractual alliances. The main purpose of this chapter to understand the emerging knowledge sharing perspective within strategic alliances literature and understand that how control is seen in inter-firm alliances.
Figure 7  Structure of the study

The fourth chapter presents the analytical framework of the study. Framework, model and a priori assumptions provide a solid foundation for conducting the empirical-part of the study. The framework is based on a priori assumptions and a model. A priori assumptions are presented in order to introduce a tentative framework of the study. The aim is to devise an in-depth description of the factors of knowledge sharing introduced in the tentative framework based on an extensive literature review and then to communicate a final model following the empirical part of the study. Chapter Five presents the research methodology and empirical setting of the study. The first section analyzes the introduction, philosophical stance and research strategy in the present study. This is follows by the information about the empirical research process, data analysis and use of Nvivo. The last section of the chapter provides an overview of selected case and related industry description, and strategic alliances analyzed in the case study. Chapter Six describes the empirical results examined in the study (e.g., case evidence). The first section represents the case evidence with specific reference to the analytical-framework. This is followed by the views from the alliance partners of STMicroelectronics. The last section of the chapter provides an overview of partners characteristics and control behavior. This section provides a holistic perspective about relationship based control and resource based control. Chapter seven is the concluding chapter. The first sections presents the results of the study in comparison to theoretical framework of the study. Based on the findings of relationship based control and resource based control, a extended theoretical framework is presented to understand the knowledge sharing as control in inter-firm cooperation. This is follows by the
conclusions in relation to previous studies. The last sections of the chapter are to
discuss the summary, managerial implications and suggestions for future research.

To summarize, the first chapter began with a presentation of the background and
importance of the present study. The dynamics of International strategic alliances
(ISAs) and how control is conceptualized in strategic alliance literature and present
study were discussed. In the next sections key terms of the study were introduced (a)
knowledge, (b) knowledge sharing, (c) cooperative alliance partners, and (d) strategic
alliances. The key terms provide the definitions of the major concepts utilized in the
study. The research question and research objectives were subsequently analyzed,
providing an overview of the setting of the present study and why it is interesting to
analyze the research question and objectives. The scope, positioning and limitations of
the study followed this and then established the foundations of the analytical
framework and the connections to present and previous studies. The chapter is
concluded with the structure of the study. As a whole, this chapter provides a solid base
for the other chapters of the thesis.
THEORETICAL APPROACHES TO FIRM BOUNDARIES DECISION

In this chapter we have described different theory to analyze inter-firm control behavior. From this point of view our focus in the present chapter is to analyze inter-firm cooperative relationships as focal firm boundaries in relation to its buyers, suppliers and competitors. In this context the firm’s boundary decisions (e.g., contractual alliance, JVs alliance, JV consortium alliance) are analyzed in the context of (a) transaction cost economics theory, (b) network approach, (c) resource dependency theory, and (d) combining resource dependence theory with the knowledge based theory of the firm as foundation of analytical framework. These are the major theories utilized in earlier studies to analyze inter-firm cooperative and competitive behavior as the basis of firm boundary decisions. First, the different theories are analyzed in relation to the firm’s boundaries or control decisions which are followed by a critical analysis based on literature and the author’s perspective.

Cray (1984, p.85) argues that “for any large complex organization the problem of ensuring that its constituent parts act in accordance with overall policy is a central and continuing concern”. Many high-tech industries are large organizations consisting of complex inter-firm cooperative relationships, where control over the operations between the focal firm and its partners are a significant factor for successful implementation of competitive and cooperative strategies. Thus, inter-firm control is a significant issue among independent firms linked in a value creation process within a business network.

2.1. Transaction cost economics and the firm’s boundary decisions

In TCE (Williamson 1975, 1985, 1991) the coordination of cooperation and competition is to a great extent related to price mechanisms (Stigler and George, 1966). TCE analyzes the firm’s boundary decisions within the context of optimizing transaction specific investments for economizing on transaction costs. Therefore, the nature of cooperative relationships is transactional and related to the continuous estimation of transaction costs as criteria for maintaining cooperative relationships with other firms. Further, the nature of the firm’s cooperative institutional form (e.g., contractual alliance, JV alliances, and JV consortium alliances) is likely to influence transaction costs. Thus, TCE theory is useful in terms of (1) how an organization should organize its boundary-spinning activities so as to minimize the sum of its production and transaction costs, and (2) what institutional forms (e.g., organizational boundaries as contractual or JV alliances) are suitable in different situations.

Transaction cost theory explains that the production costs in organizations could differ as a result of (i) the scale of their operations, (ii) learning and experience efforts, (iii) location advantages (e.g., market position), and (iv) propriety influences such as patents and trade secrets. Other factors that could influence transaction costs also include expenses associated with arranging, managing and monitoring transactions across markets (Child & Faulkner, 1998; Kogut, 1988). In this context the potential of a trading partner to exhibit opportunistic behavior, defined as behavior that is self-interested or deceptive, drives transaction costs higher.

Thus, transaction-cost theory, as formulated by Williamson (1975, 1979, 1985, 1991), among others, begins with the axiom that man is characterized by ‘bounded rationality’
and 'opportunism'. As mentioned earlier, theory endeavors to answer the question of what institutional form provides the most efficient exchange (e.g., inter-firm control) under conditions of bounded rationality and opportunism. The "transaction costs" are analyzed with respect to the three following dimensions:

The first dimension is asset specificity. This refers to the dependence (i.e., inter-firm control) created through transaction-specific investments. It expresses the amount of value arising from the parties having made investments in the exchange, and from the costs that would be incurred through terminating the relationship and choosing another exchange party. The second dimension is uncertainty, inherent in situations in which bounded rationality makes humans incapable of predicting the future. The third dimension is frequency; referring to how frequently the transaction occurs. Based on the above dimensions of TCE theory, we could safely argue that TCE clarifies the following dimensions of transaction cost specific inter-firm control behavior: The market governs those transactions that are characterized by a low level of transaction-specific investments. On the other end of the continuum, ranging from low to high transaction-specific investments is hierarchical based control. Institutional form as 'hierarchical based control' is capable of dealing with opportunism and bounded rationality under conditions where transaction-specific investments are high. Hence, with the recognition that 'markets' and 'hierarchies' by no means constitute a mutually exhaustive set of institutional forms for governing and "controlling" transactions, there have been numerous attempts to develop alternative forms: Williamson (1975, p. 41) introduced the peer group as the simplest alternative to the market. The collective organization offers scale, information, risk, and associational advantages, but "is itself best with numerous transactional difficulties." Williamson suggests that the peer group's vulnerability to opportunistic free rider abuses and costly decision-making processes makes its substitution by simple hierarchies advisable.

Building on contract law, Williamson (1979, 1985) adds the bilateral and trilateral forms, which he sees as providing for the efficient governance of transactions with an intermediate degree of transaction-specific investment and of frequency, whereas considerations of bilateral form on efficiency govern recurring transactions of moderate specificity: Williamson views the third-party assistance implicit in the trilateral form as being useful in the case of occasional transactions that are of medium to high specificity. Williamson (1991) also introduced the hybrid as an intermediate forms between the market and the hierarchy. It involves reciprocal trading, regulation, franchising, and various forms of long-term contracting. Relative to the two main polar forms, the hybrid form is intermediate in the adaptability, incentive intensity, and administrative control it provides.

Other TCE researchers have developed concepts of inter-firm alternative institutional forms. Such attempts can be traced back to the early works of Clark (1965), Warren (1967), and Richardson (1972). Chandler and Daems (1979) proposed that inter-agency 'control' arrangements be added to the price mechanism of markets and administration of managerial hierarchies as a means of coordination, allocation, and monitoring within economic systems (Daems, 1983; Powell, 1991). Another institutional form, which is probably best known, is Ouchi's (1980) clan. Ouchi (1980) suggests that 'clan based control' may be a viable form when performance ambiguity is so high that not only markets but also hierarchies fail to mediate exchanges due to difficulties in measuring the contributions of different parties. Clan based inter-firm control overcomes this performance ambiguity through socializing its members towards goal congruence. Hence, the threat of free rider abuses is avoided by depending on the general assumption of opportunism. Jörgensen, Hafi, and Kiggundu (1986) refer to Ouchi in
considering (i) culture, (ii) organizations, and (iii) markets, as the three basic coordination mechanisms. For example when we consider the role of culture in regulating social transactions, it is seen as prescribing legitimate behavior in the form of its embodied traditions, norms, and rules. Hence, it is uncertain whether the numerous labels and conceptualizations aim at capturing substantially different phenomena or are merely the result of research fragmentation. Hence, while dealing with issues of inter-firm control within the context of firm boundaries decisions, Ouchi’s (1977, 1980) studies are considered as classics, which analyze the relationships among firm structure and organizational control choices. These studies clarify the firm’s control choices as (i) market, (ii) bureaucracies, and (iii) clan

Therefore, Maitland, Bryson and Van de Van (1985) have compared Ouchi’s (1980) and Williamson’s (1991) points of view. Their conclusion is that ‘any union between the two perspectives is bound to be scientifically barren’ (p. 64). The reason would be the radical incompatibility of assumptions: for Williamson, opportunism is the key motivator; for Ouchi, it would be ‘fairness’. But this is a simplistic, deterministic view. However, TCE and Ouchi’s work are connected together in the literature.

2.2. Critical analysis of transaction cost economics theory

However, numerous criticisms have been also leveled at the transaction-cost theory: It fails to consider matters of power and trust (Bradach and Eccles, 1989; Cook and Emerson, 1984; Francis, 1993; Granovetter, 1985; Leblebici, 1985; Perrow, 1981, 1986), which could significantly influence the coordination and control of value creation activities among firms. It has unrealistic assumptions regarding human behavior (Bauer and Cohen, 1983; Donaldson, 1990a, 1990b; Dugger, 1983; Etzioni, 1988; Granovetter, 1985), as humans are rational enough to calculate the transaction costs involved among parties in an exchange or set of complex exchange relationships. Many have also noted that there is a lack of a clear definition of the core concept of transaction cost (e.g., Perrow, 1986; Blois, 1990).

In the presence of small numbers of buyers and sellers, markets are seen as a network tradition (Johanson and Mattsson, 1993). This view is important for a knowledge based economy, where there are small numbers of buyers and suppliers for a given product or service procurement, even on the global scale of a business network. A TCE inter-firm boundary perspective is quite useful for industrial-age firms (e.g., the petrochemical and automobile industry, among others), where production inputs and the structure of the industries (Porter, 1985) are well defined and therefore the standard technology and standard human skills are sufficient to perform operations across the organizational boundaries. However, given the nature of the research problem/research objectives, and subsequently the selection of the semiconductor industry (e.g., in terms of rapidly changing knowledge and R&D intensive industry) as the empirical part of this study, the TCE could not be utilized as the basis for building the analytical framework. In the present study we have been dealing with very dynamic industry conditions (e.g., microprocessor and semiconductor industrial applications for the electronics and wireless industries).

2.3. Network approach and firm boundary decisions

Thorelli (1986) sees ‘networks’ as something between markets and hierarchies. Firms act in a complex environment, where no firm can really be understood without
reference to its relationships with many others: Thorelli (1986) recognizes that, instead of network, he could have used the term 'system', but it was a 'tired term' (p. 39), and in this sense he was basically describing reality, more than conceptualizing it. Johanson and Mattsson (1985, 1988) use the concept of network to define industrial markets. Networks are seen as complex arrays of relationships between firms. Firms establish those relationships through interactions with each other. These interactions imply investments to build the relationships, which give consistency to the network. Competing is more a matter of positioning one's firm in the network than attacking the environment. Thus, care of the relationships becomes the priority of management for effective cooperation and competition or simultaneously both cooperating and competing (i.e., coopetition).

Network is a mode of organization that is not based strictly on the price mechanism, or on 'hierarchical fit' (Williamson, 1975: 101), but on coordination through interaction and adaptation (Johanson and Mattsson, 1985; among others). Therefore, the network model of actors' activities and resource coordination through interaction and adaptation can seen as the basis of a firm or firm's network boundary decisions (i.e. strategic networks).

Turnbull (1993) clarifies why personal contacts are at the heart of interaction between organizations. Håkansson and Johanson (1992) also stated that industrial networks emerge and develop as a consequence of interaction between semiautonomous, interdependent industrial actors. Actors memorize their interaction in an industrial network, which is a product of their history. Companies influence and adapt to each other's ways of performing activities by exchanging resources, products and services, as well as developing bonds with each other. Håkansson (1987) describes the network model as consisting of an actor, an activity, and a resource (see Figure 8.). The actors, activities, and resources framework is widely utilized within the interaction and network approaches.
In an interaction and network approach a relationship develops between two companies as some activity links, resource ties or bonds are formed between two companies. These links, ties and bonds make up a relationship that can be conceived as a ‘quasi-organization’ or governance structure (i.e. conceptualization of firm boundary in interaction and network approach). [e.g., Håkansson (1982); Hardwick and Ford (1986); Håkansson (1987); Wilson and Möller (1988); Kock (1991); Axelsson and Easton (1992); Håkansson; Snehota (1995); Bengtsson, Eriksson and Kock (2005); Baraldi and Strömsten (2008); Lee, Ghauri and Hadjikhni (2007)].

The propositions of the network model can at this point be summarized as follows:

Business organizations often operate in a context in which their behavior is conditioned by a limited number of counterparts, each of which is unique and engaged in pursuing its own goals. In relation to these entities, an organization engages in continuous interactions that constitute a framework for exchange processes. Relationships make it
possible to access and exploit the resources of other parties and link the parties' activities together.

The distinctive capabilities of an organization are developed through its interactions in the relationships that it maintains with other parties. The identity of the organization is thus created through relations with others. Since the other parties to the interaction also operate under similar conditions, an organization’s performance is conditioned by the totality of the network as context, i.e., even by interdependences among third parties.

The definition of a “boundary”, when applied to any social system, is naturally quite arbitrary (Hall and Fagen, 1956) and depends on the interactions and aims of the observer. When the perspective of management is adopted, as in strategy management doctrine, the intention is to embrace within the boundaries of the organization those resources and activities that can be controlled and influenced by the organization, and to leave outside those that cannot be influenced. This control is assumed to be necessary in order to adapt and relate efficiently to the environment. An organization's boundaries should thus be set as conterminous with the limits to its activity control: “the organization ends where its discretion ends and another begins” (Pfeffer and Salancik, 1978, p. 32). The network view of the organizational context has considerable bearing on the problem of boundary setting, namely the interrelatedness that prevails in networks and the possible impact on the focal organization of relationships among third parties.

The importance of resources and activities “external” to the traditional boundaries of the organization, and the interrelatedness with relationships to third parties, has been documented in studies that focus on the process of technology diffusion and technology development (von Hippel, 1982; Håkansson, 1987) and in some research on growth patterns in new-venture organizations (Lorenzoni and Ornati, 1988). In view of the role of “external” resources and interdependences stressed in the network view of business organizations, it becomes meaningless and conceptually impossible to disconnect the organization from its context. The organization appears without boundaries in as much as it is to a certain degree constituted by resources and activities controlled by other parties forming the network, and exists only in the perceptions of other parties. It develops its distinctive capabilities (e.g., core competencies) in relationships with others. The organization is constrained in the exercise of its discretion and therefore is always engaged in attempts to create so-called monopoly power within its given business networks.

2.4. Critical analysis of network approach

The preceding paragraph points out some of the first pioneering theoretical elements, which are used in the conceptualization of networks (e.g., networks are an intermediate form among markets and hierarchies). Therefore, some of the so-called ubiquitous characterization of markets and hierarchies (Williamson, 1975) will serve as a starting point: Williamson’s main insight (1975), derived from Coase (1937), was to see ‘markets’ and ‘hierarchies’ as two alternative modes of coordinating economic activities. It is assumed that the most efficient mode for a particular kind of transaction will prevail. In the classical theory the advantages of a total ‘de-integration’ (e.g., non-hierarchy or market) seem clear. So much so that the original question posed by Coase was, indeed, why are there firms at all, instead of just a market of separate economic atomistic units? Hence, to understand the nature of control required for effective
coordination, Ouchi (1980) proposed breaking ‘hierarchies’ down into two different categories: ‘bureaucracies’ and ‘clans’.

The first type (i.e. bureaucracies) would have some of the characteristics of markets: the ‘congruence of goals’ could be very low, but the organizational form would still be that of a firm. Clan, on the hand, would be much closer to eliminating transaction costs, because the congruence of goals would allow the firm to do without much of the supervision found in a ‘bureaucratic’ company. Hence, the prominent ‘transaction costs’ avoided by the ‘clan’ would be needed to ascertain how much each participant should be compensated.

Figure 9  The four modes of organizing economic activity

Source: Jarillo (1988) page 34

Figure 9 represents the four ‘modes’ [i.e., (i) classic market, (ii) bureaucracy, (iii) clan, and (iv) strategic networks] of organizing complex economic activities. The upper-left corner of the matrix thus formed would truly be what Williamson called ‘markets’, i.e., an organizational arrangement where many players interact on a spot basis. The lower-left quadrant would be exemplified by an antagonistic labor-management relationship (e.g., bureaucracy). It is, from a formal point of view, a hierarchal organization, but many of its characteristics - particularly those referring to transaction costs - are those of an open market. The third quadrant, ‘clans’ as Ouchi called it, is probably the closest thing to what a Williamsonian (1975) hierarchy would be in real life: long-term relationships, carried out through non-specified contracts within the formal environment of an organization. Finally, Jarillo (1988) called the upper-right quadrant ‘strategic networks’. In them, a ‘hub’ firm has special relationships with the other members of the network. Those relationships have most of the characteristics of a ‘hierarchical’ relationship: relatively unstructured tasks, a long-term point of view, relatively unspecified contracts. These relationships (i.e., strategic networks) have all the characteristics of ‘investments’, since there is always a certain ‘asset specificity’ to the know-how of, say, dealing with a given supplier instead of a new one. And yet the ‘contracting parties’ remain as independent organizations, with few or no points of contact along many of their dimensions. Jarillo (1988) commented that the entrepreneur can affect the way the relationship is shaped, and in the same way that a conscientious manager can create a ‘clan atmosphere, an inter-organizational relationship can be based on (a) perceived goal congruence, and (b) trust.
Actually, when the relationship is viewed as valuable in itself, then unforeseen future development possibilities are also valuable. Therefore, it is possible to relax the assumptions about human behavior (e.g., opportunism and self-interest), as human behavior is seen as being largely influenced by (a) perceived goal congruence and (b) trust. Within this view, Ouchi (1980) and Jarillo (1988) also attempt to understand how networks can be stable as a result of cooperative efficiency. But stability in a network does not necessarily mean that the network is economically efficient in a competitive sense with other competing networks (e.g., Barnard, 1968).

However, according to Williamson (1979) lack of trust is the quintessential cause of transactional costs. For example, ‘opportunism is a central concept in the study of transaction costs’ (Williamson, 1979: 234), which poses a real danger to the stability of network, whenever there are ‘appropriate quasi-rents of specialized assets’ (Klein, Crawford and Alchian, 1978). This is one of the major criticisms of the network approach. Hence, the network approach argues that entrepreneurial skills are required in order to maintain (a) trust among members towards the organization, and (b) individual alignment with the goals of organization (e.g., the maintenance of internal contacts). These will significantly lower the transaction costs (e.g., the maintenance of external contacts) and thus make the existence of the network economically feasible.

In a nutshell, trust is a tricky concept in itself, but is, however, an important concept of network approach within an entrepreneurial context. Thorelli (1986: 38) has defined trust as "an assumption or reliance on the part of A if either A or B encounters a problem in the fulfillment of his implicit transactional obligations. In this situation B may be counted on to do what A would do and it is assumed that the decision rule to be followed will be identical to my own decision rule". These arguments deal with the function of trust within organizations, which are seen as essential to a network approach. In fact Williamson (1979: 241) also accepted that, other things being equal, idiosyncratic exchange relations (i.e., transactions involving specific assets) which feature personal trust will survive greater stress and display greater adaptability. This is also consistent with work in the field of agency theory, which shows that long-term contracts are easier to enforce than spot ones (Fama, 1980; Lambert, 1983; Radner, 1981, 1985). It provides the possibility of playing future valuable games which could modify the solution for a 'prisoner's dilemma' in a cooperative way (Jarillo and Ricart, 1987). In this view, if the network is perceived as positive, a desire to remain in the network discourages firms from engaging in narrow, self-serving opportunistic behavior (Maitland, Bryson, Van De Ven and Walker, 1984).

The present study does not deal with the issues of trust within an entrepreneurial context, nor is it an analysis of network business relationships involving actors, activities and resources. Rather, it is the resources within relationships that is of most concern. Therefore in this view, given the nature of the research question and research objectives, the analytical framework in the present study is not based on the network approach.

2.5. Resource dependency theory and firm boundary decisions

Resource dependency theory (Peffer, 1972; Peffer and Salancik, 1978; Peffer 1987) represents an important dimension to the issue of control through characterizing power-dependence relationships among firms as the basis of firm boundary decisions. The theory places emphasis on organizational effectiveness through maintaining favorable power-dependence relationships to buyers, suppliers and competitors within
Resource dependence theory views the market environment as a set of organizations that engage in exchange relationships with one another (Thompson, 1967). Organizations engage in resource exchange relationships because no one organization possesses a sufficient amount of every resource needed. Thus, a set of organizations that directly affect the goal attainment of an organization is important for survival. Organizational survival (e.g., effectiveness) depends on a stable flow of resources, which in turn depends on the degree to which the focal organization exercises control over the total set of inter-structured activities. Resource dependence theory is rooted in an open system framework, which argues that organizations must engage in exchanges with their environment to obtain resources (Scott, 1987).

The focal firm needs to successfully manage the resource dependence to (1) acquire control over critical resources in an effort to decrease dependence on other organizations, and (2) increase control over resources that increase the dependence of other organizations on them. In other words, an organization tries to increase its power (thereby reducing its dependence) relative to other organizations in its relevant environment (Pfeffer & Salancik, 1978; Thorelli, 1986). Within the view discussed, the strategy view in resource dependency theory is related to building coalitions or cooperative arrangements to control scarce resources in the environment, and as a result, gaining power. Thus, a major outcome of effective implementation of competitive strategy is maintaining an effective resource control in the environment. If scarce resources are controlled effectively, it implies that the focal firm is more independent, but ‘maximizes’ other firms’ dependence on a single or few sources of supplies controlled directly or indirectly by the focal firm.

To analyze firm cooperative behavior and subsequent boundary decisions, resource dependency theory (Pfeffer & Salancik, 1978; Thorelli, 1986) takes into consideration the role of competitive strategy linked to analyzing the firm’s environmental constraints where the firm’s environment is characterized as uncertain or unstable. Uncertain environmental conditions are, however, not consistent with a stable market perspective (Williamson, 1975:1985:1981) and the notion of stable networks (Jarillo, 1988). Therefore, to overcome the perceived constraints in an unpredictable environment, the focal firm boundary decisions are based on its power-dependence analysis in unstable environments, thus striking a favorable resource control through its strategic cooperative behavior. Although not fully explored in the dimension of the knowledge based economy (Barney, 1991; Spender, 1996; Grant, 1996a & b), the promise of the theory is that boundary decisions of the focal firm are related to the power-dependence relationship emerging from the control of scarce resources required by other firms in the environment.

Participating in inter-organizational cooperation is one important dimension to achieve a favorable resource-dependence relationship with the environment. Much of the literature in this area falls under the heading of perceived resource deficiency (Child & Faulkner, 1998). However, an organization may also seek out a partnership with another organization to gain enough market power to neutralize the motive of a competitor, or it may form an alliance to simply plug a skill or resource gap. Therefore, in either case, the organization does not perceive that it has the necessary resources to optimize its own competitive position.

Thus, forming an alliance with one or more other firms to gain access to the needed resources is often the most practical alternative (Michell & Singh, 1996) in commercializing complex goods. Therefore, an inter-organizational cooperation behavior that fits the resource dependence paradigm is that firms enter into
partnerships to take advantage of complementary assets such as (a) resources and (b) relationships (e.g., knowledge based view) and therefore build its distinctive competence.

Different types of alliances are likely to satisfy different resource and relationships needs. For example, membership in a trade association may provide an organization access to special services at low costs, relevant industry information, legal and technical advice (through a trade journal or I.D. protected website), and a platform for collective lobbying (Oliver, 1990). Similarly, membership in a research consortium may provide a firm with invaluable insight into the cutting-edge technology of its field (Browning, Beyer, & Shetler, 1995).

Another interesting extension of the traditional application of resource dependency theory to alliance formation is provided by Barney (1991, 1995). According to Barney (1991), resources can lead to sustained competitive advantage only if they are rare, valuable in the market, imperfectly imitable, and non-substitutable. However, there are two ways that inter-organizational cooperation are unique in their ability to produce resources (such as new products or services) that fit these criteria:

First, inter-organizational cooperation often brings together diverse standards of knowledge that no single firm could muster. This is the case of research consortia or multi-firm alliances (Dyer & Singh, 1998). For example, in the early 1990s, Kodak led an alliance that included Fuji, Canon, Minolta, and Nikon to create the Advance Photo System, which is a technology that allows a person using a camera with a fixed lens to switch back and forth among standard, close-up, and wide-angle pictures. According to Harbison and Pekar (1998), this technology could only have been developed through the combined efforts of this collection of companies. The second way that inter-organizational cooperation may be unique in the ability to create resources that are rare and imperfectly imitable is through combining the efforts of firms that possess unusual market power, prestige and also local market knowledge as critical success factors. For example, Wal-Mart (the largest retailer in the U.S.) has an equity joint venture with Cifra (the largest retailer in Mexico) to develop retail stores in Mexico that are similar to Wal-Mart stores in the U.S., among other world-side expansions (Harbison & Pekar, 1998). No other two firms could replicate the combination that this joint venture has in terms of Wal-Mart’s market power and experience in discounting retailing combined with Cifra’s name recognition in Mexico and understanding of the Mexican market.

In the perspective of the study, the earlier examples also characterized the cooperative behavior of the focal firm to further accumulate the control of rare, imperfectly imitable and non-substitutable market resources (Barney, 1991) through contractual and JV alliances and also mergers & acquisitions (M&As). In the present study, the focal firm attempted to control its environment via controlling scarce sources (e.g., firm-specific knowledge and firm-specific relationships) and therefore maintain a favorable market position. However, controlling the behavior of cooperative firms (e.g., law-suit against Microsoft presented at the European Court of Justice for its anti-competition cooperative behavior) can be questioned on the basis of anti-competition and anti-trust laws (Joseph, 2005).

Pfeffer and Salanick (1978) assert that organizational survival depends on the acquisition of scarce and valued resources from the environment in a stable and low cost manner. Strategies that maximize an organization’s inter-organizational power presumably yield such desired relations. For example, if for some reason one firm is highly dependent on a second for a particularly scarce and valuable resource, the first
might acquire the second in order to ensure stable, low cost supplies. The acquisition shifts power away from the second firm and centralizes power in the former firm. For example, such upstream integration to ensure stable supply relationships was practiced by General Motors in acquiring Fisher Auto Body in the 1920’s (Chandler, 1962). In these situations, power is centralized in the acquiring firm, and the likelihood of a stable supply relationship is enhanced.

Resource dependency theorists have emphasized power maximization strategies, that is, strategies that centralize power in one or a set of firms. Such strategies represent a movement away from an abandonment of market forces between firms. However, other theorists recognize that power centralization sometimes will be necessary to ensure efficient supply relations.

2.6. Critical analysis of resource dependency theory

It is recognized by resource dependency theorists that under conditions of moderate or low exchange complexity or uncertainty, market forces will ensure efficient supplies. Williamson’s (1979, 1981) work could be useful to specify the conditions under which centralized power governance mechanisms or decentralized market forces will be most appropriate in developing and maintaining low cost, stable supply relations.

The following examples (Case scenarios 1 & 2) are useful to understand control within power-dependence vs. TCE perspectives (Ouchi, 1980):

Suppose a semiconductor manufacturer develops a unique product that a computer manufacturer designs into its new machines. Using a power perspective, the computer firm, in order to ensure low cost and stable supplies, could acquire the semiconductor firm or the firm’s technology and build the desired chip itself. Such a centralization of power through vertical integration would be necessary to avoid becoming dependent on one single autonomous semiconductor firm.

From a TCE perspective also, one could argue for vertical integration or centralization of power (e.g., vertical integration or centralization of power via mergers and acquisitions). However, a market alternative also exists. Instead of acquiring the firm, the computer manufacturer could require the semiconductor firm to license another semiconductor firm to fabricate the product. In other words, the computer firm could attempt to develop a market situation with alternative suppliers, and thus assure low cost, stable supplies through competitive market forces.

Such second source relations are quite common in the electronics industry (“Semiconductor Rivals,” 1981). Within the efficiency framework, the choice between centralized (i.e. bureaucracy or clan) and decentralized (i.e. market) governance mechanisms depends on the characteristics of the transaction itself. An efficiency analysis generally is not bound to the consideration of different types of centralized power relations to ensure stable resource acquisition relations; it may also consider decentralized market forces.

In the context of the examples presented above, it is important to explain a comparative view of resource dependency and transaction costs economics theories (see Table 4)
Table 4  Comparison of Resource Dependency and TCE Perspectives

<table>
<thead>
<tr>
<th>Issues</th>
<th>Resources Dependency Perspective</th>
<th>Transaction Costs Economics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational success:</td>
<td>Maximize organizational power</td>
<td>Maximize organizational efficiency</td>
</tr>
<tr>
<td>Organizational concept:</td>
<td>Coalitions acquiring resources</td>
<td>Mediator between parties involved in economic transaction</td>
</tr>
<tr>
<td>Assumptions:</td>
<td>1. Organizations are comprised of coalitions.</td>
<td>1. Study transactions between organizations.</td>
</tr>
<tr>
<td></td>
<td>2. Environment contains scarce and valued resources. Environment is uncertain.</td>
<td>2. Identify alternative governance mechanisms (market, bureaucracy, clan).</td>
</tr>
<tr>
<td></td>
<td>3. Organizations gain power by controlling resources to minimize their dependence.</td>
<td>3. Assess transaction characteristics.</td>
</tr>
<tr>
<td></td>
<td>4. Controlling resources to maximize others’ dependence on them.</td>
<td>4. Match governance mechanism to transaction characteristics to get lower transaction cost.</td>
</tr>
<tr>
<td>Literature:</td>
<td>Sociology and political science</td>
<td>Economics</td>
</tr>
</tbody>
</table>


2.7. Combining knowledge based perspective and resource dependency theory

In the quest for finding an appropriate theory to increase our understanding of the research question and research objectives, the resource dependency theory along with the resource /knowledge based view of the firm are combined to build the analytical framework.

To discuss the knowledge based view of firm behavior, the point of departure is the resource-based view of the firm (Penrose, 1959; Wernerfelt, 1984). The resource-based approach (Penrose, 1959; Wernerfelt, 1984) is attracting the attention of a growing number of researchers, precisely because the framework encourages a dialogue between scholars from a variety of perspectives, including the knowledge based view of firm behavior (Mahoney and Pandian, 1992). For example, distinctive competencies (Andrews, 1971; Ansoff, 1965; Selznick, 1957) of heterogeneous firms are a fundamental component of the knowledge-based view of the firm, and these concepts originate from the resource-based approach. In the knowledge based view of firm behavior, our point of departure is knowledge-based intangible resources, along with the concepts from resource dependency theory, as discussed in the next section. In the following discussion the knowledge-based perspective is combined within the power-dependence framework based on the resource dependency theory. This is done to provide a solid foundation for the analytical framework in this study.
We know that knowledge is the most significant source of competitive advantage (Nelson and Winter, 1982; Grant 1996 a & b; Baden-Fuller and Pitt, 1996; Spender, J.C, 1996; Porter-Liebskind, 1996) and it provides a good point of departure for understanding the nature of competition and subsequently the power-dependence cooperative behavior of the firm in knowledge-based industries (Badaracco, 1991; Drucker, 1993). A firm with knowledge-base resources and capabilities (Barney, 2001; Eisenhardt and Martin, 2000) and absorptive capacity (prior knowledge & internal R&D; see e.g. Cohen and Levinthal, 1989, 1990; Keller, 1996) is likely to learn about its environment at a faster rate (Kraatz, 1998; Becker and Peters, 2000). The firm’s capabilities and absorptive capacity are even more valuable when the sources of competitive advantage are also outside the firm, complex in nature, thus making continuous learning important (Leonard-Baron, 1995).

However, the learning capacity of firms might differ largely (Lane & Lubatkin, 1998; Mangematin and Nesta, 1999) and it is likely that firms with knowledge-based capabilities (Kogut and Zander, 1992) and absorptive capacity might also attempt to control the critical market knowledge (Badaracco, 1991; Langlois, 1995; Larsson, Bengtsson, Henriksson and Sparks, 1998; Ohmae, 1989), e.g., building coalitions, networks and also hierarchies through contractual and JV strategic alliances, mergers and acquisitions to gaining market power (Contractor and Lorange, 1988; Joel and David, 1995; Freek and Harry, 2001). Firms differ in their market position, learning and knowledge utilization capacity. These differences are likely to influence the flow of information and strategic knowledge creation. The unequal access to information, differences in knowledge utilization capacity provide incentives to the focal-firm to influence competition to its own advantage (Kitch, 1983; Samuels, 1989; Veljanovski, 1981). This factor is even more significant in knowledge-based industries, where a firm with superior knowledge (firm-specific capabilities and absorptive capacity for effective learning) and market position (Hopkins, 1987) is likely to dominate the competition to its own advantage through its control seeking cooperative behavior (Jorde and Teece, 1990).

For example, a given superior market position will certainly facilitate greater information and knowledge access. Thus, such a market position is likely to also increase the focal-firm knowledge absorption or utilization capacity (see e.g. Cohen and Levinthal, 1989, 1990) to make better choices (see e.g. Gulati, 1999). As a consequence of imperfect market conditions, a firm with better access to information and knowledge utilization capacity might behave more strategically for maintaining the desired market position for continuous learning about its environment and therefore build strategies for maintaining a power-dependence relationships in its environment.

In the absence of effective price mechanism, the process of inter-organizational exchange also requires non-price incentives for the parties to negotiate, enforce and maintain or sustain such inter-organizational contracts and strategic relationships. Knowledge sharing is one such incentive, which results in improvements in process methods, product quality or technical skills, and can help cooperative partners create a sustainable competitive advantage in an environment characterized by constantly changing technology and customer expectations for new products. Learning by accessing the external complementary assets of another organization enhances the core capabilities of the firm and hence leads to performance superiority (Prahalad and Hamel, 1990). Today’s highly sophisticated innovations often depend upon work across several areas of science and technology (Hagedoorn, 1993). Few firms have the breadth of knowledge required for such undertakings (Randon, 1991), and so a new
combination of competencies is necessary to build core competencies (Hagedoorn, 1995; Tyler and Steensma, 1995).

In accordance with the discussion above, we have combined the concepts of resource dependency theory and knowledge-based view of the firm to build a foundation of analytical framework in the present study. The next chapter is devoted to a more in-depth analysis of knowledge sharing and inter-firm control perspectives in strategic alliance literature.

To summarize the second chapter, theoretical approaches involving the perspective of firm boundary decisions (e.g., contractual alliances or JVs) are analyzed. These theoretical approaches are transaction cost economics, network approach and resource dependency theory. TCE is useful in terms of (1) how an organization should organize its boundary-spinning activities so as to minimize the sum of its production and transaction costs, and (2) which institutional forms are suitable in different situations. Network is a model of organization that is neither based strictly on the price mechanism, nor on 'hierarchical fit', but on coordination through interaction and adaptation. Therefore, the network model of actors, activities and resource coordination through interaction and adaptation can be seen as the basis of a firm network boundary decisions. Resource dependency theory represents an important dimension to the issue of control through characterizing power-dependence relationships among firms as the basis of firm boundary decisions. This analysis reveals that the knowledge based perspective of the firm and resource dependency theory are the most suitable theories for analyzing the research problem and objectives within the presented scope and limitations of the present study. Three fundamental elements of the study (e.g., knowledge sharing, control and alliances) are discussed in greater detail in chapter three.
KNOWLEDGE SHARING AND INTER-FIRM CONTROL IN STRATEGIC ALLIANCES

The current chapter presents the literature review of three elements of the study (e.g., knowledge sharing, control and alliances). The relationships between these elements have already been presented in the first chapter (e.g., figure 1).

3.1. Knowledge sharing in inter-firm cooperation

Knowledge sharing between a knowledge holder and a knowledge seeker, and cooperative relationships (e.g., strategic alliances) are strategic relationships for internalizing the other’s competencies. The growing interest in how organizations learn from their partners and develop new competencies through strategic alliances has led to the emergence of a distinct stream of research. This research explores how knowledge is managed in international joint ventures alliances (Inkpen, 1997; Tiemessen et al., 1997), how knowledge is shared across partners (Appleyard, 1996; Choi and Lee, 1997; Dodgson, 1996; Mowery, Oxley, and Silverman, 1996), how knowledge is acquired from the partners by the joint venture alliance itself (Lyles and Salk, 1996), and even how knowledge about collaborating per se develops over time and impacts collaborative outcomes (Doz, 1996; Powell, Koput, and Smith-Doerr, 1996; Simonin, 1997).

In conjunction with earlier research (Hamel, 1991; Hamel, Doz, and Prahalad, 1989; Kogut, 1988; Lyles, 1988; Pucik, 1988), these studies confirm the competitive nature of knowledge sharing and the process of inter-firm learning between partners. A number of theoretical perspectives related to the role of firm-specific knowledge in competitive strategy have started to contribute to our understanding of knowledge in strategic alliances. These perspectives include resource-based views of the firm, dynamic capabilities, knowledge-based views of the firm, management of technology, the economics of innovation and information, and organizational learning (Mowery et al., 1996; Spender and Grant, 1996).

Doz (1996) and Hagedoorn and Schakenraad (1994) recognize that much research attention has been directed towards trends in alliance formation, determinants of cooperation, forms of collaboration, the alliance outcomes, in comparison to process-related questions (e.g., the impact of interpreter learning on the evolution of a strategic alliance; the economic effects of strategic alliances on parent companies). Most of the studies turn to the role of firm-specific variables such as strategic intent (Hamel, 1991), organizational capabilities (Lyles and Salk, 1996), partner selection (Makino and Delios, 1996; Tiemessen et al., 1997) or trust (Aulakh, Kotabe, and Sahay, 1996; Dodgson, 1996; Inkpen, 1997; Liu, Ghauri and Sinkovics, 2009). For instance, Szulanski (1996) shows those knowledge-related barriers such as lack of absorptive capacity, casual ambiguity, and the arduousness of the relationship between the source and recipient of knowledge clearly dominate motivation-related barriers.

Beyond the development of knowledge taxonomies (e.g., Kogut and Zander, 1992), very few studies have empirically linked the properties of knowledge to its transfer across organizational boundaries. Leonard (1995) stated that most innovation happening at the boundaries between disciplines or specializations tells us that working across boundaries is a key ingredient of competitive advantage, but also why innovation proves so difficult to create and maintain. The growing amount of research on
knowledge in organizations underscores this challenge by recognizing first “knowledge boundaries” (Brown and Duguid 2001) between specialized domains, and second that knowledge is “both a source of and a barrier to innovation” (Carlile 2002, p. 442). It means that the firm boundaries perspective in broader organization theory could be re-examined from a perspective of managing knowledge across boundaries (e.g., knowledge-based theory of the firm behavior). In organizational theory, the three following properties of knowledge at a boundary are analyzed: (a) difference (b) dependence, and (c) novelty (Carlile and Rebentisch, 2003). Understanding these properties are important to understanding the dynamics of knowledge sharing.

Difference in knowledge refers to a difference in the amount of knowledge accumulated, for example the novice-expert discussion found in Schank and Abelson (1977) and Hinds (1999) and/or the difference in the type of domain-specific knowledge accumulation, such as specialization in different problem-solving domains found in Weber (1947) between actors. Creating a complex product or service often requires differences in the amount and types of knowledge. This, in turn, creates differences in levels of experience, terminologies, tools, and incentives that are unique to each specialized domain. When the difference in the amount and/or type of domain-specific knowledge increases between actors, the amount of effort required adequately sharing and assessing each other’s knowledge also increases. The second relational property of knowledge at a boundary is dependence - without dependence, difference is of no consequence. Examples of dependence can be seen in the relations between co-authors working on a paper, employees on different stages of a product line, or a design engineer and a manufacturing engineer in a product-development setting. Dependence was defined by Litwak and Hylton (1962) as a condition where two entities must take each other into account if they are to meet their goals. Victor and Blackburn (1987) stipulated how the actions of actors determine their individual payoffs or success, specifying the consequential link between the activities and goals of actors who are dependent on each other. The third relational property of knowledge at a boundary is how novel the circumstances are. In a new product-development setting, the most obvious source of novelty is new customer needs that generate new requirements of the various actors in their specialized domains (Carlile, 2004, p. 557) This suggests that the most challenging aspect of the relational nature of knowledge at a boundary is that for each actor there is novelty to share with others and novelty to assess from others. A less-obvious source of novelty comes when an actor is unfamiliar with the common knowledge being used to represent the differences and dependences between domain-specific knowledge (Carlile 2004). When novelty arises, there is often a lack of common knowledge to adequately share and assess domain-specific knowledge at a boundary (Star 1989, Carlile, 2002).

In the opposite case, the actors are susceptible to misrecognizing what is novel as something that is already known (i.e., competency traps as seen in Levitt and March 1988; Martins and Kambil, 1999) or disregarding what is novel as irrelevant (Arrow, 1962). Camerer et al. (1989) have referred to this tendency as the “curse of knowledge,” which recognizes the difficulty that actors have in abandoning previous knowledge (e.g., unlearning). These issues highlight the challenges that actors face in identifying what is of consequence when novel circumstances arise (Weick et al. 1999).

Therefore, the knowledge-based perspective postulates that the services rendered by tangible resources depend on how they are combined and applied (e.g., knowledge sharing), which is in turn a function of a firm’s know-how (i.e., knowledge absorptive capacity). This knowledge is embedded in and carried through multiple entities, including organization culture and identity, routines, policies, systems, and documents,
as well as individual employees (Grant 1996a, 1996b; Nelson and Winter 1982; Spender 1996). Knowledge-based resources are usually difficult to imitate unless otherwise deliberately decided to be shared among specific firms (e.g., knowledge transfer in strategic alliances, and M&As). The emerging knowledge-based view of the firm (e.g., Grant 1996b; Spender, 1996) treats the knowledge held by employees as a primary source of value. Compared to markets, organizations are conceptualized as superior settings for the transfer and integration of knowledge between individuals (e.g., Argote et al. 2003; Davenport and Porusak 1998). Knowledge is defined as a justified belief that increases an entity’s capacity for effective action (Huber 1991; Nonaka 1994).

The question of defining the term knowledge has occupied the minds of philosophers since the classical Greek era and has led to many epistemological debates. It is, however, unnecessary for the purposes of this dissertation to engage in a debate to probe, question, or reframe the term knowledge, or discover the “universal truth,” from the perspective of ancient or modern philosophy. This is because such an understanding of knowledge was neither a determinant factor in building the knowledge-based theory of the firm, nor in triggering researcher and practitioner interest in managing organizational knowledge. Therefore, in the next section we will devote more attention to the perspective of knowledge as presented in strategic alliances (e.g., inter-firm cooperative behavior) literature.

Strategic alliances are defined in a variety of ways. Faulkner (1995) defines a strategic alliance as a “cooperative arrangement between organizations in which the partners make substantial investments in developing a collaborative effort and common orientation” (p. 189). Parkhe (1991 p. 581) defines strategic alliances as a “relatively enduring inter-firm cooperation involving flows and linkages that utilize resources and/or governance structures from autonomous organizations, for the joint accomplishment of individual goals linked to the corporate mission of each sponsoring firm”.

Both definitions refer to external relationships between two firms, which, in principle, are independent, with pre-specified goals. Strategic alliances are seen as different from the normal buyer-supplier relationships because of their strategic motives, but they are also different from full acquisitions and mergers. This implies that the strategic motives in strategic alliances are an important dimension of such inter-firm cooperation. The term strategic indicates that the alliances are formed to improve the future market or business network position of the partners in a strategic alliance. Alliances that concern either the present or the immediate future are not seen as strategic. Strategic alliances in principal should have very clear and pre-specified strategic goals or ends.

Much pioneering research has been focused on the motivational aspects of strategic alliances, namely forming strategic alliances to acquire skills (Hamel, 1991), and strategic alliances between competitors (Burgers, Hill and Kim, 1993). Strategic alliances are formed with either competitors (competitive alliances) or with non-competitors (collaborative strategic alliances).

The present study particularly represents the perspective of knowledge-sharing as inter-firm control behavior (see research problem and research objectives in the first chapter). Therefore, in the following paragraph, only the prominent dimensions of knowledge sharing research are incorporated within the context of JV strategic alliances. In addition, the definitions, with corresponding industry specific examples, are also presented to clarify fundamental differences and similarities for each cooperative arrangement and the subsequent nature of knowledge sharing & its
strategic motives in each case. The next section will focus on the formation process of strategic alliances within the context of knowledge sharing in JV strategic alliances.

### 3.2. Knowledge sharing in JV strategic alliances

Following Inkpen and Crossan (1995) and Nonaka (1994), knowledge sharing and also knowledge creation through JV alliances is a multi-stage process, analogous to the innovation diffusion process (e.g., Tushman and Scanlon, 1981) related to the role of boundary-scanning individuals.

The first stage begins with the formation of the JV alliances and interactions between individuals from two (or more) partners. JV alliances are characterized by some sort of equity sharing as a mechanism of inter-firm cooperation. The second stage is the focus of transfer of knowledge from the JV to the partner in addition to equity sharing, as mentioned in the first stage. Huber (1991) referred to that process as "grafting," whereby organizations increase their store of knowledge by internalizing knowledge not previously available within the organization.

For internalization to occur, the parent firms first engage in efforts to transfer skill-related knowledge from the JV to themselves. These efforts create the "connections" through which individuals can share their observations and experiences (Von Krogh et al. 1994). The intensity of a parent firm’s learning efforts reflects the degree to which the parent is actively trying to internalize the skills and capabilities of its partner.

Knowledge connections are formed through both formal and informal relationships between individuals and groups (Inkpen, 1996). Those internal managerial relationships facilitate the sharing and communicating of new knowledge and provide a basis for transforming individual knowledge to organizational knowledge. When one individual’s or group’s knowledge connects with other knowledge, it can be discussed, debated, and possible discarded. The knowledge may be further developed and move upwards in the organization. Individual knowledge is inherently “fragile”, and therefore without knowledge connections, new knowledge may be ignored or viewed as irrelevant (Von Krogh et al., 1994). Grant (1996b) argues that organization structures can be designed to maximize the efficiency of knowledge integration. In the literature on innovation, specialized personnel such as “technological gatekeepers” (Katz and Tushman, 1980) and specialized organizational structures such as transfer groups (Katz and Allen, 1988) have been shown to have a significant effect on the transfer of information between organizations. When a JV partner has a strategic objective of acquisition and proprietary control over alliance knowledge, the knowledge connections are the mechanisms for knowledge acquisition (e.g., knowledge sharing).

Although the transfer of partner knowledge is a necessary condition for knowledge creation and utilization (Cohen and Levinthal, 1989, 1990), it must be ensured that the transferred knowledge is moved and shared within the parent organization. The risk, particularly with tacit knowledge, is that knowledge transferred from a JV to a parent will dissipate as it spirals up the organization level. The rate of dissipation will be influenced by a variety of factors. For example, when confronted with learning opportunities, successful firms may see little need to change behavior and thus may become trapped by their distinctive competence (Levinthal and March, 1993). The strength of a firm’s learning intent will help determine the organizational resources committed to learning (Hamel, 1991). Alliance control mechanisms may influence the transfer of knowledge (Makhija and Ganesh, 1997). The type of knowledge creation
mechanisms plays a key role in how new knowledge is “managed” by alliance parent firms (Hedlund and Nonaka, 1993). Finally, management belief systems permeate all levels of knowledge creation and correspondingly, contribute to knowledge dissipation (Inkpen and Crossan, 1995).

Narrowly defined for our purpose, a joint venture strategic alliance occurs when two or more firms pool a portion of their resources within a common legal organization. Conceptually, a joint venture strategic alliance is a selection among alternative modes by which two or more firms can transact. Thus, a conceptualization of joint ventures strategic alliances must explain why this particular mode of transacting is chosen over such alternatives as acquisition, supply contract, licensing, or spot market purchases.

Two theoretical approaches are especially relevant in explaining the motivations and choice of joint venture strategic alliances. The first approach is derived from the theory of transaction costs, as developed by Williamson (1975, 1985). The second approach focuses on strategic motivations and consists of a catalogue of formal and qualitative models describing competitive behavior. Transaction cost arguments are driven by cost-minimization considerations, whereas strategic motives are driven by competitive positioning and the impact of such positioning on profitability. Strategic motives presuppose that firms transact by a mode which produces a competitive position vis-a-vis rivals. Thus, the primary difference is that transaction costs address the costs specific to a particular economic exchange, independent of the product market strategy, whereas strategic motives address how competitive positioning influences the asset value of the firm. Transaction cost and strategic motivation provide compelling economic reasons for joint venture strategic alliances.

Confusion lies in the explanation of joint ventures, commonly embraced as a form of transaction cost theory, that the transfer of know-how in the market place is severely encumbered by the hazards, which attend the pricing of information without revealing its contents. Because knowledge can be transferred at -so it is claimed- zero marginal cost, the market fails, because sellers are unwilling to reveal their technology and buyers are unwilling to purchase in the absence of inspection. Yet, as Teece (1977) demonstrated, the transfer of technology entails non-trivial costs, partly because of the difficulty of communicating tacit knowledge. With this particular view, if knowledge is tacit, then it is not clear why markets should fail due to the opportunistic behavior of the party to an exchange. However, it would seem, in fact, that knowledge could be described to a purchaser without affecting a transfer, specified in a contract, and sold with the possibility of legal redress. In this sense, tacit knowledge tends to preserve the market price mechanism in the presence a contractual legal contract (e.g., contractual strategic alliance) or JV strategic alliance to safeguard the interests and subsequently secure the intellectual property rights of parties in exchange relationships.

Hence, market mechanism is replaced by joint venture strategic alliances not because tacit nature of knowledge is cost stemming from opportunism, but rather from the necessity of replicating experiential knowledge, which is not well understood (e.g., JV is formed to facilitate knowledge transfer). More generally, tacitness is an aspect of the capital stock of knowledge within a firm. In this regard, there is an important distinction between capital specific to individuals, and for which there may be an external labor market, and capital specific to organizations, or what Nelson and Winter (1982) call skills and routines, respectively. For transactions that are the product of complex organizational routines, the transfer of know-how can be severely impaired unless the organization is itself replicated (Teece, 1982 makes a similar point in explaining the multiproduct firm).
Following Nelson and Winter (1982), a firm may decide to joint venture in order to retain the knowledge or capability (or what they call ‘remember-by-doing’) of organizing a particular activity while benefiting from the superior production techniques of a partner. Even if a supply agreement were to operate at lower production and transaction costs, a firm may choose a more costly joint venture strategic alliance in order to maintain the option, albeit at a cost, to exploit the capability in future. What drives the choice of joint venture strategic alliance in this situation is the difference in the value of options to exploit future opportunities across market, contractual, and organizational modes of transacting. Thus, a joint venture strategic alliance is encouraged under two conditions: one or both firms desire to acquire the other's organizational know-how, or one firm wishes to maintain an organizational capability while benefitting from another firm’s current knowledge.

It is the aim to convey the perspectives of transaction cost, strategic behavior, and organizational learning (e.g., competence and knowledge-based view) as providing distinctive, though at times, overlapping explanations for joint venture behavior. Transaction cost analyzes joint ventures as an efficient solution to the hazards of economic transactions. Strategic behavior (e.g., resource dependency theory) places joint ventures in the context of competitive rivalry and collusion agreements to enhance market power. Finally, the knowledge sharing enables joint venture strategic alliance as a vehicle by which organizational knowledge is exchanged and also building additional mechanism of inter-firm strategic control among JV partners (e.g., the present study). The present study deals with the perspective of knowledge sharing as an additional inter-firm strategic control among contractual or JV alliance partners. Therefore, in the next section strategic alliance inter-firm knowledge sharing is focused on more closely and introduced by the knowledge-based perspective of firm behavior.

3.3. Knowledge-based perspective of strategic alliance inter-firm knowledge sharing

The emerging knowledge-based view of the firm offers new insight into the causes and management of inter-firm alliances. However, the development of an effective knowledge-based theory of alliance formation has been inhibited by a simplistic view of alliances as vehicles for organizational learning in which strategic alliances have presumed to be motivated by firms' desire to acquire knowledge from one another. Grant and Baden-Fuller (2004) more recently analysed that the primary advantage of alliances over both firms and markets is in accessing rather than acquiring knowledge. Building upon the distinction between knowledge generation ('exploration') and knowledge application ('exploitation'), analysis shows that alliances contribute to efficiency in the application of knowledge: first, by improving the efficiency with which knowledge is integrated into the production of complex goods and services and second by increasing the efficiency with which knowledge is utilized.

One of the most important trends in industrial organization of the past quarter century has been the growth of collaboration between independent firms. As larger firms have pulled back their corporate borders through outsourcing and divestment of ‘non-core’ activities, they have increasingly cooperated with other companies in order to engage in activities and access resources outside their own boundaries. These inter-firm alliances involve cooperative relationships that are not fully defined by ownership-based control. Hence, in terms of the theory of economic organization, they fall between the polar models of markets and hierarchies. As a result, cooperative relationships between firms have been viewed as ‘intermediate’ or ‘hybrid’ organizational forms (Borys and
Jemison, 1989; Powell, 1987; Thorelli, 1986). To distinguish longer-term, more substantial collaboration, the term ‘strategic alliance’ has been used to refer to agreements characterized by the commitment of two or more firms to reach a common goal entailing the pooling of their resources and activities (Teece, 1992, p. 19). Within such alliances, ‘the parties . . . maintain autonomy but are bilaterally dependent to a non-trivial degree’ (Williamson, 1991, p. 271). It also implies that by defining the strategic goals of inter-firm cooperation we could better define strategic alliances, since these cooperative relationships (e.g., strategic alliances) cannot be satisfactorily defined only in terms of ownership-based control among the parties involved in continuous exchange episodes.

Strategic alliances embrace a diversity of collaborative forms. The activities covered include supplier-buyer partnerships, outsourcing agreements, technical collaboration, joint research projects, shared new product development, shared manufacturing arrangements, common distribution agreements, cross-selling arrangements, and franchising. While the defining governance mode is the informal ‘relational contract’, strategic alliances may involve both (i) contractual agreements (e.g., franchising and cross-licensing agreements) and (ii) ownership links (e.g., cross-equity holdings, joint ventures). For example, Oxley (1997) presents a sequence of alliance types arranged from the least hierarchical (unilateral contractual agreements) to the most hierarchical (equity-based alliances).

The increasing importance of strategic alliances has resulted in a growing interest in theorizing about their causes and consequences. The main theories of alliance formation include the creation of market power to generate monopoly rents (Katz, 1986; Schwartz, 1987; Stocking and Watkins, 1946), resource-dependency theory (Barley et al., 1992; Guetzkow, 1966; Van de Van, 1976), strategic options (Hurry, 1993; Kogut, 1991; Sanchez, 1993), product complementarities and network externalities (Rotemberg and Saloner, 1991), and transaction cost theory (Oxley, 1997; Ring and Van De Ven, 1992; Williamson, 1991).

However, the emergence of resource-based theoretical approaches to strategy – especially those emphasizing the role of knowledge – has provided a broader basis upon which to build a knowledge-based approach to inter-firm cooperation. The knowledge-based view is further discussed within resource dependency theory; because resource dependency theory is traditionally an established research paradigm linked to many recent research approaches such as resource based/knowledge based view of the firm among others.

The knowledge-based view of the firm has grown out of the resource-based theory of the nature and existence of firms (Grant, 1996b). It is clear that knowledge-based explanations of the formation of strategic alliance have their roots in resource-based approaches to alliances. Drawing upon resource-dependence theory (Pfeffer and Salancik, 1978) and the resource-based view of the firm (Penrose, 1959), several studies (Eisenhardt and Schoonnoven, 1996; Gulati, 1999; Rothaermel, 2001; Ven De Ven and Walker, 1984) have viewed alliances as a quest for resources. Moreover, certain types of resources appear to particularly influential in alliance formation. The concentration of alliances in R&D intensive sectors points to technology as playing a key role in alliance formation (Dickson and Weaver, 1997; Dodgson, 1992; Doz, 1988; Hagedoorn, 1993). As technology management became absorbed within the wider field of knowledge management, so alliances have been viewed from a broader knowledge perspective. Several studies of strategic alliances have identified the sharing of knowledge (including technology, know-how and organizational capability) as their dominant

The knowledge-based literature identifies two conceptually distinct dimensions of knowledge management. First, those activities that increase an organization's stock of knowledge – what March (1991) refers to as 'exploration', and Spender (1992) calls 'knowledge generation'; and second, those activities that deploy existing knowledge to create value – what March (1991) refers to as 'exploitation', and Spender (1992) calls 'knowledge application'. In relation to strategic alliances, this distinction between knowledge generation and knowledge application corresponds to a key distinction in the ways in which knowledge is shared among alliance partners. Knowledge generation points to alliances as vehicles of learning in which each member firm uses the alliance to transfer and absorb the partner's knowledge base. Knowledge application points to a form of knowledge sharing in which each member firm accesses its partner's stock of knowledge in order to exploit complementarities, and with the intention of maintaining its distinctive base of specialized knowledge.

Several prior studies have distinguished these two types of knowledge sharing within alliances. Hamel (1991, p. 84) notes that: 'The crucial distinction between acquiring such skills has seldom been clearly drawn.' Similarly, Inkpen (1998, p. 72) observed: 'In some alliances, partners aggressively seek to acquire alliance knowledge while in others, the partners take a more passive approach to knowledge acquisition.'

While acknowledging that learning occurs in all alliances and that some alliances are motivated primarily by the desire to acquire partners' knowledge. As mentioned earlier, Grant and Fuller (2004) concluded that the primary motivation for knowledge-based alliances is knowledge accessing rather than knowledge acquisition. For example, General Motor's NUMMI ventures with Toyota have been viewed as GM's attempt to acquire Toyota's operational management skills (Kale et al., 2000, p 219).

The knowledge-based view within resource dependency theory is a prominent feature in illuminating the rationale for inter-firm alliances. However, in the following section we clarify some basic assumptions concerning knowledge, knowledge sharing, and its role in production or value creation:

(i) Knowledge is the overwhelmingly important productive resource in terms of market value and the primary source of Richardson rents (Grant, 1996b; Machlup, 1980). For example, in a knowledge-based company such as Cisco Systems, tangible assets account for less than 4 per cent of the company's market value (Edvinsson and Malone, 1997).

(ii) Different types of knowledge vary in their transferability: explicit knowledge can be articulated and easily transferred between individuals and organizations, whereas tacit knowledge (skills, know-how, and contextual knowledge) is manifest only in its application – transferring it from one individual to another is costly and slow (Kogut and Zander, 1992; Nonaka, 1994).

(iii) Knowledge is subject to economies of scale and scope, since the costs of replicating knowledge tend to be lower than the costs of the original discovery of creation of the knowledge (Grant and Baden-Fuller, 2004). Therefore, knowledge replicating (e.g., knowledge transfer) is subject to economies of scale (Grant and Baden-Fuller, 2004).

(iv) To the extent that knowledge is not specific to the production of a single product, economics of scale could also have implications for economies of scope (Penrose, 1959).
The extent of economics of scale and scope vary considerably between different types of knowledge. They are especially great for explicit knowledge, information in particular, which is ‘costly to produce, but cheap to reproduced (Shapiro and Varian, 1999, p. 3). Tacit knowledge tends to be costly to replicate, but these costs are lower than those incurred in its original creation (Winter, 1995). This signifies that tacit knowledge transfer is still less costly than knowledge creation itself.

(v) Knowledge is created by individual human beings, and to be efficient in knowledge creation and storage, individuals need to specialize (Simon, 1991, p. 127). Therefore “knowledge specialization” is an important concept related to knowledge creation.

(vi) Producing a good or service typically requires the application (e.g., knowledge transfer and subsequent learning) of many types of knowledge (Kogut and Zander, 1992).

Therefore, the fundamental dichotomy between knowledge creation (exploration) and knowledge application (exploitation) becomes clear: knowledge creation requires specialization (points iii, iv & v above), while knowledge application requires diversity of knowledge (points v and vi). Given the limited transferability of knowledge (point ii), this presents considerable difficulty for the institutions of production and value creation. The solution lies in some process of knowledge integration that permits individuals to apply their specialized knowledge to the production of goods and services, while preserving the efficiencies of specialization in knowledge acquisition (Demsetz, 1991).

3.4. Strategic alliances and inter-firm control

As the term suggests, “strategic alliances” involve allying two or more partner firms. The key features setting strategic alliances apart from other single-firm strategies are the element of inter-firm cooperation and control (Buckley & Casson, 1988; Doz, 1996; Teece, 1992). Based on this literature, partner co-operation and control can be defined as the willingness of a partner firm to pursue mutually compatible interests in the alliance rather than act opportunistically. Opportunism is defined as self-interest seen as the opposite of partner control in strategic alliances.

Partner cooperation and control in strategic alliances is a significant concept because it represents a somewhat paradoxical situation: firms are supposed to pursue their own interests, but they are simultaneously required to restrain cooperative pursuit (e.g., inter-firm control) in order to make the alliance work. Thus, the key is to strike a balance between competition and cooperation (Teece, 1992). Although strategic alliances may be a mutually beneficial strategy when both markets and hierarchies are insufficient, the essentially fickle and tentative nature of partner cooperation should not be overlooked. Because of this, some authors have suggested that strategic alliances may be fundamentally self-defeating, unstable, and transactional in nature (Das & Teng, 1997; Inkpen and Beamish, 1997; Kogut, 1989; Williamson, 1985). After all, if cooperation and competition are at odds with each other, one cannot take for granted that a satisfactory level of cooperation and inter-firm control will be sustained in alliances (Park & Russo, 1996). As Parkhe has noted, opportunistic behaviors are “individually rational yet we intend to produce a collectively suboptimal outcome” (1993: 794).
Hence, the firms in alliances tend to be more confident about partner cooperation when they feel they have an adequate level of control over their partners (Beamish, 1998; 1988; Sohn, 1994). Inter-firm control is an important concept in management; some consider it, essentially, a cybernetic process. Others, however, have adopted broader perspectives, treating inter-firm control as any process in which one partly affects the behavior of others. Authors have used a variety of terms in the literature on the control paradigm, such as “level of control,” “mode of control,” “controlling,” “control mechanisms,” and “control systems” (see Bradach & Eccles, 1989; Das, 1989, 1993; Flamholtz, Das, and Tsui, 1985; Geringer & Hebert, 1989; Goold and Quinn, 1990; Simons, 1991).

A consequence of all these diverse formulations is that inter-firm control is referred to simultaneously as (i) an organizational setup, (ii) a process of regulating behaviors, and (iii) an organizational outcome. In addition, control mechanisms and level of control are two other important concepts. Control mechanisms are the organizational arrangements designed to determine and influence what organization members will do, whereas the level of control is the direct outcome of the controlling process - that is, the degree to which one believes that the desired behavior of the other party is ensured. Indeed, the purpose of inter-firm control is to fashion activities in accordance with expectations so that the ultimate goals of an organization can be attained. For example, firms may want to use inter-firm control mechanisms to either reutilize their activities or to promote non-routine activities, such as learning (Sitkin, Sutcliffe, and Schroader, 1994) risk-taking, and innovation. Regardless of the focus, firms use inter-firm control to make the attainment of organizational goals more predictable, which ensures more certain outcomes, and it is in this sense that effective inter-firm control is believed to help generate a sense of confidence.

Researchers of strategic alliances conform to this logic and focus on the characteristics of inter-firm control mechanisms that enhance the level of control. For example, the topics of special interest in this area include the role of ownership control in joint ventures (Blodgett, 1991; Mjoen and Tallman, 1997) and contractual control in order to deter opportunistic behaviour (Parkhe, 1993; Provan and Skinner, 1989). In this view, the simultaneous existence of cooperation and competition between the partners is an important characteristic of strategic alliances inter-firm control behaviour. Whereas competition within a network context can be defined as pursuing one’s own interest at the expense of others, cooperation is the pursuit of mutual interests and common benefits in alliances. Along similar lines, Buckley and Casson (1988) note that cooperation is essentially about mutual forbearance.

The fundamental difference between alliances and other single-firm strategies is inter-firm cooperation and mutual control, which is intended to create collaborative advantage, otherwise unavailable to single firms.

However, the reorganization of the importance of inter-firm cooperation and control does not mean that strategic alliances are free from competition (e.g., competition for knowledge absorption, learning among other factors); therefore, the knowledge sharing perspective is also linked to an attempt to attain power dependence-based control as presented in the second chapter.

Hence, cooperation and competition are opposing forces within strategic alliances. Koot (1988) identifies fight versus team cooperation as one dilemma in alliances. The force of cooperation emphasizes goodwill, collective interests, and common benefits, whereas the force of competition subscribes to opportunistic behavior, zero-sum game,
and private benefits (Khanna et al., 1998, Yoshino and Rangan, 1995). The two forces differ significantly in both philosophy and spirit and can be viewed in terms of a paradox (Lado et al., 1997). In fact, both cooperation and competition are indispensable for a sustainable and successful alliance. Cooperation ensures the smooth working relationships needed to carry out the project, and competition protects a partner from losing its firm-specific advantage through inattention. As Teece puts it, “the challenge to policy analysts and to managers is to find the right balance of competition and cooperation” (1992, p.1). However, imbalanced tensions between simultaneous cooperation and competition may be responsible for the high failure rate of strategic alliances.

In this view, however, many studies suggest (e.g., Brouthers et al., 1995) that the most desirable alliance arrangement is balancing the contending forces of cooperation and competition with partners so that they are approximately equivalent (in terms of their size, profitability, and status in their own industry) and possess complementary know-how and resources. One significant example is the Universal Card alliance between AT&T and Total System Services (TSYS) (Sankar et al., 1995). Because both partners are leaders in their own particular industry, they could successfully build the alliance on their distinctive strengths.

In the present study this paradoxical situation of balancing between competition and cooperation is analyzed within the context of mutual inter-firm control through “knowledge sharing” as a key source of distributing power-dependence and therefore a source of stability for an alliance within a given business network. A foundation of the study - resource dependence theory - suggests that organizations depend on other organizations within their environment to acquire the needed resources. Pfeffer and Salancik (1978) describe how organizations cope with the uncertainty and deficiency of resources created by interdependence (e.g., inter-firm control). Pfeffer and Nowak (1976) believe that the management of interdependencies (e.g., inter-firm control) is a means for stabilizing the flow of resources that a company needs. Further favorable interdependencies (e.g., inter-firm control) reduce the uncertainty and perceived resource deficiency confronted by the focal-firm.

The strategic alliance links specific facets of businesses of two or more firms. At its core, this link is a trading partnership that enhances the effectiveness of the competitive strategies of the participating firms by providing for the mutually beneficial trade of technologies, and more importantly, the trade of knowledge or skills, or product design based upon them.

For example, in the 1990s Matsushita had developed a broad licensing agreement with Sun Microsystems. Matsushita, eager to bolster its minuscule computer business, planned to develop a new line of “high performance” machines using the basic design of Sun Microsystems, the leading U.S. maker of engineering workstations (The Wall Street Journal, 1990). The Japanese company also utilized Sun’s microprocessor in its consumer electronics products. These agreements became significant for Sun, as it was on a quest of searching for allies interested in becoming the de facto standard in the growing market for the powerful desktop machines.

In technology development, for example, Toshiba (Japan) has established a cooperative relationship with Siemens (Germany) in the semiconductor field. This tie-in began with the transfer to Siemens of Toshiba’s dynamic random-access-memory technology. This development has been further followed by joint development work on application-specific integration circuits, including standard cells.
Equity sharing agreements are still an important vehicle for inter-firm partnering. However, the majority of alliances made in recent years have been of a contractual nature. It is estimated that in the late 1980s and early 1990s about 75 percent of the strategic alliances have been of a contractual nature without equity-sharing (Hagedoorn, 1996).

3.5. Types of control in JV and contractual alliances

Since JVs strategic alliances are separate entities jointly owned by two or more partners, the type of control used in JVs includes both hierarchical and ownership control (Aulakh et al., 1997)

On the one hand, hierarchical control refers to the type of control used within organizations, which is not the subject of analysis in the present study. On the other hand, controlling JV alliances also involves ownership because the JV is jointly owned (see Geringer and Hebert, 1989). On view expressed is that equity ownership is the ultimate means of inter-firm control among partners, owing to the fact that more equity shares give a partner more voting power (Blodgett, 1991). The opposite view, as also incorporated in the present study, is that control is not "a strict and automatic consequence of ownership (Geringer and Hebert, 1989: 238), so ownership plays only a limited role in providing control in JV alliances (Heide and John, 1992).

Hence in terms of contract, non-equity alliances do not involve any equity arrangement, so inter-firm ownership control is not possible. However, it does not mean that the contractual alliances (e.g., licensing agreements, supplier agreements) are without any control mechanism among partners. In this view we have positioned and tested knowledge sharing as a significant element of inter-firm strategic partnering (e.g., control) in addition to equity sharing based ownership control.

Hence, based on the definitions in the literature (Hagedoorn, 1996) it is possible to distinguish two forms of strategic alliances which are analyzed in the present study within the context of knowledge sharing as strategic inter-firm control behavior: 

**joint ventures** are combinations of economic interests of at least two different companies in a ‘distinct’ firm which also performs R&D or undertakes innovative projects where a joint equity investment is made.

**contractual alliances**, in particular joint R&D pacts and joint development agreements, through which companies undertake innovative projects with shared resources.

The analytical framework (e.g., knowledge sharing as inter-firm control behavior) in the next chapter draws on resource dependency theory and resource/ knowledge based view of the firm behavior. The framework characterizes the focal-firm constraint absorption activities such as contractual and joint venture alliances in an uncertain environment. Resource dependence theorists argue that constraint absorption activities (e.g., contractual alliances, JV alliances) can be used by organizations to restructure their environmental interdependencies in order to stabilize critical exchanges (Pfeffer and Salancik, 1978: 115). Knowledge sharing is one such critical exchange and as a result, an inter-firm control behaviour, as analysed in the present study.

To summarize, the present chapter conducted a literature review of three fundamental elements of the study (e.g., figure 1). These elements are knowledge sharing, inter-firm control and strategic alliances. Knowledge sharing is discussed within the context of
inter-firm cooperation. Three properties of knowledge are discussed to understand the dynamics of knowledge sharing. These properties deal with need for difference, dependence and novelty of knowledge to be shared among the parties to an exchange. This was followed by a review of how and why knowledge sharing takes place in JV strategic alliances. After this the emerging knowledge-based literature of strategic alliances inter-firm knowledge sharing was analyzed to better support two important dynamics of knowledge sharing (e.g., knowledge creation or exploration and knowledge application or exploitation). At the end the literature of inter-firm control in strategic alliances and types of control as JV and contractual alliances was discussed. Based on the comprehensive literature review of the three elements of the study (e.g., knowledge sharing, inter-firm control and strategic alliances) the next chapter is poised to discuss knowledge sharing factors and inter-firm control behavior in strategic alliances and provide the foundations to conduct the empirical part of the study.
4 KNOWLEDGE SHARING FACTORS AND INTER-FIRM CONTROL BEHAVIOR IN STRATEGIC ALLIANCES

The present chapter concerns the analytical framework related to three elements of the study (e.g., knowledge sharing, control and alliances). The tentative framework is presented as the foundation to conduct the empirical part of the study. The framework is based on a priori assumptions and a model. A priori assumptions are presented to discuss the tentative model of the study. A priori assumptions are to come up with an in-depth description of factors of knowledge sharing raised in the tentative framework based on extensive literature review. The purpose of this model is to develop a final model after the empirical part of the study. The analytical framework in the present chapter deals with exploring the elements (e.g., factors) of knowledge sharing as inter-firm control behaviour. The conceptual framework analyses the factors affecting knowledge sharing in contractual and JV strategic alliances. From this point of view the main aim of the study is exploring whether knowledge sharing corresponds to inter-firm control behaviour among partners in a strategic alliance (see research problem of the study). In fact, the nature of inter-firm control could differ (e.g., research objectives) among cooperative partners in the cases of “vertical” and “horizontal” strategic alliance types.

The analytical framework in the present chapter is based on resource dependency theory and knowledge based view of the firm as described in detail in the previous chapter. In a nutshell, when resource dependency theory is applied to strategic alliance formation behavior, it suggests that no organization can survive alone (Emerson, 1962; Pfeffer and Salancik, 1978). Each organization must constantly interact with its environment either to purchase resources such as labor, supplies (e.g., product components, production inputs that also include knowledge), or selling outputs (e.g., products and knowledge) through creating value among end-users. Thus, organizations seek out alliances to gain control over their environment for effectively buying inputs and selling outputs in the absence of an effective price mechanism. Alliances can protect an organization from its external unstable environment and are likely to guarantee a more stable flow of scarce resources (Stearns, Hoffman, and Heide, 1987; Miner Amburgey, and Stearns, 1990). These alliances, in turn, also make further new coalitions to create interdependence with specific firms. Cooperative relations among specific firms will, however, alter the coalition-firms’ interdependence with the broader environment, which possesses scarce resources. In other words, as result of creating strategic interdependencies, the focal-firm through its cooperative behavior is likely to take a greater degree of control of resources in comparison to other organizations in the environment. In an imperfect market situation and subsequently unstable environment, an effective control is likely to guarantee sustainable rents.

Borrowing an explanation of alliances within the “resource based view” (as a foundation of knowledge based view of the firm) describes the business enterprise as a collection of sticky and difficult-to-imitate resources (Penrose, 1959; Barney, 1986a; Wernerfelt, 1984), stressing the need to capture resources through the protection and hence also deployment and sharing of these resources. In the context of these competitive alliances, we will specifically look at knowledge sharing alliances (Huber, 1991). In general, much research on knowledge sharing and learning in alliances has focused on organizational and inter-organizational (alliances) knowledge sharing, especially from a strategic perspective. From this perspective it is possible to distinguish three streams of literature on learning and knowledge sharing in alliances (Soekijad and Anderiessen, 2003):
Firstly, organizations can learn through alliances how to improve their operations, strategy, competencies, skills or capabilities (Huber, 1991; Mowery et al., 1996; Inkpen and Dinur, 1998). The second stream of literature focuses on the inter-organizational level of learning. It is believed that alliances as a whole can benefit and learn from organizational participation and processes (Lane and Lubatkin, 1998; Kraatz, 1998; Levinson and Asahi, 1995; Khanna et al., 1998). Finally, the third part of the literature can be distinguished in those who have found that organizations can learn about other alliances, cooperative linkages among firms in the market (Gulati et al., 2000; Teece, 1994; Eisenhardt and Martin, 2000; Kale et al., 2001). Powell (1988), for instance, states that (successful) participation in, and management of, alliances are 'key drivers of a new logic of organizing (p. 231). In this stream, organizations might want to acquire knowledge that can be used for the management of alliances in general. It can also help them improve the design of new future alliances. In a nutshell, these unraveling streams of literature provide different (motivational) reasons for organizations to participate in alliances.

Another significant view for our purpose is to understand the conditions for learning and knowledge processes (Soekijad and Andriessen, 2003) within strategic alliance formation behavior among cooperative partners:

The first range of conditions can be described as organizational characteristics. Each organization in an alliance must expect to receive a certain added value from knowledge sharing (high pay-off) (Axelrod, 1984, Gulati et al., 2000; Inkpen and Dinur, 1998) and in general must be willing and able to share knowledge (Larsson et al., 1998; Inkpen and Crossan, 1995; Doz, 1996). From this point of view an organization must be motivated and have high intent towards co-operation and knowledge sharing. Besides that, the organization must be able to communicate and it needs to be highly transparent and receptive (Hamel, 1991). Organizational capabilities to share knowledge and learn can also be explained through the concepts of learning effectiveness (Inkpen and Dinur, 1998) or (relative) absorptive capacity (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998; Lane et al., 2001). A final organizational characteristic that influences learning concerns an organization’s ability to have access to knowledge (Powell, 1998; Inkpen and Dinur, 1998). Access can be gained through ties or personal networks of key individuals, for instance (McEvily and Zaheer, 1999; Lofstrom, 2000).

The second cluster of conditions consists of characteristics of the (mutual) relationship between the organizations involved. They, for instance, include the strength of the ties or relation (Hansen, 1999) and recognition and trust between the organizations (Larsson et al., 1998; Liu, Ghauri and Sinkovics, 2010). Further, the closer an activity is to a client, the less co-operative an organization will be (Bengtsson and Kock, 2000; Kogut and Zander, 1995). Other conditions include positive former experiences, either with co-operation in alliances in general, or with a specific partner, and an unlimited ‘shadow of the future’ (Axelrod, 1984; Larsson et al., 1998; Inkpen an Dinur, 1998; Kogut and Zander, 1992).

A final cluster of conditions can be found in the characteristics of the knowledge shared. Tacit knowledge is less easy to exchange (Larsson et al., 1998) and the more modifiable and more teachable the knowledge is, the easier it is to transfer it (Kogut and Zander, 1995).
However, in the present study another view within knowledge sharing alliances is emphasized, namely that resource dependence is increased among cooperative partners through inter-firm knowledge sharing as an inter-firm control behavior. In other words, the motive of knowledge sharing strategy (resource-seeking and power-seeking) corresponds to inter-firm control behavior.

Resource-seeking motives are linked to the knowledge-based view of the firm, whereas power-seeking motives are linked to resource dependency theory in the overall theoretical context of the study (e.g., analytical framework). The analytical framework of present study explores the contributing factors to knowledge sharing as inter-firm control behavior (see Figure 10 and the propositions of the study). From this perspective the present study provides an additional explanation within the framework of resource dependency and knowledge-based view of the firm as to whether knowledge sharing exists among cooperative partners in strategic alliances as inter-firm control behavior. In this respect, the (a) resource-seeking (knowledge-based view of the firm) and (b) power-seeking (resource dependence-based view of the firm) factors (i.e., objectives) correspond to knowledge sharing as inter-firm control behavior, as presented in the analytical framework (see figure 10 and the priori assumptions of the study). The analytical framework clarifies between the relationship characteristics and resource characteristics of the firm and their respective relationships to (i) perceived network uncertainty (e.g., resource dependence theory) and (ii) perceived deficiency of resources (e.g., knowledge based view of the firm) respectively.

The framework in the next sections provides the basis of the methodology chapter and then the empirical part of the study.

4.1. Scope of focal-firm strategy in unstable environments

An uncertain environment provides a point of departure to understand the firm’s cooperative behaviour. In this view the formation of collaborative alliances among organizations is seen as a significant strategy that organizations can use to cope with the turbulence and complexity of their environments. A number of writers, particularly Aldrich (1979), Caves and Porter (1977), Galbraith and Schendel (1983), McGee and Thomas (1986), Porter (1980) and Rumelt (1981) have addressed a wide range of economic, organizational and environmental sources of complexity affecting strategic decision-making at the firm level. For example, concepts such as mobility barriers (Caves and Porter, 1977) and isolating mechanisms (Rumelt, 1981) together define, from primarily economic perspectives, key strategies available to firms, or groups of firms within industries, and link them to unique firm advantages and characteristics such as the possession of an important financial resource or technological advantage.

The organization’s ability to handle environment was perhaps the key challenge to strategies in the 1980s & 90s. To conduct a study within strategic management, it was significant to incorporate strategists’ beliefs and perceptions about competition and competitors in particular industries clearly needed to identify the frameworks which could be related to competitive positioning concepts (Porter, 1985, 1990). It was seen as providing an awareness of those key controllable strategic dimensions, to consider which strategies were perceived to be important in formulating competitive strategy in the industry. Thus, adding the perceptual data drawn from individual decision-makers to the economic models of competition provided by industrial organization economics perspectives should enable a more general framework to be developed for identifying important strategic variables. Kogut (1984) and Williams (1984), amongst others,
endorse the viewpoint that the concept of the ‘value-added’ chain is a useful framework for analyzing industry complexity.

The ‘value chain’ facilitates the identification of the forces driving industry and competition and thereby allows adaptive corporate strategies to be formulated. Williams (1984) defines ‘value-added’ in terms of what is added to the product during its production. The ‘value-added’ influences the productivity achieved by a firm and its cost structure over time. The impact of the value added is reflected in competitive behavior, and, in turn, the formation of strategic groups within an industry (e.g., strategic alliances). Kogut (1984) provides additional important insights, though he defines the value-added chain in terms of contribution to the market value of the firm. Kogut (1984) adds the concept of economics of scope (Teece, 1980) – the sharing of resources to achieve synergy – to economies of scale and learning effects in order to capture the process of exploitation of economic advantage along multiple value-added chains (hence, multiple value-added chains are closer to the concept of strategic alliances).

McGee and Thomas (1988) noted that the use of the term ‘value-chains’ is associated with the firm’s decision process in relation to business-unit competition. Firms have a set of alternative value chains from which they can choose, and this choice results in different competition sets and strategic postures. The firm’s strategic aim is to match its distinctive skills (or strategic capabilities) with one of the alternative competition sets available in the environment (McGee and Thomas, 1988). Once this strategic choice is made, the examination of the forces which drive the value-chain leads firms towards an understanding and definition of an ‘industry’ and its boundaries and influencing environment within which competition takes place (McGee and Thomas, 1988).

According to Spender (1981) and Huff (1982), strategists may also borrow ‘recipes’ for strategies from other firms in the industry, particularly strategic groups, and also from a wider set of firms. Indeed, many organizations appear to be following this strategy in at least some of their environmental relationships. In this respect, collaboration shows promising results for solving organizational problems, and provides some intriguing research settings (Gray and Wood, 1991).

Collaboration is defined by Gray (1989, p. 5) as “a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible. "Based on this definition, a collaborative alliance can be described as an inter-firm effort to address problems too complex and too protracted to be resolved by unilateral organizational action. Collaboration refers to the process; collaborative alliances are the forms. Together, these concepts provide a foundation for moving towards answering the questions of why, how, and with what consequences organizations participate in multi-party problem solving. Certainly, collaborative ventures are used to promote knowledge sharing (e.g., supporting new technology development, and boosting the competitiveness of a specific network or technology regime or standard).

Within the context of the present study, we will particularly focus on the issue of “knowledge sharing as inter-firm control”, with the framework provided by the resources dependency theory and also borrowing some explanations from the resource/knowledge-based view. In this respect existing literature of resource dependence theory suggests that for a given business network the nature of dependency will take three forms, as firms attempt to alter their interdependence through strategic alliances:
The first type of interdependence is an up/downstream alliance hereafter called *vertical alliances*. These represent an association between a firm and the organizations supplying it, such as suppliers, buyers, or the labor pool. These organizations supplement each other’s efforts and are mutually interdependent, with a strong motivation to cooperate. Strategic alliances under these circumstances allow firms to insure continuous supply in an uncertain environment and maintain links to complementary assets (Silverman and Baum, 2002). In terms of theory, this view is also related to the knowledge-based view of the firm. The second type of interdependence is horizontal interdependence between competitors. These are alliances between organizations that compete for the same nature of resources, such as customers or suppliers (e.g., common suppliers for purchasing and selling of inputs to the focal-firm and also its competitors, etc) (see e.g., MacMillan & Jones, 1987; Astley and Fombrun, 1983; Oliver, 1990). In *horizontal alliances*, the organizations exchange or pool their resources towards some market power advantages (e.g., improving the firm’s market position) and overarching goal, for example in research consortia to influence the whole industry. In terms of theory, this view is also related to the power/resource dependency theory of the firm. The third type of interdependence is reciprocal, where firms exchange both inputs and outputs (Borys and Jemison, 1989; Oliver, 1990). An example would be joint R&D. In reciprocal alliances, firms exchange ideas, people and equipment, share lab space and pass designs back and forth. In fact, the new product development process has been found to be related to both the number of alliances and type or alliances in firms choosing to use strategic alliances (Rothaermel & Deeds, 2001).

Hence, the nature of alliances for the motive of building reciprocal interdependence also overlap and the characterization of interdependence is ‘horizontal’ (MacMillan and Jones, 1987; Astley and Fombrun, 1983; Oliver, 1990).

Resource dependency theory within this view suggests that the type of interdependence between the firms determine, in large part, the governance structure used to manage the alliance. How tightly the partners must be linked becomes an important factor in choosing a governance structure. Partial ownership represents more control for the partners but tighter control comes more organizational complexity and loss of strategic flexibility (Bresser, 1988; Harrigan, 1988; Osborn and Baughn, 1990; Kanter, 1989). The critical issue then for choosing a governance structure is the trade-off between tight control achieved through partial ownership and the need for strategic flexibility of the partners (Hermens, 2001). Das and Teng (1998) differentiate the object of control and types of control in different strategic alliance types as presented in Table 5.
Table 5  Object and types of control for different inter-firm cooperative ventures.

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<th>Alliance Types</th>
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<td>Dimensions</td>
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<td>Object of control</td>
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<td>Types of control</td>
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Source: Adapted from Das and Teng (1998) p. 498

In both up/downstream and horizontal alliances, the theory suggests that these do not need to be very tightly coupled and a non-equity alliance or contractual form of governance would be preferred.

In the third type of alliance, a reciprocal alliance, the partners exchange both inputs and outputs. In these alliances, the partners have a need to learn and communicate, as in design decisions that may affect both suppliers and customers (Thompson, 1967; Scott, 1987; Borys and Jemison, 1989). As the alliance interdependence increases from horizontal to reciprocal, so does the need for close interaction and stability in the relationship. Governance structures with more institutional control, such as minority investment or joint ventures will be preferred (Borys and Jemison, 1989). However, in the present study setting, inter-firm knowledge sharing is conceived to be an inter-firm control behavior in JV alliances and non-equity based alliances.

It is clear that in the case of a full acquisition or merger the relationship is no more a inter-firm strategic alliance setting. In this view, a greater control is achieved through financial control followed by post-merger knowledge sharing arrangements. Indeed, Mody (1993) analyzes the trade-off as being between a merger and a more loosely structured alliance. The argument rests on the need for strategic flexibility in an uncertain environment. Strategic flexibility to acquire knowledge before making irreversible investments is obtained at the cost of imperfect incentive structure and a (possible) inferior physical organization of work in the case of M&As.

Therefore, only equity and non-equity based alliance settings are selected to study the strategic role of knowledge sharing as inter-firm control behavior. However it is likely that the focal-firm with a better market position will exercise a greater degree of control over its other cooperation partners within vertical strategic alliance settings. However, a relatively more equal degree of inter-firm control through reciprocal knowledge transfer could be exercised among cooperative partners in a horizontal alliance. This view is, however, further explained in the empirical part of the study in terms of how the nature of knowledge transfer as inter-firm control behavior can differ for vertical vs. horizontal alliances. Based on this understanding, we have already formulated research objectives to analyze the variations in inter-firm control behavior through knowledge sharing (see first chapter). It is important to clarify here that knowledge sharing is regarded as inter-firm dependency or control. What is meant by control in the present study is the power balance among parties that is achieved as result of knowledge
sharing. In this view, knowledge sharing is also a new type of control as presented in the present study.

4.2. Collaborating on the firm’s relationship and resources characteristics

Co-specialization alliances create value by bringing together the skills and knowledge of collaborating partners. When the contribution of knowledge sourcing alliances is analyzed, the focus is generally on the question: "What does my potential partner bring that is unique?" (Doz and Hamel, 1998). Co-specialization alliances rely on the skills or other ownership-specific contributions of the alliance partners (e.g., firm-specific knowledge of the firm’s needed internal and external resources). Actually, this category of alliances ought to measure the value of new opportunities they create compared with what the partners could have achieved on their own. Increase revenues and cash flow streams are likely to be the most frequently used benchmarks for co-specialization alliances in the long run.

There could be also other motives for alliances in relation to evaluating potential partner characteristics. For example, a defensive alliance may have limited effects on increased revenues, but reduce competition within a business network. However, there might still be improvements over the effect of having no alliance at all. Obviously, the comparison will always be clouded by the difficulty of answering the “what if?” question; hence, the strength of co-specialization should be able to swing the balance decisively in favor of an alliance as opposed to no alliance (Doz and Hamel, 1998). Hence, resource selection and accumulation are a function of both in-firm decision-making and external strategic factors. In-firm managerial choices also are guided by so-called economic rationality and by motives of efficiency, effectiveness and profitability (Conner, 1991). However, external influences are sometimes more significant, for example strategic industry factors that impact the firm, including buyer and supplier power, intensity of competition, and industry and product market structure. These factors influence what resources are selected, as well as how they are selected and deployed. Whether resource selection and deployment result in enduring variation across firms will depend on factor market imperfections. It is defined as barriers to acquisitions, imitation, and substitution of key resources or inputs (Barney, 1986, 1991, 1994; Penrose, 1959; Schoemaker and Amit, 1994). These barriers inhibit competitors’ abilities to obtain or duplicate critical resources and lead to long-run differences among firms in their ability to generate rents. When strategic factor markets are imperfect or incomplete, they create barriers to resource mobility and an unequal distribution of resources across competing firms (Barney, 1986; Dierickx and Cool, 1989).

Resource market characteristics, in turn, shape resource characteristics and the rent potential of resources. The persistence of rents from resources depends fundamentally on the features of the resources themselves. These resource characteristics include whether resources are scarce, unique, inimitable, durable, idiosyncratic, non-tradable, intangible and non-substitutable (Amit and Schoemaker, 1993; Barney, 1991; Mahoney and Pandian, 1992; Peteraf, 1993; Rumelt, 1984). Rent-generating resource traits develop not only from factor market imperfections but also from unique historical circumstances (e.g., a valuable physical location) and the accumulation of specialized capabilities (Barney, 1991). Therefore, sustainable competitive advantage is the outcome of discretionary so-called rational managerial choices, selective resource accumulation and deployment, strategic industry factors, and factor market imperfections (Oliver, 1997). Hence, so-called economic motives also partly drive resource procurement decisions and economic factors in the firm’s competitive and
resource environments drive firm conduct and outcomes. However, constraints on optimal resource choices are also a function of resource longevity. Some resources owe their distinctiveness and inimitability to their longevity within the firm (Conner, 1991; Teece, 1988; Teece, Pisano, and Shuen, 1997). These history- or path-dependent resources (e.g., specialized technical expertise, unique R&D capabilities) are rooted in the history and culture of firms and derive their value from time compression diseconomies; that is, from development over a long period of time (Amit and Schoemaker, 1993; Canner, 1991; Dierickx and Cool, 1989; Powell, 1991; Teece, 1988).

Yet it is the embeddedness of these institutionalized competencies in history that also increases their likelihood of being perpetuated without question. For example, Chrysler’s inability to see the value of smaller car production in the mid-1970s was a result of unquestioning conformity to the firm’s historical competencies. However, traditional core competencies have the potential to become ‘core rigidities’ that inhibit subsequent development and success (Leonard-Barton, 1992). As Teece (1988: 256) observed, firms have limited abilities to change their competencies ‘because a firm’s learning domain is defined in part by where it has been.’ Longstanding core competencies typically become taken for granted as indispensable assists, not because of their demonstrated superiority under a variety of competitive conditions, but because their longevity is considered sufficient evidence of their value. Xerox, for example, took for granted that its traditional competence in serving copiers was a key strategic capability until Canon ‘designed service out of its product’ by substituting superior product design for an extensive service network (Dierickx and Cool, 1989: 1509). These ‘competency traps’ (Barnett, Greve, and Park, 1994; Levitt and March, 1988) are more likely to occur the longer a particular resource or capability has served a firm, and the more integral its role is in the firm’s most deeply rooted competencies may, paradoxically, pose the most serious challenge to sustainable competitive advantage. Put differently, it is the path-dependent assets in a firm’s resource portfolio that may become its most limiting liabilities when competitive environmental conditions change.

Within the context of the study we have considered that perceived business network uncertainty (e.g., resource dependency theory) and perceive deficiency of resources (e.g., knowledge based view of the firm) are primarily linked with the collaborating firm’s relationships and resources characteristics as describe in Figure 10. Here it is important to explicitly make the statement that the perceived business network uncertainty discussed in the next section is not based on the network approach. Network uncertainty is seen as network resource dependence based on resource dependence theory. Instead of network business relationships, the resources in relationships was studied and therefore resource dependence theory was found as a better alternative to network approach in this case. In the following section a priori assumptions are systematically presented to explain the tentative model of the study (e.g., Figure 10).

4.2.1. Perceived business network uncertainty

Uncertain firm environment is a vital dimension of the resource dependency theory. Understanding about the concept of uncertainly itself will serve as a starting point: The emphasis on uncertainty coping has grown out of the work of Cyert and March (1963) and extended by Thompson (1967). As Hickson et al. (1971: 217) noted, “organizations are conceived of as interdependent-mental systems in which a major task element is coping with uncertainty.” This perspective has been pursued in the literature on
organizational design as well, as in Galbraith’s (1973) emphasis on information processing requirements and capacities as critical variables in the design process. Uncertainty coping is seen as a critical task or activity within organizations, in part because organizations are viewed as social entities in which uncertainty is reduced through the use of standard operating procedures, forecasting, buffering, decision rules and other activities that permit the rationalization of organizational activities.

As quoted in Doz and Prahalad (1980: 150) in most instances, the unification-fragmentation trade-off is not predetermined: it involves both uncertainty and choice. Hence, benefits of integration and the extent of the pressures to fragment can be estimated through analysis (i.e., managerial decisions). Indeed, most firms face some degree of choice: that is, there may not be a single optimal point on the fragmentation-unification continuum, but a range of tenable positions. Furthermore, pressures for integration and fragmentation are not independent.

The emergence of knowledge as key resource of firm sustainable competitive advantage has created difficulties as to what kind of knowledge is important as change in customer preferences and technological change became rapid. This kind of uncertainty caused by technological change is emphasized in the literature (Rosenberg, 1996). In this view, rapid technological change in many industries is competence destroying (Schumpeter, 1942) for firms that might not be able to absorb the benefits of new technology (i.e., linked to the concept of the firm’s absorptive capacity, see Cohen and Levinthal, 1990) to their existing and new emerging capabilities as a source of building new core competencies. This is further explained in the following paragraphs:

In the product life-cycle tradition, many writers have observed that uncertainty peaks early and decreases following convergence on a dominant design (Anderson and Tushman, 1990; Klepper, 1997) Hence, in the case of radical and so-called competence destroying or destabilizing technological change (see e.g. Schumpeter, 1942) the sources of the shorter product life cycle are particularly difficult to predict (Tushman and Anderson, 1986; Ayres, 1988; Mokyr, 1990). However, entrepreneurial talent is an important source of managing uncertainty (Penrose, 1959). Technologies evolve and uncertainty decreases as inventors are able to analyze the needs of customers and the technology logic of their customer trajectory. Hence, research remains agnostic about the causal sources of uncertainty and the simple models it stochastically draws (Nelson and Winter 1982; Klepper, 1996). Proponents of bounded rationality often characterize technological change as an intrinsically uncertain and, to varying degrees, blind search process (Nelson and Winter, 1982; Vincente, 1990; March, 1991).

Despite this widespread acknowledgement of the importance of uncertainty it is difficult to explain the ultimate sources of uncertainty. For, there are many causes of uncertainty in technological change besides purely technological sources, including the adaptation and diffusion of (i) new technologies, (ii) market and customer acceptance, and (iii) competitors’ strategic actions (Rosenberg, 1996). Hence, Schumpeter (1939) defined innovation as the commercial application or adaption of an invention. He argues that, “the making of the invention and the carrying out of the corresponding innovation are, economically and sociologically, two entirely different things” (p. 85). That is why the absorptive capacity (Cohen and Levinthal, 1990) is significant when innovations in firms require a response to broader technological change in industry’s boundaries. While these sources of uncertainty remain interdependent, it is difficult to explain the sources of uncertainty. However, a viable focus in reducing the sources of uncertainty through managing inter-firm dependencies and hence preserving the organization’s autonomy is the theoretical context emphasized by resource dependence
theory. In the next section P1 and its subsections P1(a), P1(b), and P1(c) are presented, based on the theoretical context presented in the resource dependency theory of firm behavior.

Based on the above analysis a priori assumption P1 is given as follows:

P1: “The focal-firm’s perceived business network uncertainty is likely to be related to strategic alliance formation and subsequent knowledge sharing between partners as inter-firm control behavior.”

This is stated while recognizing that inter-firm relationships (e.g., strategic alliances) are necessary among specific cooperative partners to control the critical sources of inputs and outputs within an uncertain environment (e.g., business network). It is important to analyze the environmental-links that might cause ‘perceived business network uncertainty’ (e.g., (a) new technology application (b) competitors’ strategic actions, and (c) risk of knowledge spillovers).

4.2.1.1. New technology application

Selecting the right technologies to incorporate in a new product is a challenging aspect of new product development. Product definition, the early phase of the product development process, involving the determination of the key specifications of a product, has been shown to be critical to the success of a firm’s new product (Cooper 1993; Bacon et al. 1994).

During the product definition phase, input data and information about customer needs and emerging technologies are used to finalize key specifications of the product such as its performance levels and features. These specifications are important inputs based on which subsequent downstream detailed design and prototyping activities are carried out. To minimize the adverse impact on these subsequent downstream activities, it is often recommended that the specifications be frozen early in the development process (Cooper, 1993).

Based on this understanding, we extend a priori assumption P1 as follows:

P1(a): In a business network, new technology application is a perceived network uncertainty likely to be influencing knowledge sharing between partners in a strategic alliance.

4.2.1.2. Competitors strategic actions

Competition is not a well-developed concept among organizational theorists, and efficiency is only one of several criteria that have been used by organization theorists to judge the appropriateness of specific organizational forms (Barney and Ouchi, 1986). Thus, most organizations (Hoenack, 1983) and certainly most business firms face competition that constrains their options to a small, efficient set of possibilities (Hirshleifer, 1980).

Why do some firms form strategic alliances while others do not? Two themes from the literature on cooperation seem relevant to this question. One theme emphasizes the strategic aspects of cooperation. The central premise is that people engage in cooperation because of appropriate payoff structures (e.g., Axelord, 1984; Parkhe,
That is, people cooperate when the payoff for cooperation exceeds that of proceeding alone. When the payoff shifts to favor solo endeavors, people will disengage from cooperation activities. Thus, this perspective takes an atomistic view of individuals (e.g., Hennart, 1988; Pisano and Teece, 1989; Williamson, 1991), emphasizing the nature of the payoff structure and the role of self-interest in cooperation (e.g., Axelrod, 1984; Parkhe, 1993).

In the case of alliances, a high payoff for cooperation is particularly likely when firms are in vulnerable strategic positions. The strategic position depends on the characteristics of both firm strategy and the market (Conner, 1994). In vulnerable strategic positions, or when undertaking expensive or risky strategies, alliances can provide critical resources such as skills and financial resources (e.g., Hamel et al., 1989; Pisano and Teece, 1989) or others such as legitimacy and market power (e.g., Weiwel and Hunter, 1985; Hagedoorn, 1993; Baum and Oliver, 1991) that improve the strategic position. Thus, alliance formation occurs when firms are in vulnerable strategic positions such that the payoffs for cooperation are high.

The competitors’ strengths and subsequent strategic actions can also create a vulnerable strategic position for the focal-firm within an industrial network. For example, in a more recent study, Perry, Sengupta and Krapfel (2004) noted that turbulent competition in high-technology industries fuels many firms’ desire to develop horizontal strategic alliances (HSAs) for offensive and defensive reasons mainly caused by the growing strengths of competitors. Hence, coordination problems and risks inherent in alliances are magnified in horizontal alliances and horizontal network relationships among companies (Park and Russo, 1996). Further, the assessment of a company’s strategic position must include an analysis of the company’s situation in the particular business networks where it performs its operations. Normally, this analysis focuses on the company’s products relative to those of competitors with questions such as: what are the sales trends, profits and market shares of its products and services in comparison to competitors?

Based on this understanding, we extend a priori assumption P1 as follows:

P1(b): In a business network, competitors’ strategic actions are a perceived network uncertainty likely to be influencing knowledge sharing between partners in a strategic alliance.

4.2.1.3. Risk of knowledge spillovers via cooperative partners

Successful innovation depends on the development and integration of new knowledge in the innovation process. Part of this knowledge will reach the firm from external sources. In most theoretical models of cooperation, there can be some spillover risk of valuable know-how reaching competitors. Assuming symmetry between incoming and outgoing spillovers precludes the idea that firms manage these information flows. The aim of managing the external information flows is to maximize the incoming spillovers from partners and non-partners, while at the same time minimizing spillovers to non-partners.

Several strands of the literature have developed the notion that firms attempt to manage incoming information flows: First, firms try to increase the extent of incoming spillovers by investing in absorptive capacity. Cohen and Levinthal (1989) argue that external knowledge is more effective for innovation process when the firm engages in
its own R&D. Secondly, a firm might increase its incoming spillovers by voluntarily trading knowledge with specific partners, as in the research joint venture information-sharing scenario of Kamien et al (1992). Increasing the incoming spillovers between research partners is found to increase not only the profitability, but also the stability of cooperation in R&D, since it makes the potential threat of non-sharing harsher (Kesteloot and Veugelers, 1995) Cassiman and Veugelers (2002) found a significant relation between external information flows and the decision to cooperate in R&D.

Firms that rate generally available external information sources as more important inputs to their innovation process (the incoming spillovers) are more likely to be actively engaged in cooperative R&D agreements. At the same time, firms that are more effective in appropriating the results from their innovation process are also more likely to cooperate in R&D. Differentiating between incoming spillovers and appropriation proves particularly important when examining their effect on different types of cooperative agreements, such as agreements with suppliers and customers or agreements with research institutions. Furthermore, Cassiman and Veugelers (2002) results suggest that level of knowledge in- and outflow is not exogenous to the firm. However, firms through their innovation activities affect incoming spillovers and appropriation capabilities.

There have been some attempts to examine the underlying conditions that lead firms to cooperate in R&D. The most frequently argued condition is transaction costs (see, for example, Hennart, 1988; Kogut, 1988). Major sources of transaction costs in cooperative R&D include investments in transaction-specific or relation-specific assists, uncertainties regarding R&D outcomes and the execution of contractual agreement (Pisano, 1991), and costs to monitor and bond parties to an agreement (Kought and Singh, 1988). Cooperation in R&D is assumed to economize on the costs of sharing or exchanging knowledge. The emphasis on resource dependency theory in this thesis as basis for the analytical framework resides in the limitation of TCE, which does not view cooperative R&D as a means of knowledge creation, nor does it address the strategic learning motives (Kogut, 1988) that are also very significant aspects of R&D cooperation.

In highly concentrated industrial markets buyers, suppliers, competitors and cooperative partners are in closer proximity and most likely to learn better about each other’s strategies. Firms are bound to operate within an industrial network consisting of a small number of buyers and sellers where fewer alternative partners are available in the value creation processes. Therefore, the focal-firm like to cooperate with such suppliers which could possibility join its competitors, and it is likely to be done through building a stronger cooperative ties through knowledge sharing. Creditable commitment allows a firm to influence (i.e. control) its important suppliers and thereby simultaneously delay substitution and control the threat of imitation (e.g., risks of knowledge spillovers to competitors).

Based on this understanding, we extend a priori assumption P1 as follows:

P1(c): In a business network, the risk of knowledge spillover is a perceived business network uncertainty likely to be influencing knowledge sharing between partners in a strategic alliance.
4.2.2. Perceived resource deficiency

Since the publication of March and Simon’s (1958) influential book, the political image of the business firm has been a key component in organizational theory (Thompson, 1967; Zald, 1970; Pfeffer and Salancik, 1978; Pfeffer, 1981; Perrow, 1986; March, 1988). If constrained dependence (i.e., perceived deficiency of resources) imposes limits on firm sustainable functioning, it may equally confer advantages on the limiting party (e.g., focal firm with dominant market position) in a more general sense, which represents a power-dependence dimension with cooperative partners in a given business network.

When firms are faced with constrained dependencies, the actors (i.e., cooperative partners) are likely to engage in “balancing operations” (Emerson, 1962: 34; Blau, 1964; Jacobs, 1974). In some cases, these operations may reduce the salience of the dependence by incorporating new players into the network, or actors may eliminate the constraint altogether by withdrawing from troublesome relations. Choosing between these options, however, is not always feasible, even for a powerful organization (i.e., focal firm), where dependence results from market circumstances largely outside the individual firm’s control.

In the organizational literature, embedding maneuvers are often discussed as cooptive strategies (Pfeffer, 1981: 166-177). Research has shown that resource dependence between organizations triggers cooptive ties – such as interlocking directories, vertical integration, and business alliances between the organizations (Pfeffer and Salancik, 1978; Burt, 1983). Analysis of inter-organizational power strategies have pointed out the cooptive role of maneuvers such as integrating special committees to reduce the actual constraints imposed by powerful outsiders on the strategic player (Pfeffer, 1972; Selznick, 1980). The results of these studies show that the actors seek strategic alliances in proportion to the intensity of constraint in a specific sector of their environment. Thus, the distribution of cooptive ties should be positively correlated with the distribution of constraint. Hence, Gargiulo (1993) implies that the standard operationalization of resource-dependence theory has neglected cooptive relations with actors with whom there is no direct dependence, since such ties are strategically inconsequential.

In industries experiencing rapid technological change, a single company rarely has the full range of expertise needed to offer timely and cost-effective new product innovations (Teece, 1987). In fact, a turbulent, uncertain environment serves to increase the motivation to cooperate and innovate (Buckley and Casson, 1988; Lengnick-Hall, 1992). The theoretical basis for this lies in inter-firm exchange behavior, in which, given functional specialization and scarcity of resources, organizational exchange resources are for mutual benefit (Bucklin and Sengupta, 1993; Frazier, 1983). This view complements the clear resource constraints on a firm’s behavior and motives of inter-firm knowledge sharing based cooperation inherent in dynamic models of competition (Hangedoorn, 1993). Firms need to source some knowledge and technology externally in order to concentrate on their competitive advantage (Teece, 1987; Ohmae, 1989). Successful firms employ their resources to focus on their relative competitive advantage and then leverage the skills and knowledge outside the firm to maximize this advantage (Dickson, 1992). Cooperating firms’ cumulative resources, complementary skills, and boundary-spanning activities are likely to increase the level of innovativeness of the products (Kotabe and Swan, 1995).
However, the focus is still on minimizing inter-firm dependencies and preserving the organization's autonomy, while recognizing that inter-firm relationships are necessary to acquire resources. For resource dependence theory, a key question from the perspective of the individual firm is how can we achieve stability and reduce uncertainty with respect to the environment without increasing our dependency on other organizations?

Based on the above analysis a priori assumption P2 is given as follows:

P2: “The focal firm perceived deficiency of resources is likely to be related to resource-dependence in a strategic alliance and subsequent knowledge sharing between partners as inter-firm control behavior.”

However, circumstances (e.g., perceive deficiency of resources links) which might cause the perceived deficiency of resource conditions are characterized as P2(i) complementary knowledge, and P2(ii) relationship with either key customer and competitor (e.g., collaborating on the firm’s resources and relationship characteristics).

4.2.2.1. Complementary knowledge

Firms are heterogeneous, even if they are in the same industry and also within a given business network. The resource/knowledge-based view of the firm has underlined imperfectly imitable and imperfectly mobile firm resources as the roots of sustainable competitive advantage.

We maintain the point of view that the firm builds cooperative relationships in order to access these firm resources. For example, Barney (1991: 101) defines firm resources as “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness”. A resource is imperfectly imitable if other firms face uncertainty in replicating the resource on their own (Lippman and Rumelt, 1982), and is imperfectly mobile if other firms encounter difficulty in acquiring the resource from its present employer (Peteraf, 1993). The firm-specific knowledge of each potential alliance partner is a resource that is both imperfectly imitable and imperfectly mobile, unless deliberate efforts are made to exchange and transfer or sharing this resource (e.g., knowledge). In fact, no firm can have resources with these two features, unless the resources of different firms in an industry are heterogeneous (Rumelt, 1984; Wernerfelt, 1984). Furthermore, in order for an imperfectly imitable and imperfectly mobile resource to sustain any competitive advantage, it must be able to provide its employer with rents that are more than temporary (Peteraf, 1993,) and have no substitutes that are easily imitable or mobile (Barney, 1986b, 1991). In strategic management literature (Hitt and Ireland, 1985, 1986; Snow and Herbriniak, 1980), these resources are commonly identified by a firm’s distinctive competence in technology (secret know-how or superior R&D capability), marketing (skills in bundling product attributes), and management (a valuable organization culture).

Penrose argues that: ‘It is the heterogeneity . . . of the productive services available or potentially available from its resources that gives each firm its unique character’ (1959: 75). Further, the firm may achieve rents not because it has better resources, but rather the firm’s distinctive competence involves making better use of its resources (Penrose, 1959: 54).
This perspective could be also understood in the context of the importance of knowledge sharing for maintaining the distinctive competencies of alliance partners, which also involves better use of their own distinctive resources and capabilities. Penrose argues that unused productive services of resources ‘shape the scope and direction of the search for knowledge’ (1959: 77). Hence, Penrose (1959) did not explicitly mention that the direction of the search for new knowledge is complementary in nature. However, we know from more recent research that the firm, due to its limited absorptive capacity, can only identify the usefulness of the complementary nature of knowledge, and therefore a new knowledge search is also likely to be complementary in nature (Cohen and Levinthal, 1990). Therefore, we assume that the focal-firm, due its superior market position, prior experience and absorptive capacity is likely to identify the complementary knowledge residing with the potential alliance partner and then make the decision to build knowledge sharing based cooperative relationships (e.g., strategic alliance).

Based on the above understanding, we extend a priori assumption P2 as follows:

P2(a): In a business network, complementary knowledge is a perceived resource deficiency likely to be influencing knowledge sharing between partners in a strategic alliance.

4.2.2.2. Relationship with key customers and competitors

Hence, the resource/knowledge based view also suggests that the degree of heterogeneity in the participating firms’ capabilities is another condition which leads firms to cooperate in R&D. Capability heterogeneity is defined here as the breadth or diversity of technological capabilities that firms possess. Today’s highly sophisticated innovations often depend upon work across several areas of science and technology (Hagedoorn, 1993). Few firms have the breadth of knowledge required for such undertaking and so a new combination of capabilities is necessary to build core competencies (Hagedoorn, 1995; Tyler and Steensma, 1995). For instance, the degree of capability heterogeneity can distinguish the different motives for participating in cooperative R&D. In the case of skill-sharing or learning-based R&D cooperation, what is important is not only the outcome of the project, but also the process of resource accumulation, or learning in an R&D consortium (e.g., building firm absorptive capacity for understanding new knowledge: direction of search). However, the cooperative partners with knowledge-sharing motives might not find it easier to reach an agreement to cooperate without a clear end result in mind, mostly in horizontal alliances. This is in contrast to firms whose primary motive for cooperation is cost-sharing or economizing, which could have more specific goals for vertical integration. Hence, it is difficult for organization theorists to deny that inter-firm knowledge-sharing is an important means for a firm to enter a new business or strengthen its core competencies to effectively compete with competitors.

The resource/knowledge based literature views the firm as a bundle of resources and capabilities, and examines conditions that contribute to the realization of sustainable economic rents (Penrose, 1959; Wernerfelt, 1984) Because of (1) resource-market imperfections, and (2) discretionary managerial decisions about resource development and deployment, it is to be expected that firms differ in the resources and capabilities they control. These resources are also seen as firm-specific relationships with both (a) key customers, and (b) key competitors. Therefore, establishing a cooperative
asymmetry with potential alliance partners, with unique relationships with key
customers and key competitors, in be a source of sustainable economic rents.

In this respect it is important to emphasise that competitor analysis (Hamel and
Prahalad, 1990; Porac and Thomas, 1990; Porter, 1980, 1985; Zajac and Bazerman,
1991) and inter-firm rivalry (Bettis and Weeks, 1987; D’Aveni, 1994; Smith, Grimm,
and Gannon, 1992) occupy a central position in strategy. A primary objective of
competitor analysis is to understand and predict the rivalry, or interactive market
behavior, between firms in their quest for a competitive position in an industry (Porter,

Based on the above understanding we extend a priori assumption P2 as follows:

P2 (b): In a business network, the focal firm’s cooperative relationship, either with its
customer or competitor, is a perceived resource deficiency likely to be influencing
knowledge sharing between partners in a strategic alliance.

The overall framework of study is presented in figure 10 (e.g., factors affecting
knowledge-sharing as inter-firm control behavior among contractual and JV strategic
alliances). It’s important to clarify here that resource dependency theory regards a
firm’s external resources as a source of superior organizational performance. Whereas
resource and knowledge based theory of the firm regards firm-specific (the firm’s
internal) resources as a source of competitive advantage. In the study, the dimension of
resources is related to external and firm-specific resources. Therefore, the research
question should be understood within the context of both the external and internal
resources exchanged through knowledge sharing. As such, knowledge-sharing factors
are presented as relationship based and resource based respectively. In the framework
knowledge sharing is a form of control. However the existing literature does not see
knowledge sharing as a form of control. Therefore knowledge sharing and control are in
separate boxes although they are two different sides of the same coin as conceptualized
in the present study.
Theoretical framework

Factors Affecting Knowledge Sharing

Perceived business network uncertainty

Perceived resource deficiency

Factors

Relationship characteristics

P1a: New technology application
P1b: Competitors strategic actions
P1c: Risk of knowledge spillovers

Resource characteristics

P2a: Complementary knowledge
P2b: Focal-firm’s relationship with either customers or competitors

Knowledge sharing

Control
To summarize, the present chapter was about the analytical framework related to three elements of the study (e.g., knowledge sharing, control and alliances). The chapter started with the discussion of how resource dependency theory of the firm and resource/ knowledge based theory of the firm are utilized in the context of the analytical framework of the study. Further, the focal-firm strategy in unstable environments was analysed to establish the relationship in firm alliance behaviour in response to environmental uncertainty. In this view, the nature of dependency takes three forms as firms attempt to alter their interdependence through strategic alliance (e.g., vertical, horizontal and reciprocal interdependence). This was followed by the discussion of how collaboration among strategic alliances partners is based on their mutual resources and relationship characteristics. Finally, perceived business network uncertainty (e.g., resource dependency theory) and perceived deficiency of resources (e.g., knowledge based view of the firm) were primarily linked with the collaborating firm’s relationships and resource characteristics as described in Figure 10. A tentative framework was presented as the foundation to the methodology chapter and to conduct the empirical part of the study. The framework is based on a priori assumptions and a model. A priori assumptions were presented to discuss the tentative model of the study. A priori assumptions were used to come up with an in-depth description of the factors of knowledge sharing raised in the tentative framework based on an extensive literature review. The purpose of this model is to ultimately come up with a final model following the empirical part of the study. The analytical framework in the present chapter deals with exploring the elements (e.g., factors) of knowledge sharing as inter-firm control behaviour.
5 RESEARCH METHODOLOGY

5.1. Introduction

The chapter examines the philosophical and methodological stance of the present study. As a point of departure, constructivism as a methodological tradition is discussed in the context of realist perspective of strategic management research. Then key ontological and epistemological assumptions which are incorporated in the overall research strategy and design of the study are made explicit as a critical realist methodological paradigm of scientific research.

5.2. Philosophical stance of the study

According to Denzin and Lincoln (2000), ontology is the set of ideas or framework that guides a researcher. It is a matter of how reality is constructed. Epistemology attempts to answer what distinguishes true knowledge from false knowledge. Epistemological issues guide methodological decisions (Easton, 1995). There is a willingness amongst strategy researchers to engage in this debate (e.g., Priem and Butler, 2001a, 2001b; Mir and Watson, 2000, 2001; Spanos and Lioukas, 2001; Bronn, 1998; Kwan and Tsang, 2001). Further discussions on the philosophical underpinnings of strategy research have had great prominence in the field of knowledge management in recent years (Nonaka, 1998, Schendel, 1994; Spender, 1996). In this respect, many theorists have used premises derived from the philosophy of science to examine the inherent assumptions that guide strategy research. For instance, they have discussed the tension between inductive and deductive logic (Montgomery, Wernerfelt, and Balakrishnan, 1989), the role played by Karl Popper’s theory of falsification in designing and testing hypotheses (Seth and Zinkhan, 1991), and the textual nature of strategy research (Bauerschmidt, 1996).

In the following section, we will argue for the potential of constructivism as a methodology for strategy research (Spender, 1996; Schere and Dowling, 1995): Constructivism is a philosophical school of thought arguing that research is fundamentally theory-dependent. The theoretical position held by researchers not only guides their basic position, but also determines what becomes constructed as a research problem (Ghauri & Gronhaug, 2010). It is, however, important what theoretical procedures are used, and what constitutes observations and evidence (Boyd, 1991: 202). Constructivism is linked to the notion that research is not just conducted by impartial, detached, value-neutral subjects, who seek to uncover clearly discernable objects or phenomena. Rather, constructivists view researchers as craftsmen, as toolmakers (Spivey, 1995: 314), who are part of a network that creates knowledge (Law, 1992: 381) and ultimately guides practice.

The research problem always starts from a broader perspective, and it is narrowed down to context of the study through formulating research objectives. The research problem is based on the researcher’s understanding of the problem, which should correspond to explaining the concepts and relevant theoretical discussion. Therefore, by using existing knowledge the researcher will often be able to structure the problem so that propositions may be derived and tested. However, in this way the problem may be more or less understood. A distinction is often made between a ‘structured’ and
‘unstructured’ problem. It should be noted that it is not the problem per se, but the understanding of problems that is more or less structured. The structured nature of the research problem has implications for the choice of research design and research methods. The research practice is also influenced not only by the researcher’s philosophy of science perspective but also understanding of the industry itself and through the teaching and training of managers. This was quite relevant for me as a lecturer in the Executive MBA program during recent years, whereby I have had the possibility to mutually share knowledge, prepare applied lectures and development-oriented assignments for executives in the ICT and telecommunication industries in Finland, Sweden and other European countries.

In order to conduct scientifically consistent and practically relevant research, a multi-method strategy has been used in formulating the research problem, which varies from literature review, understanding managerial practices and also the researcher’s own orientation (Brewer and Hunter, 1989). Within the context of researcher orientation, the present dissertation is also the product of my last 7-8 years of teaching, and my research interests as lecturer and researcher.

5.2.1. Constructivism as a methodological tradition

Constructivism has been described as “a theory of knowledge with roots in philosophy, psychology, and cybernetics” (Von Glaserfield, 1995: 8). Its epistemological assumptions are non-positivist: according to constructivists, rules and principles do not exist independently of our theorizing about them. Indeed, they suggest that it is our theory that drives all aspects of our empirical inquiry, including what counts as observation, what research designs and experiments will be acceptable, what problems are worthy of attention. As Von Glaserfield (1995: 7) asserts, ‘to the constructivist, concepts, models, theories and so on are viable if they prove adequate within the context they created.’ The concepts that drive constructivism are as old as Socrates, who taught his students that knowledge was merely perception (Murphy and Rhaume, 1997). However, much of the theoretical impetus to modern constructivist research comes from Thomas Kuhn, who reported that research in the physical science proceeded not through immanent laws, but rather through the facilitating powers of paradigms, which he defined as a characteristic set of beliefs and perceptions held by a discipline (Kuhn 1970: 12).

Constructivism does not question the existence of phenomena, but rather our ability to understand them without a specific theory of knowledge. As Nelson (1994: 535) argues, we are not to think of the phenomena studied by scientists as the inevitable manifestation of existing entities and processes, but instead theoretical entities and practices are constituted and constructed by scientists post hoc. Clearly, the attempt here is to subject our theorizing of phenomena to inquiry, not the phenomena themselves.

In a nutshell, there are six important assumptions that are shared by all the constructivists (Mir and Watson, 2000). Hence, these assumptions are fundamental as a point of departure for describing the philosophical stance of the present study for guiding our understanding between the theoretical and empirical parts of the dissertation: Knowledge is theory driven. Constructivists believe that as long as researchers are transparent about their a priori theoretical position, the process of research is not impeded. However, they oppose a ‘nomothetic’ approach to methodology in the discovery of ‘natural’ phenomena, and that adherence to systematic
protocol and technique will eliminate all biases from the research process (Burrell and Morgan, 1979:6).

The separation of the researcher (subject) and the phenomena under investigation (object) is not feasible. According to constructivists, the philosophical positions held by researchers determine their findings. (Berger and Luckman, 1966; Gergen, 1995). Constructivists believe that theory and practice are fundamentally interlinked. According to constructivists, practice exists both before and after theory. As Butts and Brown (1989) theorize, there is a phase of pretheoretical praxis that leads to the formalization of theory, and ultimately guides future praxis. For instance, Scherer and Dowling (1995) have studied the literature on strategic control systems and demonstrate that many of the suggested theories of strategic control are either empirically inapplicable or may be applicable in multiple ways, which are mutually incompatible (pp. 203-204). They suggest that this problem can only be resolved when "researchers cease to drive their authority from being observers" and acknowledge that "they are participants in the processes they study" (p. 230).

Researchers are never ‘objective’ or value-neutral. Constructivists subscribe to the view that theory is distinctive and power-laden. They suggest that theories are transmitted across space and time through distinctive practices. Institutions are the sites where discourses produce communities of agreement (Von Glaserfield, 1995). In this respect, the theories are reflections of the dominant power interests of their time (e.g., monopoly power, perfect competition). Research occurs within a ‘community’ of scholarship, where mutually held assumptions are deployed to create ‘conversations’. Similarly, analysis of the philosophical assumptions of scientific research has led to a variety of scholars advocating a more constructivist interpretation of science (Bloor, 1976; Knorr-Cetina, 1983).

Constructivism constitutes a ‘methodology’. Constructivism is distinct from a method. A method is a tool or technique that is used in the process of inquiry. In contrast, a methodology may be regarded as an ‘intricate set of ontological and epistemological assumptions that a researcher brings to his or her work’ (Prasad, 1997: 2). However, the distinction between methodology and method is not a trivial one. As Machlup (1978) suggests, methodology represents the doctrine of systematic forms of thought, and in order to be clear researchers need to be explicit about their choices of methodology. According to the constructivist paradigm there are multiple realities (Charmaz, 2000; Denzin and Lincoln, 2000). From a constructivist perspective, the researcher constructs an image of reality. The researcher should look for meanings and go deeper than surface meanings (Charmaz, 2000). A constructivist researcher tries to understand contextualized meaning (Greene 2000). According to Moren and Blom (2003), the researcher tries to examine the underlying values, meanings and interpretations. Within social science, Moren and Blom (2003) argue that constructivism to some extent also regards the context. The aim is directed at understanding. The principles of hermeneutics can consequently be coupled with constructivism (Denzin and Lincoln 2000).

As mentioned earlier, constructivism does not approve of the traditional positivistic demands of scientific research (Sinkovics et al 2008). Traditional positivist criteria such as validity, reliability and objectivity are replaced by credibility, trustworthiness and conformability (Denzin and Lincoln, 2000). According to Charmaz (2000), there is a distinction between the real and the true in constructivist grounded theory. The truth as something universal (might be metaphysical) and lasting is not a part of the constructivist approach. Instead, human realities are addressed, but these are not
regarded as one-dimensional. Constructivism goes hand in hand with natural research settings and qualitative methods such as case studies and interviews (Greene, 2000). Interpretative case studies are suited for use within the constructivist paradigm (Denzin and Lincoln, 2000).

There are, however, some problems connected with constructivism. The problem with constructivist research is mostly in relation to evaluating the findings. It becomes problematic to judge what is good science (Easton, 1995). Constructivist reports are often descriptive, which means that the possibilities of explaining are limited and therefore it is not possible to analyze the effects of something as true world images? To address some of these difficulties, anthropological and epistemological realist and relativism perspectives are discussed in connection with the overlapping constructivism paradigm (see Figure 11).

5.2.2. Realism and constructivism

Many recent theories of the firm that have significantly influenced strategic management research are based on realist assumptions. The most prominent among them are transaction cost economics, where constructs such as opportunism are used to explain the existence of firms, and agency theory, which is predicated upon the choices made by agents as well as the utility functions of principals and agents. Further, resource dependency theory and resource-based/knowledge-based views of the firm, which have contributed significantly to our understanding of inter-firm performance heterogeneities in markets where factors of production are relatively mobile, also depend on the premise that the firm is able to keep its resource configurations unobservable (Godfrey and Hill, 1995). Typologies of strategic action such as those developed by Miles and Snow (1978) and Porter (1980) are based on realist premises, and the various strategic positions taken by firms may be operationalized in a variety of ways.

However, the principles of constructivism are in fact partly overlapping within the context of realism assumptions on which strategic management theories are based (e.g., resource dependency theory and resources/knowledge based view of the firm), as utilized in the analytical framework of the present study. In this respect it is important to clarify how the principles of constructivism can be applied to the strategic management field which is largely based on realist assumptions. In order to answer this question, we must first make a key differentiation between ontological and epistemological relativism - a distinction that was made explicit by Campbell (1988). In his analysis of act of theory building, Campbell (1988: 507) goes so far as to state that ‘any theory of how science could produce beliefs of improved “truth” or competence in reference will have to be sociological in considerable part and will have to be epistemologically relativistic’. At the same time, Campbell draws very strict boundaries around his relativism, declaring, ‘while I am a thoroughgoing epistemological relativist, I reject ontological relativity ... evolutionary epistemology has in it an unproven assumption of a (n external) real world’. Drawing on previous discussion, Mir and Watson (2000) somehow resolve this tension between ontological and epistemological issues by a 2 x 2 matrix, as depicted in Figure 11. In strategy research, the notion of ontological realism is one where the existence of phenomena themselves is taken for granted. For instance, one does not need to argue that people working together produce tangible things like cars and intangible things such as insurance policies.
In the present study this ontological realism is extended from the zone of constructivism into epistemological realism, assuming that the theories (e.g., resource-based view and resource dependency theory) used to explain phenomena are themselves nothing more than mirrors of reality (Rorty, 1979). Therefore, the theoretical part of the study (e.g., mirror of reality) investigates the epistemological realist world through questionnaire building (e.g., interview guide), data collection and analysis, thus extending the analysis to the empirical world of subjective reality (e.g., empirical data collection and model illustrating). Hence, investigating this subjective realism (e.g., epistemological realism) could help in drawing some ontological conclusions as well (e.g., objective reality), thus building theory and identifying areas of further research.

![Diagram of the zone of constructivist methodology](image)

**Figure 11 The zone of constructivist methodology**

Source: Adapted from Mir and Watson (2000) page 946

### 5.2.3. Critical realism

The research methodology discussed above as ontological and epistemological realism is not in contradiction with critical realism paradigm. Rather, it supports the critical realism methodology of first building an understanding (e.g., model building) and then explaining the phenomenon (e.g., model illustrating). This basic assumption underlying realism is that there is a reality “out there” (Easton, 1995). “We see through a glass darkly but there is something there to see” (Easton, 1998: 76).

According to a critical realist perspective, reality is considered to be both external and independent, and socially and historically constructed. Within the realist orientation a researcher seeks valid explanatory knowledge. It is argued that the meaning of explaining is understood differently based on an epistemological realm, as stated in Figure 11. This meaning of explaining indeed differs between a positivist and realist perspective. However, we not only have to explain the production of social phenomena (see chapters 1-4) but also understand or interpret what they mean. Although the starting point for the interpretation is the researcher’s own frame of meaning, the phenomena exist regardless of the researcher’s interpretations of them (Easton 2002).
Another basic assumption behind realism is that our knowledge of the world is fallible and theory-laden. Based on realism, it is, however, arguable that all knowledge is not equally fallible and that it is true that facts are theory-dependent, but this does not mean that they are theory-determined (e.g., theories are subject to empirical testing in new studies). Therefore, the fact that all knowledge is fallible means that science may be false at any time when it makes statements of its object; therefore, theories in science can only be regarded as the best truth about reality we have at the moment. We do not have ultimate knowledge. New scientific studies may show that the knowledge was false. Theories can always be replaced with new theories (Danermark et al 2002).

In accordance with critical realism, data are always theory-laden, which means that all data arise in connection with some theory (Bhaskar, 1978). Cause is central within critical realism, but the meaning within the frames of critical realism is totally different from statistical co-variance. Cause involves what makes something happen, what produces, generates, creates, determines it, or what enables or leads to it. Another way of describing causality from a critical realist perspective is “how the event came about” (Danermark et al 2002: 52). Cause is not about the relationship between two events, but about objects or relations and their nature. The central issue is what causal powers and liabilities there are in a certain object or relation. Within critical realism we can distinguish between events, mechanisms and structures that constitute a complex and compound whole. A structural mechanism leads to certain efforts based on what other mechanisms they at that particular time are being combined with. This means that the same events may have totally different causes (Sayer 1992). The context of time consequently matters when it comes to critical realism. A central task of science is therefore to try as much as possible to reach beyond the purely empirical assertion of a phenomenon to a description of what it was in the object that made it possible. Therefore, critical realism favors both abstract and concrete studies and it is argued that the knowledge generated in one study may be used for another.

5.3. Research strategy and design

According to the ontological and epistemological assumption discussed in Figure 11 and subsequent discussion of critical realism, this work starts from theory (see chapters 1-4). The author of this dissertation has synthesized an extensive literature review which constitutes the theoretical context of the study. The theoretical context of the study signifies the importance of the research question and objectives of the study for understanding the inter-firm control behavior in knowledge-based industries (e.g., microprocessor or semiconductor, wireless and telecom industries).

The analytical framework of the study is narrow drawn within the framework of (i) resource dependency theory and (ii) resource/ knowledge based view of the firm to understand and explaining events occurring within business-to-business cooperative relationships. The present study signifies the specific nature of knowledge sharing based cooperative relationships among independent firms (e.g., contractual strategic alliances, equity sharing alliances such as joint ventures). These are seen as a consequence of factors or characteristics of firms involved within business-to-business cooperative relationships. In other words, the firm-specific characteristics or factors involved in cooperation could influence the decision of knowledge sharing based cooperation among partners (e.g., contractual alliance, joint ventures among suppliers, buyers, competitors), where knowledge sharing is contextualized as inter-firm control behavior. Questionnaires/interview guides were produced based on the interlinked priori assumptions and model which is presented as analytical framework in the fourth chapter. Two different sets correspond to the differences in control objectives which are
overlapping in the overall strategic pursuit of the firm. These mean that changes in the nature of some factors (e.g., characteristics of the partners) among cooperative partners could have a positive or negative influence on the decision of knowledge sharing as inter-firm control behavior. Based on these arguments, the basic principles of critical realism are applied/incorporated in this study (e.g., abduction).

5.3.1. *Abduction*

There are two basic scientific approaches to be used when carrying out research: deduction and induction. Deduction implies that the researcher starts by deriving hypotheses from theory and thereafter tests these hypotheses on an empirical sample. A deductive approach can be seen as appropriate when there is a solid theoretical background on which the researcher logically develops propositions. Deduction has traditionally been considered as the most appropriate approach when carrying out reliable research. However, this can be related to the traditional favoring of positivism. Induction, on the other hand, can be described as research starting from an empirical phenomenon, aiming at theory generation or development. Induction has received attention within the social sciences among others and it is usually coupled with more anti-positivist epistemologies such as hermeneutics.

It often seems difficult for researchers within various fields to fully apply either the deductive or inductive approach in their extremes. Several scholars, however, advocate making the line between deduction and induction more flexible. Some have mentioned that deduction and induction should be preferably viewed as end points of a continuum of possibilities. Another example is Bonoma (1985), who writes that when case study research is applied, a theory/data/theory revision cycle is useful. According to Eisenhardt (1989), researchers continuously compare theory and data. Perry (1998:786; 2001:305) writes about “levels of induction and deduction” and “induction versus deduction continuum” (1998: 788) as well as “a blend of induction and deduction” (2001:321). Gummesson (2003) also indicates that both induction and deduction are involved in research when he writes that it is a process of both theory testing and theory generation. Furthermore, he writes that “a case study could be primarily inductive where the cases provide data for conceptualization and theory generation, or primarily deductive where cases are used to confront existing theory with reality and test validity” (p. 488). Parkhe (1993) states that inductive and deductive approaches for theory development are inseparable when reflecting on the grounded theory approach as an instrument for developing theory. The researcher continuously moves back and forth between induction and deduction. According to Perry (1998), it is neither practical nor preferable to start from scratch with absolutely no theoretical background. An interesting discussion of different degrees of induction and deduction is found in Perry (2001). Perry (1998) advocates a mix of induction and deduction and he writes that it is unlikely for a researcher to genuinely separate induction and deduction. Pettigrew (1997) writes that the recognition of inductive patterns has to go hand in hand with deduction. Furthermore, Pettigrew argues that researchers always carry some pre-understanding of the phenomenon that is studied and discusses “the inseparable balancing act of deduction and induction (Pettigrew 1997:339).” Miles and Huberman (1994: 17) also write that induction and deduction are linked research approaches. Furthermore, they stress pre-structured research in qualitative research. Perry argues that “pure induction might prevent the researcher from benefiting from existing theory, just as pure deduction might prevent the development of new and useful theory” (Perry, 1998:789). He also writes that “case study research includes some deduction based on prior theory, although inductive
theory building is more prominent” (1998:788). However, Perry (2001) stresses that there are risks with pure induction and refers to Yin (1989) as well as Miles and Huberman (1994). One risk is that data analysis becomes difficult because the generated material is too flexible and “loose”.

Perry (2001) suggests that in the literature review part of a case thesis, small initial models of theory drawn as boxes and lines are developed. Furthermore, prior theory provides a focus for the data-collection phase in the form of research issues that always conclude the literature review. That is, the literature review is the same as in a conventional thesis, charting the body of knowledge and identifying gaps. More recently, a term comprising both deduction and induction has appeared, namely abduction.

The term abduction is consistent and corresponds to the further explanation of the philosophical stand of the present study. However, the term abduction can be described as a middle course between induction and deduction. Abduction is a mean of trying to diminish the distance between creativity and the scientific world, and the concept of abduction was introduced by Peirce (1950). The logic of abduction is illustrated in Table 6, which starts from theory to empirical setting to again finally enriching or building the theories synthesized in the dissertation theoretical chapters. To clarify the model presented earlier (i.e. the philosophical stand of the present study) in Figure 11 the following steps as “abduction research approach” is consistent with each other as overall research methodology of the present study.

The abduction approach (Peirce, 1950; Dubois and Gadde, 2002) is clarified in Table 6:
Table 6  Abduction research approach in the present study

<table>
<thead>
<tr>
<th>Research focus</th>
<th>Abduction research approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Building theoretical context of the study</td>
<td>In order to establish consistent and valid generalizations as theoretical and empirical contexts of the study, we are required to explain the contributions of the study within developed researched paradigms or group of studies identified as discipline (e.g., see tables 3). A phenomenon such as cooperative relationships among firms is approached from a number of different theoretical contexts, which could qualify as established or matured research discipline. Building a tentative model is based on combining relevant and established theories in the context of specified research objectives (e.g., priori assumptions are combined within a flow chart as model). However, the researcher’s own understanding about “reality” could play a key role in building the boundaries of interesting or useful and empirically testable theoretical context of the study. Based on this understanding, the abduction research approach is also clarified in the present stage of research.</td>
</tr>
<tr>
<td>(2) Building empirical context of the study</td>
<td>Theory generation from real life through illustrating a model and building new concepts.</td>
</tr>
<tr>
<td>(3) Theory development and conclusions</td>
<td>Comparing the (2) empirical findings within (1) existing literature with the aim of enriching theories which are utilized primarily as the theoretical context of the study. The conclusion of the study could present new concepts to explain the phenomenon under study and its implications for future research could be also analysed.</td>
</tr>
</tbody>
</table>

Source: Abduction as the middle course between induction and deduction (Peirce, 1950; Dubois and Gadde, 2002).

At this point it is important to discuss the limitations of empirical research and the role it can play in furthering theory development. The generation of new theory is limited by the theoretical context of the study though providing a basis of building the empirical context of the study. Thus, developing theory for the discussion and concluding chapters requires that theoretical analysis should be an important part of the thesis and that the empirical results and contributions are based upon a rigorous theoretical review.

5.3.2. Qualitative approach

From a critical realist perspective, an empirical study may consist of both qualitative and quantitative approaches. However, given the nature of the study we are adapting a qualitative approach within a critical realist methodological paradigm. In comparison with quantitative data, qualitative data provide well-grounded and rich descriptions
and explanations. Qualitative data may provide the researcher with interesting previously unexpected findings, which may lead to new theoretical insights. One characteristic of qualitative data is that it focuses on ordinary events that occur naturally in a natural setting, and it is consequently coupled with real life situations. Qualitative research takes on a holistic perspective and thereby searches for an understanding of the whole (Janesick 1994). Quantitative data, on the other hand, is standardized and logical, with the aim of explaining causalities or verifying a present hypothesis. A simple general distinction is that qualitative data is focused on language and words, while quantitative data is focused on numbers and their relationships: “Quality refers to what kind, to the essential character of something. Quantity refers to how much, how large, the amount of something” (Kvale 1996:67).

Two aspects that are often stressed in relation to qualitative research are the pre-understanding of researcher and the role of the researcher. According to Janesick (1994), it is important that the researcher already at the beginning of the study identifies his or her own biases and ideology. Within qualitative research it is fully accepted that research in part is ideologically driven: “There is no value-free or bias-free design” (Janesick 1994: 212). These ideas are highly related to how the generation and development of science is understood. As far the role of the researcher is concerned, qualitative research implies that the researcher becomes the research instrument. The researcher should able to articulate his or her own understanding about the context of the study and how well it could be explained through selected theory (e.g., analytical framework). Further, within the empirical part of the study, the researcher must consequently be able to observe behavior and must have the skills needed to observe and carry out face-to-face interviews. The whole process of research is very demanding and uneven for the researcher as the research instrument.

The researcher in the research process is likely to be utilizing his/her own phenomenological understanding within the strict conceptual boundaries of literature and empirical reality side by side, therefore scientific enquiry is based on/consistent with the previous knowledge produced by other scientists. Morse (1994) writes that qualitative research is only as good as the researcher. According to him it is the researcher’s skills, patience and wisdom that play a central role in the gathering of necessary information.

Flexibility is only applied to a qualitative research design (Marshall and Rossman, 1989; Miles and Huberman 1994; Glense and Peshkin 1992). Questions can be modified, added or deleted. In qualitative research the researcher has the possibility to invent or put together new tools or techniques, or to add informants. It is not predetermined which interpretive practices should be applied (Denzin and Lincoln, 2000). Miles and Huberman (1994: 5) state: “To us it seems clear that research is actually more a craft than a slavish adherence to methodological rules”. Eisenhardt (1989) says that the adjustments provide the researcher with the possibility to probe emergent ideas or benefit from special opportunities that appear in a given situation. It is accepted to add methods for data generation during an empirical study because the researchers are aiming at understanding a case in as much depth as possible (Eisenhardt, 1989). Eisenhardt (1989), however, stresses that this opportunity should not be viewed as a license to be unsystematic.

Meaning has a central role within qualitative research and it only exists within a certain context (Easton, 1995). Furthermore, this means that the same situation can have a different meaning under different circumstances (Neuman, 1997), as the clarified
research problem/research objectives and overall theoretical and empirical context of the study represent specific meanings analyzed in a dissertation.

5.3.3. Case study approach

The case study approach is often associated with descriptive or exploratory research, without being restricted to these areas (Ghauri, 1983; Bonoma, 1985; Yin, 1994). Case study research is particularly useful when the phenomenon under investigation is difficult to study outside its natural setting and also when the concepts and variables under study are difficult to quantify (Ghauri, and Grønhaug, 2010). Often, this is because there are too many variables to be considered, which makes experiment or survey methods inappropriate (Bonoma, 1985; Yin, 1994; Siggelkow, 2007). Research in business studies emphasizes the role of deduction, where the validity of all findings depends solely on the quality of logic employed in the study and precise measurement. However, the trade-off between precision and reduced generalizability is not a useful one in many situations. Many phenomena cannot be understood if removed from their social context. In these cases inductive, qualitative approaches are alternative methods to scientific investigation.

Case research, in this study, refers to qualitative and field-based construction and analysis of case study. It is based on a process model as suggested by Bonoma (1985). This is the preferred approach when ‘how’, ‘why’, or “what” questions are to be answered, when the researcher has little control over events and when the focus is on a current phenomenon in a real-life context (Yin, 1994). Case studies are particularly well-suited to research areas for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building from normal science research (Eisenhardt, 1989: 548-9).

The ultimate goal in a case study is to develop a holistic description of the phenomenon. Qualitative case studies are relevant when the studied phenomenon is broad and complex and when the existing knowledge is insufficient in order for the researcher to set causal questions (Bonoma, 1985). Easton (1995) argues that case studies are useful solely in situations when the researcher has very scarce knowledge about the subject: “It can be used in an inductive model, following interesting and apparently relevant clues, exploring the boundaries of the phenomenon, and coming at the subject from different points of data attack.” (p. 475-476). According to Eisenhardt (1989), case studies aimed at theory building do not rely on previous literature or findings from earlier empirical studies: “Building theory from case study research is most appropriate in the early stages of research on a topic or to provide freshness in perspective to an already researched topic” (p. 548). A case study is also appropriate to use when the aim is to clarify, widen or smooth an already existing theory. However, it is also applicable when the aim is to develop a so-called a totally new theory. Bonoma (1985) describes a hierarchy of study types, ranging from description to determining cause and effect. He says that descriptive studies are often associated with theory building, whereas studies aimed at determining cause and effect are more often used for theory disconfirmation. Case studies are relevant when the researcher aims at building theory (Bonoma, 1985), as done in the present study.

In accordance with Yin (1989), the relevant questions for a case study are How?, Why? and What?. These questions indicate a striving to understand factors behind a certain phenomenon. In a qualitative case study the researcher is striving to describe the unit of analysis, “in depth, in detail, in context, and holistically” (Patton 1987: 19). The
result of a case study is descriptive, which means a “thick” description of the phenomenon. We could receive contextual knowledge from case studies (Dyer and Wilkins, 1991). Bonoma (1985: 204) states: "Case studies should reflect and be sensitive to the context within which management acts occur and to the temporal dimension through which events unfold. They go beyond providing a static snapshot of events, and cut across the temporal and contextual gestalt of situation".

Miles and Huberman (1994) define a case as a researcher’s unit of analysis, which taken to an extreme means that a case can be almost anything. Examples of cases provided by Miles and Huberman (1994) are a role, an organization, a small group, an individual or a nation. A case study traditionally implies a study of a single case, and many different sources of information are used in order to shed light on the phenomenon. The definition of a case may vary, so that a single department can sometimes constitute the case, while a case can also resemble one organization or even a group of organizations (Patton, 1987 1990). According to Remenyi, Williams, Money and Swartz (1998), a case study may refer to relationships, and this is an important research approach for business and management researchers. In this study, the case refers to a multinational company consisting of suppliers’ and buyers’ cooperative arrangements (e.g., contractual strategic alliances, equal & minority equity sharing strategic alliances such as JV) in both a vertical and horizontal fashion. Suppliers and buyers could also be group of competitors cooperating and also competing with each other. A central issue when carrying out a case study within a resources dependency theory and resource/ knowledge based view of firm behavior is to draw the boundaries of the case. In this study, the boundaries are defined in accordance with a micronet-macronet perspective as defined by Halinen and Törnroos (1998).

There are two approaches that guide case study methodology; one proposed by Robert Stake (1995) and the second by Yin (2003). Both Stake (1995) and Yin (2003) base their approach to case study on a constructivist paradigm. Constructivists claim that truth is relative and is dependent on one's perspective. This paradigm recognizes the importance of the subjective human creation of meaning, but does not reject outright some notion of objectivity. Pluralism, not relativism, is stressed with the focus on the circular dynamic tension of subject and object (Crabtree and Miller, 1999, p. 10). Constructivism is built upon the premise of a social construction of reality (Searle, 1995). One of the advantages of this approach is the close collaboration between the researcher and the participant, while enabling participants to tell their stories (Crabtree & Miller, 1999). Through these stories, the participants are able to describe their views of reality, and this enables the researchers to better understand the participants' actions (Lather, 1992).

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While you are considering what your research question will be, you must also consider what the case is. This may sound simple, but determining what the unit of analysis (case) is can be a challenge for both novice and seasoned researchers alike. The case is defined by Miles and Huberman (1994) as “a phenomenon of some sort occurring in a bounded context. The case is in effect, your unit of analysis” (p. 25). Asking yourself the following questions can help to determine what your case is: do I want to “analyze” the individuals? Do I want to “analyze” a program? Do I want to “analyze” the process?

In the present study the case analysis is more related to analyzing the process of inter-firm knowledge sharing. Perceived business network uncertainty (e.g., resource dependency theory) and perceived deficiency of resources (e.g., knowledge based view of the firm) are primarily linked to the collaborating firm’s relationships and resource characteristics as describe in Figure 10. The framework is based on a priori
assumptions and a model. A priori assumptions are presented as a means of discussing the tentative model of the study. The a priori assumptions are used in order to further an in-depth description of factors of knowledge sharing raised in the tentative framework based on extensive literature review. The aim of this model is ultimately to establish a final model after the empirical part of the study. In this respect a descriptive case study is useful. The descriptive type of case study is used to describe an intervention into phenomenon and the real-life context in which it occurred (Yin, 2003). A single case (holistic) design has been used in the present study (Yin, 2003 page 46). The single case study argument is based on Yin (2003 page 47). The single-case study is an appropriate design under several circumstances. First, a single-case study is analogous to a single experiment, and many of the same conditions that justify a single experiment also justify a single-case study. Thus, one rationale for a single case is when it represents the critical case in testing a well-formulated theory. The theory has specified a clear set of propositions as well as the circumstances within which the propositions are believed to be true. To confirm, challenge, or extend the theory, there may be a single case meeting all the conditions for testing the theory. The single case can then be used to determine whether a theory's propositions are correct, or whether some alternative set of explanations might be more relevant. In this way, the single case can represent a significant contribution to knowledge and theory building. The single case study in the present study is consisting of three different cases of ST-Nokia, ST-Ericsson and ST-IBM. In this view the selected single case consisting of several cases likely to match with the single case study justification arguments of Yin (2003 page 47).

Due to the rapid nature of its technology changes and changing customer requirements, the case company STMicroelectronics Corporation has historically always been involved in multiple contractual and joint ventures alliances, R&D consortia, mergers and acquisitions among its world-wide cooperative partners for knowledge sharing and thus improving its innovation and product differentiation capacity. ST represents a more organic growth as result of contractual strategic alliances, JVs, mergers, and subsequently meta-national effective knowledge sharing is a key dimension of its core business philosophy. Hence, knowledge sharing is also vital for the ST role as an integrator of emerging silicon related capabilities through building semiconductor applications and subsequent business development among its customers, suppliers and competitors in different world-wide industries (e.g., electronics, telecoms, wireless, computers, automotive industries). In the present study we analyze the role of knowledge sharing as inter-firm control behavior among ST (STMicroelectronics) and its other partner MNEs within the settings of contractual alliance with customers in case of ST-Nokia alliance, joint R&D JVs in case of ST-Ericsson, and R&D consortia with competitors (e.g., competitors formed R&D consortia alliance around IBM).

5.4. Empirical research process

The research process of empirical enquiry consisted of the interview process, transcribing the interviews and then a systematic analysis of qualitative transcribed interview data. To build reliability in combining the data collected in different phases the process of NVivo was used in linking the different interrelated data sets. The major objective of the research process for the empirical enquiry was to build an integrative approach through (a) the process of interviewing, and then (b) utilizing Nvivo software. This was done to systematize and order the data, enabling a more thorough and reliable analysis. It is important to improve the transparency of the data analysis through a standardized type of data analysis software such as NVivo software. However the qualitative data analysis by researcher was done without any input of NVivo software.
In the next section the whole interview and data analysis process is described and may go some way towards helping to achieve greater trustworthiness in utilizing a face to face interviewing technique and opting for the case study method as a qualitative research methodology paradigm.

The initial official contact with STMicroelectronics was established in 2007-08 and after receiving the approval of the top management, the first comprehensive interview was conducted in September 2009. Based on the first interview, the second interview guide was finalized and the final follow-up detailed interview was completed in July 2010. Data is collected also from contractual alliance partner NOKIA and JV alliance partner Ericsson in February 2011. Therefore, data became more complete for moving on to the next research step, "data analysis". Meanwhile, in the process of data analysis, the possibility arose of obtaining access to the company's internal published and unpublished information via e-mail and telephone conversations. These additional possibilities of e-mail correspondence and telephone conversations supplemented minor gaps still likely to be left in data sets to analyze the case in depth. The secondary data is presented in the current chapter.

One might argue that additional interviews could be more advantageous to the study's positioning as a larger amount of data might help to foster deeper analysis. It is important to mention however, that once one person responsible for the company's global strategic alliances was interviewed, other members of his staff did not show a willingness to participate in additional interviews because they believed that their department head (STMicroelectronics Executive Vice President and Chief Strategy Officer) had the most appropriate background and experience to comment about the information asked through two different questionnaires. However, three other top managers were also interviewed as a means of providing additional perspectives (ST-Ericsson Country Manager Finland, ST-Nokia Alliance: Vice President of Customer Unit Nokia and ST-Ericsson JV Alliance: R&D Manager ST-Ericsson).
### Table 7  Data collection timeline

<table>
<thead>
<tr>
<th>Interviewees</th>
<th>Medium of interviews</th>
<th>Date of interviews</th>
<th>Duration of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Vice President and Chief Strategy Officer</td>
<td>Face-to-face</td>
<td>September 2009</td>
<td>2 hours and 30 minutes.</td>
</tr>
<tr>
<td>STMicroelectronics Worldwide Headquarters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive Vice President and Chief Strategy Officer</td>
<td>Face-to-face</td>
<td>July 2010</td>
<td>2 hours and 30 minutes.</td>
</tr>
<tr>
<td>STMicroelectronics Worldwide Headquarters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country Manager Finland</td>
<td>Face-to-face</td>
<td>February 2011</td>
<td>1 hour and 15 minutes.</td>
</tr>
<tr>
<td>ST-Ericsson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST-Nokia Alliance: Vice President of Customer Unit</td>
<td>Face-to-face</td>
<td>February 2011</td>
<td>2 hours</td>
</tr>
<tr>
<td>Nokia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST-Ericsson JV Alliance: R&amp;D Manager ST-Ericsson</td>
<td>Face-to-face</td>
<td>February 2011</td>
<td>1 hours and 40 minutes.</td>
</tr>
</tbody>
</table>

The reasoning behind the selection of so few managers could also be considered as problematic when collecting data from one of the world’s largest MNEs where there is a centralization of decision about alliances and knowledge management. Due to the strategic nature, these decisions are reserved to only a few top managers and their departmental teams. Thus, in this view we have interviewed the Executive Vice President and Chief Strategy Officer STMicroelectronics Worldwide Headquarters as his team was unwilling to participate in further interviews once the main person in their company had been interviewed. Another option was to also interview the CEO of the company who also considered that Chief Strategy Officer STMicroelectronics is the right person to provide us all the necessary information required. The managers selected for interviews were very cooperative and provided sufficient details about alliances knowledge sharing dynamics. The reliability of the data is also increased as a copy of the thesis is to be sent to the Executive Vice President and Chief Strategy Officer of STMicroelectronics and his team members. In this view, we do not see any difference of opinion among different managers in the strategy department. Further, ST-Ericsson’s Country Manager in Finland, ST-Nokia Alliance’s Vice President of Customer Unit: Nokia, and ST-Ericsson JV Alliance’s R&D Manager: ST-Ericsson did not disagree.
about the empirical findings after they were provided the thesis copy for review purpose.

The prime reasons for selecting STMicroelectronics as a focal case MNE are (i) its relationships with other leading MNEs in the electronics and telecommunications industries (e.g., see figures 12 & 13), and (ii) ST role as a semiconductor company for integrating emerging electronics and telecommunication industry knowledge sharing & subsequent innovations and therefore mutual business development among alliance partners. In this regard the selected MNE matches the criteria of being selected as a focal case in the present research project (Yin 2003 page 47). Hence through this focal case we have analyzed ST-Nokia Alliance, ST-Ericsson JV Alliance and International Semiconductor Development Alliance (ISDA) with competitors around IMB.

The empirical part of the study analyzes ST alliance and knowledge sharing behavior, which is under the decision scope of the top management team. The ST top management gave their agreement to become a case company for this PhD dissertation after quite a lengthy and time consuming process. The interviewee (respondent) for first two interviews of the study is an Executive Vice President and Chief Strategy Officer of STMicroelectronics, responsible for the company's technology strategic alliances, mergers and acquisitions and strategic planning.

In order to establish the trustworthiness of the interviewee responses it was necessity to discuss why the interviewee and his management team recommended by ST to be the main respondent (i.e. respondent on behalf of STMicroelectronics) for first two interviews in the present study.

The respondent (management team head) had extensive experience in the semiconductor industry as follows:

He joined Thomson Semiconductors, a predecessor company to STMicroelectronics in 1985 as an analog IC designer at the company's site in Grenoble France. Between 1987 and 1998 he held several positions in R&D management and marketing in Milan, Paris and Singapore. In 1999 he was appointed Director of Advanced System Technologies US Labs based in San Diego, where he oversaw the development of computing graphics and networking technologies. In 2003 he was appointed General Manager of ST's Cellular Terminals Division, and moved to Geneva to spearhead the expansion of ST's wireless business. He later moved to the Application Processor Division of ST, bringing Nomadik ST's leading-edge low-power device for enhanced mobile applications to the market. In 2006 he was appointed Group Vice President Strategies for ST's Strategies and System Technologies Group based in Geneva, where he was instrumental in establishing ST's partnership with IBM in advanced CMOS process development and in founding Numonyx, the flash memory joint-venture strategic alliance of ST and Intel. In January 2008 the interviewee was promoted to Corporate Vice President Corporate Business Development responsible for ST's Technology Strategic Alliances Mergers & Acquisitions and strategic planning.

The unit head (i.e. respondent) is also a member of ST's Corporate Strategic Committee and also sits on the Board of Directors of ST-Ericsson. The interviewee had full knowledge of the company's present and future strategic choices and subsequent cooperative relationship philosophy and criteria for new business development, as the respondent had worked in various strategic positions related to planning and implementation in the same company. As evidence of the respondent's contributions to the global semiconductor industry, he also sits on the Board of Directors of the Global
Semiconductor Alliance (GSA). GSA’s board comprises 22 global industry top executives who are representative of the global regions in which GSA holds active memberships. It is an informal consortium for knowledge sharing and analyzing the changing nature of global semi-conductors and related industries (e.g., electronics, wireless, telecommunications, among others). He is on the board of GSA, representing Europe, the Middle East, and African (EMEA) region as one of the EMEA Regional Leadership Directors. More recently in 2010, the respondent became the elected President of the Minalogic micro-nanotechnology cluster in Grenoble, France. Therefore, it was greatly satisfying to get deep into respondent responses/extended discussions. His contacts in the industry were also useful in getting all the necessary support from other related sub-units of the Corporate Strategy Division within ST and beyond for any additional data required.

For third, fourth and fifth interviews three different interviewees were selected to incorporate the alliance partners (e.g., Nokia and Ericsson) point of view. Hence for ISDA (International Semiconductor Development Alliance) around IBM the information provided in the first two interviews was utilized in the analysis.

It is important to note that for scientific research there could different types of interviews, for example personal interviews, group interviews and telephone interviews. In business and management research personal interviews are one of the most common methods for data generation (Remenyi et al. 1988). In the present study the personal interview instead of group interviews was a viable choice as the respondent for first two interviews is one of the world’s top strategic planning and business developer in the world-wide semiconductor industry and at STMicroelectronics (the case company). Further the country manager ST-Ericsson and two other managers have long experience of working in the industry and provided reliable information about ST-Nokia contractual alliance and ST-Ericsson JV alliance.

Further, the nature of an interview may vary from totally structured to totally unstructured. Yin (1989) writes that case study interviews are most often “open ended” (p. 89), meaning that the researcher can ask the informants for example about their opinions of events. An advantage with an interview is that it enables the researcher to receive a large amount of data within a short period of time. Furthermore, there is a possibility of receiving clarification by asking follow-up questions (Marshall and Rossman 1989; Patton 1990). Some advantages with personal interviews are the possibility of receiving in-depth and detailed information and the potential for the interviewer to influence the situation by asking clarifying questions or for the interviewee to ask them.

A disadvantage with interviews is that they may be costly in terms of both time and money. This is relevant in our case as it was very costly for the respondents (i.e. the interviewee) to allocate time to make the present research study process a reality. The respondents used time for e-mail correspondence, reading interview questionnaires, reading the transcribed interviews, along with some extra telephone conversations for some additional data. The company’s internal published records, e-mail correspondence, and telephone conversations were in part utilized to further clearly write about the interviewee responses in the methodology and empirical part of the study.

Finally, the respondents read the final dissertation draft to provide clarifications as ST and its alliance partners are the major stakeholders in the present research process. However, this has also further increased the trustworthiness of the present research
study. Also in this way we have actually double checked particularly the empirical part of the study, which is based on synthesized theoretical context (the model and propositions) and interpreted respondent responses.

The interviews carried out in this study are of a semi-structured nature. In this way there is the possibility of discovering unknown or unexpected results, which is an important step towards theory development.

There are certain recommendations concerning the logic of questioning in qualitative research. The interview sessions should start with a briefing, meaning that the interviewer defines the situation and briefly tells the purpose of the interview (Kvale, 1996). Patton (1987; 1990) prefers to initiate interviews with questions that are easy for the informant to answer. These questions require minimum recall and interpretation from the informant’s point of view. A context should be established before turning to questions involving feelings and opinions. One possibility when initiating an interview is to have an informal discussion about an issue that is different from the actual focus of the study. This allows all actors to relax (Remenyi et al. 1998). Morse (1994) and Fontana & Frey (2000) offer the advice of keeping the first interview on a broad level by giving the informants the possibility to “tell their stories” (Morse, 1994:229). Later on, on another occasion, the researcher may use follow-up interviews to gather more targeted information and thereby fill the gaps left by the initiating interview. A similar approach is suggested by Glaser and Strauss (1967) and Perry (1998). These all strategies are also adapted in the present study.

In the present study the personal interviews were arranged in many rounds, and different interview guides were utilized based on the tentative analytical framework and model of the study. The interview guides/questionnaires can be found at the end of the dissertation as appendix 1, 2, 3 and 4. The interviews provided the researcher with a rich understanding of the phenomenon under study (i.e., knowledge sharing as inter-firm control behavior), which was based on the prior assumptions and tentative model of the study. The interviewer travelled to the STMicroelectronics Worldwide Headquarters in Geneva, Switzerland for two face-to-face detailed interviews. Further for conducting three other interviews, the interviewer also traveled to the respondents offices in different cities. It was done in accordance with the requirement of conducting qualitative research by utilizing the personal interview technique/ generating case study material.

5.4.1. Data analysis

Reliability, validity, generalizability and objectivity are fundamental concerns for qualitative researchers. However, for the qualitative researcher the role of these dimensions is blurred. Some researchers argue that these dimensions are not applicable to qualitative research and a qualitative researcher’s concerns should be geared towards trustworthiness and encompassing issues such as credibility, dependability, transferability and conformability (Eisenhardt, 1989; Yin, 2003). To achieve these qualitative research objectives, the use of formalized and software-based procedures for the analysis and interpretation of qualitative interview data is advocated. The uses of software programs such as NVivo are deemed to help to substantiate the analysis and interpretation of textual interview data.

Many scholars suggest exploratory research and qualitative methodologies to capture multi-dimensional phenomena (Yin, 2003) and non-linear, sometimes fuzzy patterns
of our realities (Sinkovics, Penz and Ghauri, 2005). These perspectives are supported by the methodological arguments that qualitative methodologies can help to find "meaning behind the numbers", provide flexibility without requiring large samples (Sykes, 1990), and offer a clear holistic view of the context (Denzin and Lincoln, 1994; Ghauri and Gronhaug, 2010).

A case study is a useful method when the area of research is relatively less known, and the researcher is engaged in theory building (Eisenhardt, 1989). This is perhaps the most frequently used approach for thesis and dissertation research in business at postgraduate level and is often applied as a pretext to quantitative survey-based work (Jean et al. 2008; Jean 2007). However, case studies are in fact a flexible research approach that is suited to a range of different types of research questions (Ghauri, 2004). Case studies have been combined with a variety of different epistemological and methodological approaches, from positivist to phenomenological, using surveys to interviews. The main feature is an individual, group, organization, incident or situation. We need to have sufficient information to characterize and explain the unique features of the case. Finally, this approach relies on the integrative powers of research: the ability to study an object with many dimensions and then to draw the various elements together in a cohesive interpretation (Selltiz et al., 1976).

Eisenhardt (1989, pp. 548-549) argues that case studies are particularly well-suited to new research areas, or research areas for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building from normal science research. The former is useful in the early stages of research on a topic or when a fresh perspective is needed, while the latter is useful in later stages of knowledge development. However, this does not mean that case study research is only suited to exploratory and descriptive research. Case studies can, in fact, be used in all types of research: exploratory, descriptive or explanatory (Bonoma, 1985; Ghauri and Gronhaug, 2010; Yin, 2003). When to use which research approach ultimately depends upon the type of research questions. In the present study the objective is to develop a priori assumptions for later illustrating. For this study, a range of research strategies can be used.

In the next section, we deal with the stages of a case study project after the decision to use the case study method has been made, how to analyze data that have been collected through the case and how to analyze them using Nvivo.

5.4.1.1. Analyzing case studies: the traditional approach

Interpreting and analyzing qualitative data is perhaps the most difficult and time-consuming task when doing case study research. We cannot be satisfied merely with telling convincing stories. In qualitative research trustworthiness and authenticity rather than reliability are the main issues (Sinkovics et al., 2008). The idea is to present an "authentic" understanding of people’s experience. This means not just understanding the point of view of the individual and groups being studied; in addition, data has to be interpreted against the background of the context in which they are produced (Hammersley and Atkinson, 1993). But how can researchers ensure - and demonstrate - they have produced an authentic and trustworthy interpretation rather than a misguided one? As put by Miles (1979, p. 591):

"The most serious and central difficulty in the use of qualitative data is that the method of data analysis is not well formulated . . . the analyst faced with a bank of data has very
few guidelines for protection against self-delusion, let alone the presentation of unreliable or invalid conclusion to scientific or policy-making decisions. How can we be sure that an "earthy", "undeniable", serendipitous" finding is not, in fact, wrong?"

Part of the answer lies in making sure that data analysis and collection are closely interconnected during the lifecycle of the case study research. Many researchers put a lot of effort into data collection and keep on collecting data through case studies, hoping to do data analysis at the end of the process, sometimes months or years after the data collection. However, this will weaken both the analysis and the data collection processes. In case study research, inter-weaving data collection and data analysis right from the first case/interview is the best policy (Miles and Huberman, 1994). This allows theory to develop alongside the growing volume of data, allowing the research problem to be formulated or even reformulated at the same time. This often leads to new questions and new data collection, and there is no definite phase of data analysis (Ghauri and Gronhaug, 2010).

It is often difficult for case researchers to filter or discard irrelevant data before analysis commences. While analysis may not form an isolated process, nevertheless it does involve some distinct stages. The first step of analysis is to construct a case description and explanation. This will help us understand "how" things are developing and "why" things occur the way they do. First, we have to describe, i.e. make complicated things understandable in their component parts, and explain, i.e. show how their component parts fit together according to some rules (Bernard, 1988). However, it is hard to describe and explain something satisfactorily unless you understand what this "something" is. It is thus important to start with simple "story telling" about a situation and progress in chronological order. Consequently, we can construct a map and locate different elements and variables. This will finally lead us to build a theory or a model, i.e. how the variables are connected together and how they influence each other (Miles and Huberman, 1994; Rein and Schon, 1977). Step by step we can advance along the "ladder of abstraction". We start by trying to code and categorize text, then identify trends and establish findings. Finally, we integrate the data into an explanatory framework (Ghauri, 2004; Carney 1990; Gherardi and Turner, 1987). These different techniques those are also followed in the present study are summarized in Table 8.
### Table 8  Case study analysis

<table>
<thead>
<tr>
<th>Techniques for case study analysis</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronologies</td>
<td>Narratives of events that took place, organized by date.</td>
</tr>
<tr>
<td>Coding</td>
<td>Sorting data according to concepts and themes.</td>
</tr>
<tr>
<td>Clustering</td>
<td>Categorizing cases according to common characteristics <em>(In multiple cases).</em></td>
</tr>
<tr>
<td>Matrices</td>
<td>Explaining the interrelationship between identified factors</td>
</tr>
<tr>
<td>Decision tree modeling</td>
<td>Grounding a description of real-world decisions and actions coherently by using multiple cases</td>
</tr>
<tr>
<td>Pattern matching</td>
<td>Comparison between a predicted and an empirically based pattern</td>
</tr>
</tbody>
</table>

**Source:** Ghauri (2004, page 118)

The first stage of analysis, "story-telling", can be done by writing chronologies or biographical histories of the organization(s) or individual(s) under study. This is particularly important when the researcher is attempting to develop longitudinal explanations that track a phenomenon over time. The second stage of analysis is also a sifting process. This means rearranging the data that has been collected, but into more conceptual rather than chronological categories. To analyze data, we (often) have to code them so that they can be broken down, conceptualized, put together and presented in an understandable manner. Sorting the data in this fashion is typically done through coding, in other words, classifying the data. This coding and categorization will help us to interpret the data and to relate information to our research question, objectives and overall framework. This will also enable us to locate different categories when we are analyzing data to find conclusions. As qualitative studies quite often help in building theories, coding requires extra care, and a balance between creativity, rigor and persistence has to be achieved.

The stage of decision tree modeling (Ghauri, 2004) is not utilized in the present study, as it comprises one focal MNE case study. Although the focal MNE is linked to many other MNEs in the data analysis, it is still possible to analyze such complexity without the decision tree modeling step.

#### 5.4.1.2. Utilizing Nvivo for analyzing interview data

There are several software programs available that can help researchers in coding, sorting and analyzing qualitative data. Nvivo software is selected to analyze the qualitative data in the present study. The benefits are clear, when one considers all the disadvantages of paper based analysis: storage of multiple large documents, ensuring confidentiality of the data in storage, shuffling through to look for each and every new argument, mutual highlighting and cutting out text, Nvivo seems like a very attractive alternative. There is some disagreement on a theoretical level as to whether the use of
Nvivo may make qualitative data more quantitative in nature. However, it is for the individual researcher to decide when enough structuring is enough (Ghauri and Firth, 2009). In general, Nvivo helps researchers to counter criticism leveled at them that qualitative research is too subjective, biased and not at all replicable, without compromising the usefulness of qualitative data in describing and creating meaning and answering the "how" and the "why" questions (Ghauri, 2008). However, qualitative data is also easily usable in describing and creating meaning and answering "what" research questions, as formulated and integrated in the present study.

Interview data sources are transferred as tree nodes. To code data the free nodes were created from tree nodes. Free nodes are perceived business network uncertainty; new technology selection and customers’ acceptance, competitors’ strengths and strategic actions and risk of knowledge spillovers. Another category of free nodes were also created which was about perceived resource deficiency; complementary knowledge and relationship with key customers and competitors. Thus the main aim in utilizing Nvivo was for data categorization and reduction according to the framework of the study. The researcher however, finally had to analyze the reduced data himself as Nvivo could only provide very limited advantages when the data was interpreted within the context of the study. The researcher’s own interpretation skills played a key role for data analysis and creating the contextual means for the empirical findings.

The following flow chart (Ghauri, 2008) is useful in describing how the whole data analysis process could be carried out. However in the present study we have utilized stage 1-3 only. Data collected from a focal firm and its two alliance partners. Therefore stages of browsing nodes, developing on key themes and use of modelling tool to display relationships and/or new findings are not required.
5.5. Selected case and related industry description

The selected case MNE comprises a group of MNEs sharing knowledge constituted boundaries of the selected single case MNE (STMicroelectronics). This means that the primary focus lies in the focal group (or net) of closely cooperating companies. Hence, in the empirical setting of the study the external network actors which are further linked to cooperative focal net are also partly taken into consideration. In this respect, however, STMicroelectronics is integrated as a focal case company in the present study. According to Dyer and Wilkins (1991), classic studies consisting of just one case can be more powerful in contextual insight. They argue that "the more contexts the researcher investigates, the less contextual insight he or she can communicate" (p.614). They say that the ultimate goal is to come up with rich descriptions. The single case study analysis approach is also adapted in the present study for deeper contextual insight in
order to come up with rich description of the MNEs focal net related to STMicroelectronics. The selected case enterprise (STMicroelectronics) is among the largest worldwide semiconductor multinational enterprises. It is involved in inter-organizational relationships with many large size multinational enterprises in worldwide electronics, telecoms, wireless, computer, and automotive industries. Therefore, it is worthwhile to describe and analyze in detail this single multinational enterprise (STMicroelectronics) as the case company in the present study.

However, there seems to be a continuing debate concerning the amount of cases to include in a study. Therefore, it is important to mention the point of view of other scholars who have the possibility of applying the use of multiple cases and to understand in what circumstances this strategy is desirable and also possible to adopt.

Eisenhardt (1989) says that 4-10 cases work well. The use of multiple cases implies replication logic. The replication is done either in order to discover whether the same findings arise in two similar situations or to obtain findings that are different but predictable from the findings of other cases (Easton, 1995). Perry (1998) also advocates that several cases should be used. According to Perry (1998), information richness is crucial when deciding the number of cases that should be added to a study. Perry (1998) writes that the most commonly accepted amount of cases is between two to four at a minimum and 12 to 15 at the maximum. This is also in line with Halinen and Törnroos (2005: 1291), who write: “Multiple-case designs that allow case comparisons are preferred in theory-generating case studies”. The authors still recognize a potential danger with case comparisons, as they state that the value of rich descriptions enabling the recognition of complexity and change may be ignored. There we see case study as portrayed as an umbrella term (Remenyi et al., 1998). This notion speaks for the use of multiple sources of evidence, meaning more than one form of data collection. Generally, it is suggested that case study should involve a triangulation of methods in order to provide richness and enlarged information about the setting and phenomenon that is studied (Bonoma, 1985).

However, multiple case company analyses in many studies seem to be SMEs and also internationally operating companies [international regional companies such as companies within Nordic or European countries] different from globally operated MNEs such as STMicroelectronics. In the present study, multiple cases analysis is not required as the scope of business operation of the selected case company (STMicroelectronics) is globally well integrated with world-leading electronics, telecoms, wireless, computers and automotive MNEs which have dominating market positions in their own respective global industries ( see figures 12 and 13). In this respect the case company STMicroelectronics is in a unique market position for building partnerships with a number of world leading multinational enterprises in electronics and telecoms, wireless, computers and automotive industries. It is one of the leading integrators of emerging silicon related capabilities through building semiconductor applications and subsequent business development among its customers, suppliers and competitors in different industries. For example, ST has entered into several contractual and JV strategic alliances with its customers, including Nokia, Ericsson, Alcatel, Bosch, Continental AG, Hewlett-Packard, Marelli, Nortel, Pioneer, Seagate, Thomson, Western Digital, Siemens, Philips, General Electric, Samsung, LG, Sharp, and competitors IBM CMOS Technology Alliance, Free scale, among many other world leading multinational enterprises. Therefore, these partnerships around STMicroelectronics are likely to create strategic global impacts for innovation and competitiveness in its cooperative partners and also in the creation of
new businesses (e.g., the creation of new industry segments such as bringing semiconductor technology to health care products and systems).

As mentioned earlier, STMicroelectronics Corporation was selected as the case firm. STMicroelectronics N.V. is an independent semiconductor company that designs, develops, manufactures and markets a range of semiconductor products used in a variety of microelectronics applications, including automotive products, computer peripherals, telecommunications systems, consumer products, industrial automation and control systems.

The total size of the semiconductor market in 2010 is estimated to be US$340 billion. The total market consumption breakdown for worldwide produced semiconductors in 2010 is as follows:

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>15%</td>
</tr>
<tr>
<td>Americas</td>
<td>16%</td>
</tr>
<tr>
<td>Japan</td>
<td>17%</td>
</tr>
<tr>
<td>China</td>
<td>21%</td>
</tr>
<tr>
<td>Other Asia/Pac</td>
<td>31%</td>
</tr>
</tbody>
</table>

Source: STMicroelectronics 2010, home page.

ST products are manufactured and designed using a range of manufacturing processes and design methods. It uses all of the prevalent function-oriented process technologies, including complementary metal-on silicon oxide semiconductor, bipolar and nonvolatile memory technologies. In addition, by combining basic processes, it has developed advanced systems-oriented technologies that enable the company to produce differentiated and application-specific products. On February 3, 2009, it combined the businesses of Ericsson Mobile Platforms and ST-NXP Wireless into a new venture, ST-Ericsson. In May 2010, Micron Technology, Inc. acquired Numonyx B.V. This is the name for the new ST-Intel Flash venture made in 2007 and this company has been acquired by Micron Technology. The purpose of such ongoing restructuring by ST is to remain among the world’s dominating companies also for the latest Q2’10 semiconductors.

ST’s latest Q2’10 sales portfolio as a global company is as follows:

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe, the Middle East, and Africa (EMEA)</td>
<td>26%</td>
</tr>
<tr>
<td>Americas</td>
<td>13%</td>
</tr>
<tr>
<td>Greater China and South Asia</td>
<td>44%</td>
</tr>
<tr>
<td>Japan and Korea</td>
<td>17%</td>
</tr>
</tbody>
</table>

Source: STMicroelectronics 2010, home page.
Vision:

STMicroelectronics N.V. aims at becoming the undisputed leader in multimedia convergence and power applications, dedicating significant resources to product innovation and increasingly becoming a solution provider.

To achieve its vision, ST has always been involved in strategic alliances in various industries related to telecommunications, wireless and electronics. Due to the nature of its product (semiconductors) it has played an active part in the development of its alliance partners' businesses, as its mission has been to offer strategic independence to its partners worldwide, as a profitable and viable broad range semiconductor supplier. ST has received more than 100 worldwide awards in the areas of both quality and environmental protection, including the European Quality Award and Malcolm Baldrige National Quality Award.

ST’s diverse product portfolio is focused on high growth applications. In this regard, sales by market segment for the latest Q2’10 semiconductor in 2010 are estimated to be more than US$ 2.531 billion=100% in 2010:

<table>
<thead>
<tr>
<th>Market Segment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>32%</td>
</tr>
<tr>
<td>Consumer</td>
<td>13%</td>
</tr>
<tr>
<td>Computer</td>
<td>12%</td>
</tr>
<tr>
<td>Automotive</td>
<td>14%</td>
</tr>
<tr>
<td>Industrial &amp; others</td>
<td>8%</td>
</tr>
<tr>
<td>Distribution</td>
<td>21%</td>
</tr>
</tbody>
</table>

Source: STMicroelectronics 2010, home page.

Sales by Operating Segment [ST Q2’10 2010 sales 100% = US$ 2.531 billion]

<table>
<thead>
<tr>
<th>Operating Segment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless</td>
<td>21%</td>
</tr>
<tr>
<td>Industrial &amp; manufacturing sector</td>
<td>37%</td>
</tr>
<tr>
<td>Automotive, consumer, computer and telecom infrastructure</td>
<td>41%</td>
</tr>
</tbody>
</table>

Source: STMicroelectronics 2010, home page.

For the purpose of the study it is important to describe the characteristics of STMicroelectronics N.V. as a focal net within the context of its more recent alliances and subsequent knowledge sharing to achieve its strategic vision, as described earlier. Alliances for R&D and knowledge sharing among ST and its cooperative MNEs partners is described in figures 13 and 14.
In order to understand the focal-net of STMicroelectronics as a case company, the historical developments of the relationships among different players need to be clarified, as follows:

In December 2003 MIPS Technologies, Inc. (Nasdaq: MIPS) and Genesis Microchip, a world leader in the development of image processing technologies announced that Genesis Microchip has taken a license for the MIPS32™ 4KEc™ core for use in its digital TV applications. "The 4KEc from MIPS Technologies offers a high performance applications processor that matches the overall system-performance of Digital TV processors," said Anders Frisk, Executive Vice President of Genesis Microchip.

Genesis Microchip Inc. (Nasdaq: GNSS) is a leading provider of image processing systems enabling superior picture quality for a variety of consumer and PC-display products. Whereas MIPS Technologies, Inc is a leading provider of industry-standard processor architectures and cores for digital consumers and business applications. In
December 2007 STMicroelectronics entered into an agreement to acquire Genesis Microchip. Therefore, Genesis Microchip capabilities became integrated with ST.

Numonyx is the name for the new ST-Intel Flash venture. In July 2007, Intel and ST announced that they had finally chosen a name for their flash memory spin-off: Numonyx. ST was effusive about the great progress of the two companies in the introduction of PRAM technology - a technology that is poised to displace flash in the future. PRAM stands for their phase-change memory licensed from Ovonyx, a subsidiary of ECD (Energy Conversion Devices).

ST-NXP Wireless has been a leading provider of UMA solutions since 2006, supplying dual-mode products to major handset manufacturers across the globe. With world-class manufacturing capability, ST-NXP Wireless can ship the new Cellular System Solution 7210 UMA in high volumes now in order to meet the short timescales that the mobile industry demands. The joint venture between these two strong players in the wireless communications semiconductor market combines successful businesses that together generated revenues of around $3 billion in 2007.

ST-Ericsson is a 50/50 joint venture alliance created by bridging ST-NXP Wireless and Ericsson Mobile Platforms, two of the world's leading mobile semiconductor and platform companies. With the creation of ST-Ericsson, the wireless industry now has a new driving force. ST-Ericsson is a top 3 global supplier substantially bigger than its next largest competitor. That strength makes ST-Ericsson one of the few mobile-semiconductor and platform companies with critical mass in sales, product range, IP portfolio, R&D capabilities and consumer base, to cement their position as a key technology supplier which will lead in the integration path in cellular from 2G/EDGE to LTE (Long Term Evolution) and beyond.

In February 2010, Micron Technology agreed to acquire flash memory maker Numonyx, adding NOR flash chips - a memory type commonly found in mobile phones and MPs players - to its product lineup and expanding its manufacturing capacity. The all-stock offer to acquire Numonyx is worth US$1.27 billion, according to Micron. Numonyx is jointly owned by Intel, STMicroelectronics and Francisco Partners, a private equity firm.

The Numonyx acquisition expands Micron's memory range with the addition of NOR flash chips. Micron's current product line includes DRAM and NAND flash chips, which are found in removable memory cards and solid-state drives, as well as mobile devices.

NAND flash memory and NOR flash memory are both non-volatile types of memory, which means they do not lose stored data when power is turned off. But the two memory types have different strengths, making them suitable for different applications. NOR chips have faster read capabilities, making them suitable for storing software code, while NAND chips, are suited for storing large amounts of data, such as pictures and music.

Besides NOR flash, the acquisition also gives Micron access to Numonyx's phase-change memory technology. Phase-change memory is an emerging memory type which is currently under development and seen as a possible replacement of flash chips.
Leadership and reduced process development costs are enabled through the International Semiconductor Development Alliance (ISDA)

NXP Semiconductors is the name of a semiconductor company founded by Philips in August 2006. NXP Semiconductors provides high performance mixed signal and standard product solutions based on its RF, analog, power management interface, security and digital processing expertise. These semiconductors are used in a wide range of automotive, identification, wireless infrastructure, lighting, industrial, mobile, consumer and computing applications. They also manufacture and market the chip set and contactless card for MIFARE used by many major transit systems all over the world. Headquartered in Netherlands, the company had sales of US$ 3.8 billion in 2009.

Crolles 2 Alliance partners had to work together to complete the program on 45nm CMOS and effectively manage the transition throughout 2007. The shared R&D business model, exemplified by the Crolles2 Alliance, contributed to the fast portfolio of alliances and entered into discussions with major semiconductor companies to continue and reinforce the technology cooperation in Crolles since 2008. However, the Crolles2 alliance was formed in 2000 and renewed in 2002, when Freescale (then Motorola) joined the existing alliance of STMicroelectronics and NXP (then Philips Semiconductors) to create and manufacture future-generation technologies and System-on-Chip solutions more quickly and more cost-effectively. The alliance consolidates the work of three of the world’s leading industry players in semiconductor research and process and library development with the mission to develop advanced processes. In 2002, the partners of the Crolles2 Alliance also signed a joint development program with TSMC for process technology alignment. Additionally, in

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**Figure 14** Horizontal alliances for advancing in process R&D partnerships

Source: STMicroelectronics 2010, home page.

Research Consortia around IMB

Participating MNEs
- ST, NEC, TOSHIBA, SAMSUNG, Global Foundries, Chartered, Infineon.
2004, the partners of the alliance signed the Nanotec-300 research program with CEA-LETI for development of the 45 and 32nm process technology nodes, thus further expanding the partnership. Thus, the Crolles2 facility is one of the world’s most advanced centers for R&D and the results achieved there have been instrumental in maintaining Europe’s place as a stronghold in the semiconductor industry. The Crolles2 alliance has delivered outstanding results for the 90nm and 65nm generations, and has contributed significantly to the technology strength of the member companies, who have continually ranked in the global top 10 of semiconductor companies.

In April 2009, in a move that signals the members’ ongoing commitment to advanced semiconductor technology leadership, IBM, Chartered Semiconductor Manufacturing Ltd., Global Foundries, Infineon Technologies, Samsung Electronics Co., Ltd and STMicroelectronics defined and are jointly developing a 28-nanometer (nm), high-k metal gate (HKMG), low-power bulk complementary metal oxide semiconductor (CMOS) process technology. The low-power, 28nm technology platform can provide power-performance and time-to-market advantages for producers of a broad range of power-sensitive mobile and consumer electronics applications, including the fast-growing mobile Internet device market segment. The favorable leakage characteristics of the HKMG technology result in optimized battery life for the next generation of mobile products.

This announcement represents an extension of existing joint development agreements, and further progression in the technology offerings of the alliance partners, building on the success of earlier joint development work in 32nm HKMG technology.

A 28nm low-power technology evaluation kit was previously made available in December 2008 for early access to clients, followed by the release in March 2009 of an evaluation kit for open access to the general marketplace. Early risk production is anticipated in the second half of 2010.

Already working with clients on 32nm low-power technology, the alliance has gained valuable experience in the implementation of HKMG technology, and is offering a migration path from 32nm to 28nm technology. Clients can begin their designs today in leadership 32nm HKMG technology and then transition to 28nm technology for density and power advantages, without the need for a major redesign. By assuring a path from 32nm to 28nm technology, this migration methodology offers clients (a) lower risk, (b) reduced cost, and (c) faster time-to-market.

"Through this collaboration, IBM and its alliance partners are helping to accelerate development of next-generation technology to achieve high-performance, energy-efficient chips at the 28nm process level, maintaining the focus on technology leadership for the clients and partners", said Gary Patton, Vice President of IBM’s Semiconductor Research and Development Centre on behalf of the technology alliance.

The preliminary results of working with early access clients and partners indicate that the 28nm technology platform can provide a 40 percent performance improvement and a more than 20 percent reduction in power - all in a chip that is half the size - compared with 45nm technology. The high-k metal gate (HKMG) implementation allows one of the industry’s smallest SRAM cells at 0.120 square microns, with low minimum voltage operation and competitive performance, leakage and stability.

These improvements enable microchip designs with outstanding performance, smaller feature sizes and low standby power, contributing to faster processing speed and longer battery life in next-generation mobile Internet devices and other systems.
In September 2008, ARM and the Common Platform alliance (IBM, Chartered and Samsung) announced a collaboration agreement to develop a comprehensive 32nm and 28nm System-on-a-Chip design platform. The first milestone from this collaboration was the announcement of the ARM Cortex Processor in Common Platform 32nm HKMG technology at the Mobile World Congress.

"Unlike poly/SiON, HKMG low-power technology breaks down the historical barrier of scaling, allowing significant power and performance advantage without the need for complex processes, thereby lowering clients' total development cost.

The latest development achievement from this alliance of semiconductor manufacturing, development and technology companies which collaborated to address product design and advanced process development challenges are central to producing a smaller, faster, more cost efficient generation of semiconductors.

The nature of knowledge sharing dimensions of contractual and JV strategic alliances between ST and its partners are evaluated in the empirical results of the study. In the following section three different alliances of ST are presented which are analyzed in the empirical part of the study. These alliances are ST-IBM ISDA alliance, ST-Ericsson JV alliance, and ST-Nokia alliance. These alliances represent different nature of cooperation and subsequent knowledge sharing. A brief overview of these alliances is given in the next section.

5.5.1. **STMicroelectronics’s Strategic Alliances analyzed in the study**

5.5.1.1. **ST-International semiconductor development alliance (ISDA)**

April 14th 2008: IBM (NYSE:IBM) and joint development partners - Chartered Semiconductor Manufacturing Ltd. (Chartered), Freescale Inc., Infineon technologies AG, Samsung Electronics Co., Ltd. (Samsung), STMicroelectronics N.V. and Toshiba Corporation -announced that they collectively demonstrated significant performance and power consumption advantages over industry standards by using a breakthrough material known as “high-k/metal gate” (HKMG) on silicon manufactured at IBM’s state-of-art 300 millimeter (mm) semiconductor fabrication facility in East Fishkill, N.Y. With this achievement the joint development partners are in the process of customer engagements. Clients may now design in this leading edge, low power foundry technology in order to help speed time-to-market and help realize power-performance advantage for their products.
Figure 15 ISDA Horizontal Alliance around IBM

Source: STMicroelectronics 2010, home page.

Significant performance and power improvements have been observed in HKMG evolution circuits and test on silicon manufactured at IBM’s East Fishkill, NY. semiconductor fabrication facility. The alliance has assessed performance improvements on 32nm technology circuits of up to 35 percent over 45nm technology circuits at the same operating voltage. The 32nm power reduction over 45nm can be as much as 30 to 50 percent depending on the operating voltage. In addition, testing on product library test chip and industry standard microprocessor critical paths has shown performance improvements of up to 40 percent conventional (Poly/SiON) technology at the same technology dimensions.

These early high-k/metal gate results demonstrate that by working together we can deliver leading-edge technologies that handily surpass others in the industry," said Gary Patton, vice president for IBM’s Semiconductor Research and Development Centre on the behalf of the technology alliance. Demonstrating this caliber of result in a practical environment means that as our collective client base moves to next-generation technology by using the "gate-first" approach, they will continue to maintain a significant competitive advantage.

**ST offers networking variant on ISDA 32-nm bulk CMOS (25.05.2010):**

ST has announced the availability of a bulk 32-nanometers CMOS manufacturing process platform for the development of ASICs for networking applications. The process, known as 32LPH, includes high-k metal-gate stack to minimize leakage current and supports up to metallization layers as developed by the International Semiconductor Development Alliance (ISDA). 32LPH supports ASIC designs up to and beyond 200 square millimeters in area. ST’s variant of the process adds specific density and ternary content address memory (TCAM) to make it suitable for networking applications.
The networking platform is suitable for ICs intended for use in switches, routers and servers as well as optical cross-connect and wireless infrastructure applications. And as part of the supporting IP ST offering a serializer-deserializer (SerDes) circuit.

5.5.1.2. **ST-Ericsson JV alliance**

STMicroelectronics is a global leader in developing and delivering semiconductor solutions across the spectrum of microelectronics applications. An unrivalled combination of silicon and system expertise, manufacturing strength, Intellectual Property (IP) portfolio and strategic partners positions the Company at the forefront of System-on-Chip (SoC) technology and its products play a key role in enabling today’s convergence markets.

![Diagram of ST-Ericsson JV strategic alliance deal](image)

*Figure 16 The ST-Ericsson JV strategic alliance deal*

*Source: STMicroelectronics 2010, home page.*

Whereas Ericsson is the world’s leading provider of technology and services to telecom operators. The market leader in 2G and 3G mobile technologies, Ericsson supplies communications services and manages networks and serve more than 250 million subscribers. The company’s portfolio comprises mobile and fixed network infrastructure, and broadband and multimedia solutions for operators, enterprises and
developers. The Sony Ericsson joint venture provides consumers with features-rich personal mobile devices.

Table 9  JV for joint development

| Potential objectives          |  
|-------------------------------|--------------------------|
| Technology leader             | - 2G and 3G to HSPA and LTE |
|                              | - Clear scale advantage  |
| Complete platform offering    | - RF, analog, modem, multimedia, connectivity |
| Strong customer base          | - Nokia, Samsung, Sony Ericsson, LG and Sharp and other industry leaders |
| Perfect fit with synergies    |                          |

Source: STMicroelectronics 2010, home page.

On February 03, 2009, the Ericsson (NASDAQ:ERIC) and STMicroelectronics (NYSE:STM) completed deal to create world leader in semiconductors and platforms for mobile applications. The new company is designed for long-term stability and set to become an industry leader in product research, as well as design, development, and the creating of cutting-edge mobile platforms and wireless semiconductors. The JV alliance begins as a major supplier to four of the industry’s top five handset manufacturers, who together represent about 80 percent of global handset.

Ericsson contributed USD 1.1 billion net to the joint venture, out of which USD 0.7 billion was paid to ST. Prior to the closing of the transaction, ST exercised its option to buyout NXP’S 20 percent ownership stake of ST-NXP Wireless. The JV alliance employing about 8000 people- roughly 3000 from Ericsson and approximately 5000 from ST- the new leader in wireless technologies is headquartered in Geneva, Switzerland. With almost 85 percent of its workforce in R&D stressed the primary importance understanding the nature of knowledge sharing and innovation management in the success of this JV alliance.

Table 10  JV Complementary areas of focus and key competencies

<table>
<thead>
<tr>
<th>3G/LTE platforms design</th>
<th>2G system solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ericsson</td>
<td>From NXP roots</td>
</tr>
<tr>
<td>3G components</td>
<td>Connectivity/multimedia</td>
</tr>
<tr>
<td>From ST roots</td>
<td>From ST and NXP roots</td>
</tr>
</tbody>
</table>

Source: STMicroelectronics 2010, home page.
5.5.1.3. **ST-Nokia contractual vertical alliance**

![Diagram showing the alliance between STMicroelectronics and Nokia](image)

**Figure 17 Levels of interface among STMicroelectronics and Nokia**

Source: STMicroelectronics 2010, home page.

An increase in cooperation on high-speed, third-generation, or 3G, mobile technology, Nokia Corp transferred chipset technology and workers to STMicroelectronics. The transfer of around 200 personnel to ST, both in Finland and Britain, had taken place during the last quarter of 2007. The development came in line with Nokia's strategy to collaborate with three other chipset suppliers, namely Texas Instruments, Broadcom Corp, and Infineon Technologies AG. Nokia developed modem technology was licensed to chipset manufacturers for producing chipset for Nokia. STMicroelectronics is a major supplier of Nokia as interface among ST and Nokia has been moved up in 2008 as also shown in the figure 17.

To summarize, the present chapter presented the research methodology and empirical setting of the study. The first section analyzed the introduction and philosophical stance. In this view, constructivism as a methodological tradition was first analyzed. Constructivism does not question the existence of phenomena but rather one’s ability to understand it without a specific theory of knowledge. Constructivism does not approve of the traditional positivistic demands of scientific research. Traditional positivist criteria such as validity, reliability and objectivity are replaced by credibility, trustworthiness and conformability. This is followed by the discussion about realism and constructivism. In the present study the ontological realism is extended from the zone of constructivism into epistemological realism, assuming that the theories (e.g., resource-based view and resource dependency theory) used to explain phenomena are themselves nothing more than mirrors of reality. Therefore, the theoretical part of the study (e.g., mirror of reality) investigates the epistemological realist world through questionnaire building (e.g., interview guide), data collection and analysis, thus
extending the analysis to the empirical world of subjective reality (e.g., empirical data collection and model illustrating). Hence, investigating this subjective realism (e.g., epistemological realism) could help in drawing some ontological conclusions as well (e.g., objective reality), thus building theory and identifying areas of further research. The research methodology discussed as ontological and epistemological realism is not in contradiction with critical realism paradigm. Rather, it supports the critical realism methodology of first building an understanding (e.g., model building) and then explaining the phenomenon (e.g., model illustrating). This is follows by the information about the research strategy and design (e.g., abduction research approach in the present study) empirical research process, data analysis and use of Nvivo. The last section of the chapter provides an overview of selected case and related industry description, and strategic alliances analyzed in the case study.
6 CASE EVIDENCE

In this chapter data about the factors affecting knowledge sharing in strategic alliances is presented. The main data is collected from STMicroelectronics, but two of its alliances, a vertical alliance ST-Nokia and a horizontal alliance ST-Ericsson are also investigated. The main data for all the variables given in the theoretical framework is presented first. This is followed by the data presentation of ST alliance partners. In the end an evaluation of the role of knowledge sharing as inter-firm control behavior is discussed within the context of relationship based control and resource based control.

6.1. Perceived Business Network uncertainty as relationship characteristics

Perceived business network uncertainty is seen within the context of alliance formation and knowledge sharing. In knowledge based value creation, ST faces a rather higher level of uncertainty because the market changes fast and exhibits uncertain supply and demand conditions for semiconductor applications in various industries. However, this issue is dealt with within the context of the partners’ risk profile management at ST.

"While partnering with different industries, it’s natural that ST could expose itself to different level of perceived risks. Therefore it’s the most important decision which partner you could pick? Because if it’s a wrong partner then it drives the company towards higher risks or uncertainty" (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

In various industries the demand for semiconductor could be different; therefore it is important to build alliances with partners with the possibility of developing semiconductor related profits.

The perceived business network uncertainty was illustrated by a respondent at ST with an example of a session with colleagues: the session’s objective was to understand what electronics can do in health care. During the session the participants concluded that instead of starting from the technology aspect, ST should start from two things. (1) Usage model - how to find application of semiconductors in other industries, for example the healthcare industry, and (2) how the value chain is organized in industry. These two factors together were considered important by the management before discussing the technology issue.

Uncertainty related to partner’s profile was mentioned by a ST manager, saying: "In alliances we are not trying to combine technologies; rather we are trying to play with people who are already in those industries. And see how ST can relate to them” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009).

Referring to uncertainty regarding shared knowledge or common experiences with customers, the ST manager emphasized that often in the semiconductor industry, if ST is not playing in well-established fields, its customers have no idea what ST could do for them, and vice versa. Therefore, the relationship is based on mutually shared knowledge or common experience.
“This indicates that certainly, ST needs to find new applications into new fields and finding ways how it could help build up its customers for new product development. ST is not working in one industry; it’s rather at the cross-roads of different industries. And that strength is related to common experience and knowledge sharing as a means to reduce uncertainty for the company.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

The answers by the Chief Strategy Officer at STMicroelectronics indicate two main types of perceived business network uncertainties. First, uncertainty is risk profile management among partners from different industries. This risk profile management means that ST, due to nature of its product, must build partnerships in different industries, whereas exposure to risk varies from industry to industry. The second uncertainty is related to lack of understanding of its customers about the semiconductor applications in their industry. Therefore, ST must find new applications in new fields. This was explained as a lack of common experience among partners, consequently affecting problems in knowledge sharing.

The Chief Strategy Officer at STMicroelectronics indicated that ST builds alliances in order to deal with business network uncertainty. An alliance with other partners indicates implications for resource dependence between ST and its business network. For example, in alliance with Ericsson, ST has built a joint R&D framework for mutually developing wireless semiconductor businesses. Neither partner in this JV had enough knowledge of how to accelerate the wireless businesses in emerging markets. Therefore, in this alliance the purpose was to combine mutual capabilities and gain market access. The other uncertainties in accordance with the theoretical model discussed by the manager are mentioned in the following section.

6.1.1. Finding new technology applications

The uncertainty of new technology applications for semiconductors was discussed by the ST respondent within the context of established and emerging markets. For ST, the nature of the market influences partnership development and knowledge sharing among ST, its customers and other MNEs.

Established markets offer constant growth rates as market changes are less likely to happen. However, in practice established markets do experience unexpected growth rates when new technological changes are introduced in the industry. For example, the example of the cellular phone in the move from 2G to 3G, or from cellular phone to smart phone has been a new technological innovation in established markets directly influencing market growth rates. This poses even greater uncertainty as to how semiconductors will be applied in new technology. Therefore, established market uncertainty, to some extent, depends on the market growth rates. However, in the ST manager’s opinion, it could be also a trap to only consider the market growth rate in established markets, because finding new applications of semiconductors with new technology is still important. “These changes trigger completely changing the cards in the whole game even in established markets. Therefore at ST we have to be careful with these trends.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

Emerging markets, on the other hand, are markets or industries in which semiconductors have hardly been used before, so it is about semiconductors invading new markets (e.g., semiconductor applications in the health care industry) offering
higher growth rates. However, it is important to mention that semiconductors usually do not really create these markets; it is only an enabling technology. In emerging markets the possibilities of finding new technology applications for semiconductors and market growth rates are higher; therefore, new technology applications offer a lesser degree of uncertainty. “Semiconductors help all the other industries to create new businesses. This process is more than improving. It’s really, usually once semiconductors have been adopted by an industry where it was not before, it’s just “destroyed” the whole thing, it’s drastic” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Semiconductor application in new industries could bring drastic changes to the products and the industry. This offers ST greater chances of growth in emerging markets by defining new usage of semiconductors.

6.1.2. Competitors’ strategic actions

In semiconductor and related industries the customer is a competitor if likely to have similar capabilities. On the other hand, the customer could also be a cooperative partner where firms mutually share different competencies. Therefore, cooperative development among competitors is a strategic action in the industry.

Competitors’ strategic actions are important in the sense that ST management believes that they never act in a vacuum. Many moves by ST are on the basis of management assumptions about competition (e.g. competing in the firm’s strategic moves).

“ST all the time makes strategic moves in wireless, which is such a small world. When ST moves (strategic moves) or someone else moves, it has an impact on everybody. Management spends time trying to understand that what will be the consequences of what ST does in terms of alliances, and so forth. It’s very clear that it’s because of the fact that there are few major players in the wireless world and therefore the competitor’s strategic actions likely to greatly influence the mutually incorporated strategies of the partners. An incorporated cooperative strategy is when the competitors in the industry pool resources around IBM for ISDA.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

Example of horizontal alliance among competitors around IBM:

World major players ST, Samsung, and Global Foundry, among others asked IBM as a leading edge process developer to become the hub of mutual development. These companies pool resources around IBM because this is their R&D facility and all firms contributed to that. But there is no equity based joint venture, rather it is only a contract. This partnership is among competitors but all the partners including ST see each other as cooperative partners. ST has also contributed technologically and financially to this collaboration. In this collaboration what is done at ST elsewhere is also brought into the picture as well. ST plays an active role in this partnership and the ST manager believes that it is important to discuss how people work, how things are managed in this alliance; thus, ST would not be just a sleeping partner in its cooperative relationships with competitors.

"But on the ground we have a tendency to say, ‘if we have to live together for the next 5 years we had better change the methods’. The only way to make it work, and I am back to “sharing”, when the partner - in this case IBM, and the other partners- understands
that by listening to ST they have something to gain. That’s an interesting thing in cooperation among companies which are competitors in some areas” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Cooperation among competitors as a strategic action is indicated clearly, when all the partners, in cooperation among competitors, think that collectively there is much to gain. The ST respondent gave an example of an alliance with Western Digital and Nortel to illustrate inter-firm mutual dependence (competitor’s strategic actions) among cooperative partners.

When looking at examples of cooperation with changing customers vs. competitors ST has built cooperation with Western Digital and Nortel in the past. As a general trend, these companies have semiconductor capabilities, often even manufacturing capabilities, process R&D capabilities, and product capabilities. In these partnerships ST transferred capabilities to its customers. The main reason why other companies were interested in relationships was that by closely working with ST they could have access to desired technology. ST’s partners were positive that these technologies were going into leading-edge products, as these were managed by a leader in the semiconductor field.

The manager indicated that in order to respond to competitors’ strategic actions, companies build alliances to handle business network uncertainty. "It’s kind of keeping the better of the two worlds of cooperation and competition. In the presence of strong competition, I believe for those customers it is quite a smooth transition from one model to another one. And for ST, it’s the way to win businesses by leveraging our ability to relate to them in a very flexible manner with the ability to be very adaptable” and "very receptive". (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

ST and its customers have different ways of managing in the semiconductor business. ST has the ability to match other parties’ way of doing things, instead of having to say “ST does things that way and the other company had better do this”. ST does it according to the customer’s ways and gradually moves the team. And this flexibility is a major strength of ST.

This issue is clarified by ST’s manager, saying:

"Genetically, ST is very much like that, but to some extent (I think), “we are an eagerless company, we are not in the business of moving ourselves right ... it doesn’t matter. We do it in our customer’s ways” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Further, often ST develops partnerships with competitors under the pressure of cooperative customers. For instance, in some cases ST’s cooperative customers identified that they could gain by having ST work with its competitors, and ST listens to its customers. However, in such a case usually the cooperation could be sustained for only a limited time period of one or two generations of a product.

Another increasingly common trend in the semiconductor industry in the pre-competitive arena is some collaboration, in particular when there are technological discontinuities. If different related industries go in different ways without building standards, the industry as a whole could lead to fragmentation. Without standards the industry will be much weaker and much slower in growth. Developing technology standards is about very advanced technology diffusions, not products. With
semiconductors there are few technological discontinuities faced by companies. ST understands partners in term of the implications of these discontinuities and whether its make sense for the industry as whole.

"It’s a bit like building de facto-standards, particularly in technological paths; opting for one technological path or another: those likely to lead the industry towards different standards” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

In this section, first of all strategic actions were demonstrated with an example of ISDA alliance between ST and other firms around IBM. In this alliance ST contributed on ‘all levels’, as indicated by the Chief Strategy Officer at STMicroelectronics. The ST manager further emphasized that it only worked by ‘sharing’, and when partners have an understanding that by developing cooperative partnerships among competitors they could also gain substantially. This point was further highlighted by R&D and process management capabilities to these companies, who were in fact its customers. However, ST has been ‘very smoothly’ keeping the best of the two worlds of cooperation and competition. ST relates very flexibly to customers, by being adaptable and responsive, and ‘does it in the customers’ way’. Such behavior encourages the customers to stay in the relationship. What ST gains through these partnerships was described by the ST manager as “these partners giving them business”. Further, due to the nature of the technology industry, different de-facto standards, particularly in technological paths, exist. Therefore, partnering with customers is required by ST, as firms in the semiconductor industry jointly build de-facto technological standards in the industry, indicating a mutual strategic dependence of industry competitors.

6.1.3. Knowledge spillover

The risk of knowledge spillover by cooperative partners was considered to be the “least important parameter” of perceived business network uncertainty by the ST manager.

(Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009).

6.2. Perceived resources deficiency as resource characteristics

"For us perceived resource deficiency is the gap between the level of sales that can support the given level of R&D investments and what is required to compete in the market place. It is an equation, and we just don’t know its answer.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

Sometimes, ST has to invest in areas that experience low sales. Also, there could be areas in which cooperation risk could be unacceptable. Even yet, ST has to get into those areas. This happened in wireless because it was not possible for ST to work alone due to the small size of business. Therefore ST built partnership with Ericsson and through ST-Ericsson JV the overall resources of the company increased. Thus, possible sales dollars together were enough to justify R&D investments and the gap between level of sales that could support the given level of R&D was filled by developing a partnership with Ericsson. Ericsson provided initial market access due to its relationships with other customers and thus reduced the risk profile in the relationship.
"In a partnership with someone who is an initial market for us, it provides access to the market. Thus it could bring down dramatically the risk profile for us and them. As is the case of partnership between ST and Ericsson" (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

Further, in the ST manager’s opinion, ST often not only competes on the product level, but it “also competes on the basis of partnership which can be achieved.” Therefore, partnership acts as a perceived resource deficiency when firms need to justify low sales and R&D investment. For instance, establishing partnerships with the market leader has enabled ST to do much more than its leading edge product could have done by itself. Therefore, ST does not perceive resource deficiency at the product level, but rather only at the partnership level, and it also competes at the business model level.

In terms of the above-mentioned factor of competition, ST’s manager further explains how partnerships as perceived resource deficiency relate to innovation in the industry. In his opinion, for innovation one has to put together people or firms which have different perspectives. Hence, innovation is something other than just bringing different partners together with diverse backgrounds. It was explained as follows:

"There can be more innovation, because if you take that angle, it opens up the prior experience of partners; (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Mutual resource dependence between partners was explained again in terms of de-facto standards.

The whole standardization effort to start a de-facto standard is a kind of partnership. To work on de-facto standards there could be a couple of competing companies or two companies in the same industry. By working together they could bring acceleration to the market if they bring out standards together. This effort is around innovation and also market creation.

Thus, such partnerships provide opportunities to fill the perceived resource gap in a more absolute sense. Resource dependency among partners is indicated between cooperative partners by a combination of knowledge sharing, innovation and market creation.

"Thus market access is also access to partners’ knowledge (e.g. knowledge sharing). But once in a while we do create a market. Therefore, access to the market and the creation of a new market is sometimes an overlapping phenomenon" (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

From the above we see that the perceived resources deficiency is seen at two levels. The first level could be the firm level, which was mentioned as the gap between the levels of sales and the given level of R&D investments required. However, this resource deficiency at the firm level is usually measured in relation to those resources (e.g. resource gaps in the firm) required to compete in the market place. Partnerships are the resources at market level which fill the gap between levels of sales that can support the given level of R&D investments. Such partnerships also fill in the resource deficiency of ‘innovation’, as it brings closer different partners with diverse backgrounds. Innovation in this context could also be considered a market resource. To get access to this market resource, ST has developed several partnerships; however, partnerships which bring better resources than merely at the product level are considered important for ST. The company competes at a business model level and
develops such partners which could mutually work on innovation in the industry and also provide access to market. Thus, only competitive partners which could contribute to innovation through their prior experiences are valuable for ST.

Although knowledge sharing was not explicitly discussed by the ST manager, we assume that innovation in an industry where different partners with diverse background join resources together, indicates knowledge sharing.

The further dimensions of perceived deficiency of resources are discussed in the following section.

6.2.1. Partners’ complementary knowledge

Partners’ complementary knowledge as a resource for building strategic alliance can be seen when companies facilitate each other in a technological discontinuity. As mentioned before, technological discontinuity in the semiconductor industry leads to fragmentation and a lack of de-facto standards, which poses risks to industry actors. In this situation, the ST manager related complementary knowledge to industry risk management when ST exchanges complementary knowledge to build standards, thus sharing their own and the related industries’ risk profile. This was explained by the example below:

“In the ST-Ericsson alliance, ARMS architecture is a standard for wireless businesses development for all industry actors. This has removed the complementary knowledge resource gap for everybody in the industry to some extent, whereas ARMS as a standard is controlling the industry, as all the industry players in the wireless area have to get licensed ARMS”. (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

In this situation, process architecture is central for firms to compete in the market place. The Chief Strategy Officer at STMicroelectronics gave the example that there could be two process architectures in the wireless industry instead of one. As a matter of fact, to make a phone, for example, it does not matter which process architecture a firm might use. However, if a company wants to use some process architecture which is not being adopted as a standard by industry, it could not get access to the market.

The Chief Strategy Officer at STMicroelectronics argued that IBM has played the role of a clearing house for sharing complementary experiences and knowledge of different industry players. However, standard building efforts could be seen as creating a monopoly to some extent. He quoted the example of Microsoft as playing that role.

The manager also mentioned that: “when we provide opportunity to two different teams from different firms to work together who have complementary knowledge, it’s partly innovation. This complementary knowledge could be the basis of building alliances among different firms and it could be the background for knowledge sharing”. (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Complementary knowledge acts as a resource for firms in the industry when there is technological turbulence and de-facto standards cannot not be established. As process architecture is central to compete in the market place, partnering firms that build standards process architecture could bring down their respective risks as a result of partnership; for example, IBM acts as a training house in which different partners pool
their complementary knowledge resources. These complementary knowledge resources are useful for all participating firms. In this view, by building alliance with IBM, different partner firms develop mutual dependence as a result of sharing complementary knowledge. Therefore, complementary knowledge sharing may act as a resource in building mutual dependence among participating firms into a partnership.

Further, from the above we see that complementary knowledge is useful for sharing the risk profiles of partnering firms. Firms, as result of complementary knowledge sharing, could participate in building standards as in the case of partnership between IBM and different competitors. In this view, complementary knowledge sharing also represents a control mechanism between partners to stay in a relationship. Thus, in a business network, complementary knowledge is likely to lead ST to build strategic alliances and subsequent knowledge sharing.

6.2.2. Relationship with customers and/or competitors

For the sake of clarity it is repeated that in the semiconductor and related industry the customer is a competitor if likely to have similar capabilities. On the other hand, the customer could also be a cooperative partner when firms mutually share different competencies. Therefore, cooperative development among competitors is a strategic action in the industry.

Relationship with either a key customer or competitor as a perceived resource deficiency is linked to market access by ST. Relationships with some customers might be useful, as the specific customer is likely to become a link between ST and some of its competitors providing access to their markets. On the other hand, some customers could always become ST competitors in the future. In the opinion of the Chief Strategy Officer at STMicroelectronics, the semiconductor is in the business of prevision and sometimes ST considers more value in grabbing a piece of what the customer is doing, while in an alternative case there is a sense that the customer wants to dump on ST "what they used to do".

To illustrate the meaning of ‘dumping on ST’, the Chief Strategy Officer at STMicroelectronics mentioned that ST has been an active supplier to Nokia. When Nokia diversified its services, it transferred a significant number of its semiconductor team members to ST, and ST licensed Nokia’s technology.

In some areas ST also shares capabilities with its customers’ business in the value chain. Sometimes this may make ST customers unhappy about it because they could think ST is extracting lot of value from their business and might be sharing it with other partners.

“ST is reconfiguring the relationships portfolio of its customers, suppliers and competitors from time to time and it’s about cooperative risk profile management with partners. It’s the very core of our business. The underlining force is the integrating nature of our business, and it’s happens all the time” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

However, this trend is not possible in established businesses without the joint consent of the customers. Therefore, the opportunity for ST is to increase the value chain in the business for customers in emerging markets only. There, ST has the opportunity to
reset the boundaries between firms because there are technological discontinuity trends in the industry.

The manager clarifies the knowledge sharing context in the relationship with customers or competitors. This relationship context is linked to the form of alliance. The relationship between ST and its customers and competitors is based on the contractual perspective of whether it is 50% or more than 50% equity investment. Intellectual property rights are central to every deal that ST makes and consider how ST shares knowledge, how people interact, what belongs to whom in a relationship. Also, it determines what belongs to whom (partners) in case the relationship breaks up.

The form of alliance is also related to the tools for the knowledge sharing mechanism. However, the form of alliance is not sufficient and managers need to look into the internal mechanisms for knowledge sharing taking place in alliances. The following paragraph describes how knowledge is shared in alliances in relation to customer or competitor relationships.

The bench-mark for knowledge sharing depends on the scale - knowledge sharing might be only based on a contractual framework and then the project makes it happen. On other hand, when there are a lot of things at stake, ST has formal processes to make sure that it has the right level of knowledge sharing. In practice, it is like having a set of committees that have to meet on a quarterly basis and review at the end of the year. This gives the opportunity in a formal manner for people to sit down, express what they need to exchange, do it and check it. It is a way to communicate to the thousands of engineers who are involved. Because there is a formal process, it is a kind of encouragement to do it also on the management and operational levels.

In addition to the forms of alliances and alliance internal dynamics, individuals play an important role in knowledge sharing. Therefore, there are bench-marks for facilitating the knowledge sharing among individuals. In the following the manager discussed these bench-marks.

"Referring to that bench-mark for knowledge sharing, the management has one example in one relationship: we try to measure the number of joint projects ST has, and the number and the level of manpower it involves. What is very difficult to measure is how innovative the company has been. Then we can have a very qualitative assessment: are we doing things together that we have not thought about when we started the collaboration? But that’s much less systematic” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Finally, ST’s manager concluded by mentioning ST’s capabilities to manage customers.

"The ST relationship context is very unique in a sense because we know how to have partnership with customers who are competitors with each other. They all trust us and it is really an achievement and required skills on ST's part to manage effectively.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

In sum, while the relationship with either a key customer or competitor as a perceived resource deficiency is linked to market access, in some areas ST also shares capabilities with its customers’ businesses in the value chain. The knowledge sharing context in the relationship with customers or competitors between ST and its customers is based on a contractual perspective and whether the contract is 50% or more than 50% equity investment. The intellectual property right is central to every deal that ST makes and it
determines how ST shares knowledge. The form of alliance is also related to the tools for the knowledge sharing mechanism. However, the form of alliance is not sufficient for efficient knowledge sharing, and managers need to look into the internal mechanisms taking place in alliances. Further, individuals play an important role in knowledge sharing. Benchmarking for knowledge sharing, however, is a qualitative assessment by ST about what it has done with customers/competitors which was not agreed in the contract.

6.3. Views from the alliance partners of STMicroelectronics

In addition to the present empirical data analysis according to the model, we have also analyzed the information provided by the ST-Nokia and ST-Ericsson alliances. This analysis represents a different nature of mutual dependence in the case of the ST-Nokia contractual alliance and ST-Ericsson JV alliance.

6.3.1. ST-Nokia Alliance

We can look at the partnership within the context of key customers between ST and Nokia before the first joint venture was undertaken in wireless by ST and NXP.

In the beginning ST was basically providing technology services to Nokia. So ST was able to solve its problems at the beginning of the 90s as their key customer. In those days Nokia was only the 27th largest company, and ST was also a young and dynamic company in the 90s.

With ST and NXP technology ST was able to offer Nokia a competitive benefit. The venture between ST and NXP was due to the fact that ST had a relationship with a key customer like Nokia, as well as others. ST started its wireless business in the 1990s. One Nokia group had the idea of doing something differently with their phone and Nokia was asking ST if they had the technology that could utilize that idea of silicon for building mobiles. Thus, both ST and Nokia were utilizing the most modern ways of working to build mobile phones from the point of view of semiconductors.

Nokia in the 1990s was using what is called application specific IC technology. This technology could be combined very quickly with lower non-recurring engineering costs. In this way phones could be built very quickly. ST was given the specifications of mixing application specific IC technology which has digital and analogue in the same circuit. Although it was challenging for ST, both companies started adapting to each other. In those days ST used to build everything according to customer demand.

"In this view then somebody takes the challenge and we integrated circuits in Nokia’s phones. Nokia started adapting to the ST way of doing things. And there were lot of adaptations even during the first years: ST adapted its CAT system to Nokia’s CAT systems, which was basically made to build complex IC in mix signals or RF domain. And we adapted our CAT system to be fulfilling Nokia’s needs or designing with the same tool printed circuits boards, and digital application specific IC technology". (Vice President of Customer Unit Nokia, February 2011).

Now the issue is how these partnerships affected the supply chain. When the volumes started getting bigger ST and Nokia jointly started changing the worldwide supply chain. In the 1990s Nokia built many factories in different regions around the world. In
all these regions Nokia factory personnel were ordering devices from ST from individual locations. And what was happening depended on the availability of the products, the ST personnel tried to secure more products for different Nokia sites but there was still a shortage of parts for some sites.

“So the big change that ST made in those days was very simply to jump out of the box and say you can’t work with customers who have global production facilities. So we combined both front and back end capacity for one single customer Nokia in 2000. In this way our customer demand was more predictable. ST has a system where we see 12 months ahead of time what deliveries are to be made for Nokia’s worldwide locations” (Vice President of Customer Unit Nokia, February 2011).

In this arrangement there was complementary knowledge sharing about what combinations ST were producing and that has created further dependence on these two related parties.

Then the next step towards mutual dependence building in this supply chain came somewhere in 2004 or 2005, when the whole logistics chain was given to the supplier to handle. ST had the ownership of parts until they were delivered to the customers. ST had more risks but also more visibility. ST could optimize everything beforehand and thus have greater control of the supply chain and ensure timely supplies.

ST was sure that Nokia did not have the possibility to move to some other competitors because once Nokia consumed, they used to send immediately a self-billing invoice to ST. So it could be seen as big logistics and planning change during the past 12 years.

“Recently Nokia outsourced its semiconductor business because it’s not related to its core competencies. This step is, however, based on a Nokia decision in 1986. In December 1986 Nokia decided that it would not be building any basic technologies anymore. And in this view the semiconductor is a basic technology.” (Vice President of Customer Unit Nokia, February 2011).

ST made the decision to license the Nokia modem to make it easier for them to adapt to ST’s products. This was because the modem is something they already knew as it was built internally within Nokia. ST has licensed Nokia technology to become a reliable supplier due to the fact that Nokia is a ST customer.

"I don’t see the room for JV with Nokia in the sense that all we are doing with Nokia is selling them chips. I wouldn’t think that there was a need; on the other hand having JV with a customer is not good for other customers. There are fewer and fewer tight contractual relationships, because there are fewer and fewer joint risks to take together in the case of an established market like in the Nokia alliance” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

“According to the management the mutual dependence with Nokia is vertical but the only thing is that we have moved in the chain (e.g. value chain); the level of interface between customers and suppliers has moved up. We are doing more for them than we used to do earlier; more in a vertical fashion as Nokia is our customer” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

This is an example of an established market vertical alliance which represents less operational complexity and risks in sharing knowledge & subsequent development.
“Whereas in emerging markets even if there is an inter-customer supplier relationship collectively we do take more risk, and as such more risk is understood by clarification through the contract” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

The prominent aspect of dependence between Nokia and ST is seen within the context of resource sharing based mutual dependence. This dependence is more like a firm level dependence as it is based on firm level complementary knowledge and knowledge sharing within the context of key customer. Nokia as a key customer and alliance partner of ST provides specifications to ST for semiconductor deliveries.

6.3.2. ST-Ericsson Alliance

In the case of the ST Joint venture in wireless with Ericsson, the reason was emerging ST and Ericsson businesses. Independently neither of them had the scale, and they knew it was important to spend so much on R&D that neither company had the resources with the partnership.

“First ST did see that how to obtain the resources organically. Second, ST had significant business after being around one year already in the wireless area. However, previous business was built on a business model that ST knew was becoming obsolete with the passage of time. Therefore, from a technology platform standpoint ST had to acquire, a new business capability for different business models which was both platform and IC based. Further, the time was too short (i.e. shortage of time due to competitive industry environment) for ST to do it organically without a partnership with Ericsson.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010)

There are multiple reasons for undertaking a JV. But one reason in a joint venture strategic alliance is to have two parent companies, to have a 50/50 balance of governance. On one hand, ST brought their semiconductor orientation into the picture with tremendous focus on costs, execution, and leveraging the semiconductor technology. And on other hand Ericsson brought in its telecom industry knowledge, which ST did not have.

“Both companies had almost more than one year of operations, in which they saw that it was beneficial to have two parents (e.g. ST and Ericsson), even from very different industry backgrounds to achieve a balance of governance (e.g. governance achieved through joint equity investments among other measures) in a jointly created JV (ST-Ericsson)” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

The alliance of these two companies was to work on wireless semiconductor technology both related to the design and manufacturing of semiconductors. Ericsson is a world top level network design company in the wireless area and it wanted to build complete experience for its customers. ST-Ericsson platforms are suitable for different mobile phone manufactures. These platforms could be used in any Ericsson sold network to any operator in the world.

Ericsson is looking at this JV as strategic JV. And then for ST, it is really important to get, not only via Ericsson but also via ST-Ericsson customers, the latest trends in wireless technology. So the relationship with key customers is relevant. It is to be able
to transfer the complementary knowledge of ST and Ericsson into silicon technology and thus provide new platform solutions for ST-Ericsson customers. Ericsson has knowledge of multimedia, which is useful in joint development between ST-Ericsson.

ST-Ericsson is building set of boxes, IC platforms, as well as digital TV platforms. In this view all the Ericsson multimedia knowledge has to be utilized in the wireless world, whilst what one could learn in wireless could be reused in different applications for building sets of boxes, IC platforms, as well as digital TV platforms. Therefore, as result of this continuous knowledge sharing, the partners could select compatible technologies for building new products, and uncertainty was reduced with the increasing possibility of the acceptance of new products by the customers.

According to the R&D manager at ST-Ericsson, the uncertainty of product acceptance is more relevant in the case of ST-Ericsson than ST-Nokia. In case ST-Ericsson builds solutions and these are not accepted by the customers, it means losing 10 devices instead of one in the case of Nokia. ST is designing their product for Ericsson platforms. These single devices if they are built around Ericsson devices help them to sell their products. But they have to do the same work with the competitors as well. It is cross fertilization: getting some know-how from the competitors and vice-versa.

ST Ericsson has knowledge about silicon from the parent ST, whereas the modem development is inside the company. This modem originally came from Ericsson. Then combining these capabilities to build platforms is the major area of ST-Ericsson business. This is the one major reason why this company was established. Because of these competitive capabilities compatible technologies could be incorporated into platforms which are accepted by the market. So the factors of knowledge sharing have been bringing these capabilities to ST Ericsson, where they are combined for building platforms (chip + modem).

“Relationship with a silicon vendor is a bit like the ST-Nokia alliance situation, whereas with ST as our parent we could utilize advanced multimedia from them and the relationship is more complex. ST is into a market which is more advanced than the multimedia market but now it’s emerging all the time. The benefit from Ericsson is that it’s a big network company.” (ST-Ericsson R&D Manager, February 2011)

The ST-Ericsson country manager in Finland provided his view about ST-Ericsson as follows:

ST Ericsson is a big player in the industry building chip set for mobile phones and the modem part of this chipset. The modem part of the chipset is what the Ericsson network was doing originally. So it is a win-win relationship, meaning they are building different new technologies and standards for network technologies together. With this setup they can make sure that the chipset which ST-Ericsson is providing and the modem solutions are supporting the network solutions. In this view, Ericsson is producing network solutions. To perform these activities Ericsson’s relationships with customers and competitors in the wireless telecom sector was instrumental for establishing JV alliance between ST and Ericsson.

Finally the purpose of doing all this is that it is most important that as a company one should be making profits. In the ST-Ericsson case the parents are the owners so we need to provide money for the parents. Parents push the jointly created company in the beginning and then later as an independent company it should be sustainable and able to survive on its own.
Collaboration between ST and ST-Ericsson is bringing added value to ST: ST is getting a vision of what a platform supplier would need as products. ST Ericsson is also part of the ST-Nokia ecosystem but also other ecosystems. Then we can have the role of ST Ericsson in different ecosystems. In the IBM case it is more standard as the partners are fixed.

“In a pure collaborative world you have dominant players and then lot of slaves. We have ST working with Nokia in a pure partnership. Ericsson having a JV, it's a partnership. Then you have ST Ericsson working with Nokia and this is a collaborative partnership. Then you have ST Ericsson working within a different ecosystem as a fourth scenario and its collaboration. The ST-Nokia contractual alliance and ST-Ericsson JV alliance certainly represent different types of mutual dependence.” (ST-Ericsson R&D Manager, February 2011)

In the next section resource based and relationship based mutual dependence among partners is further clarified within the context of control behaviour among partners.

6.4. Partnership characteristics and control behavior

The management thinks that the best control is mutual strategic dependence. In a relationship, it is better to know if ST and the other firm mutually control each other.

“If we (ST) understand why the guy (partner) has some control over you and vice versa, it's much better. If ST is sharing knowledge with specific firms, actually it's also creating a mutual dependence. And once you are creating mutual dependence it's an inter-firm control behavior in our industry.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

Managerial explanation helps to understand the mutual dependence context as inter-firm control among partners. In the following section, mutual dependence control within the context of relationship based control and resource based control is discussed. Relationship based control is linked to the relationship characteristics of partners and resource based control is linked to the resources characteristics of partners.

6.4.1. Relationship based control

Having shared architecture or de-facto standard across the competition, one could really dedicate R&D and management resource focus to create what is unique for ST's customers. In all types of partnerships it is important to make sure that there are the right incentives for participating firms in a partnership. Therefore, it is possible to achieve strategic dependence in relationship structure instead of referring back to the contract again and again to make the partnership work. Further, to build partnership with competitors, all the firms should be gaining advantage out of the partnership. ST manager explained this as:

“The spirit behind the incentives to have a balanced relationship - no matter whether horizontal or vertical- but a balanced relationship building in the deal.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)
An example of building de-facto standards is a kind of relationship based mutual
dependence among the participating firms, where mutual interests are achieved in
relation to joint business development. This relationship is explained in the following:

“When the markets have the opportunities to be fragmented, it could be because of
standardization or de-facto standard issues. Now if some competitors get together and
understand, it’s better to facilitate the market by removing the uncertainty on the de-
facto standard, then it’s better for everybody.” (Executive Vice President and Chief
Strategy Officer STMicroelectronics, September, 2009).

De-facto standards are important to get access to the market but these are not
differentiating, and individual companies have the possibility to focus on
differentiating their product. It was discussed as follows:

“But it’s doesn’t matter because the emerging de-facto standard is the same for
everybody. But as far you (a firm) are concerned, you can focus your management
power, your technical power on where to differentiate, not on where to compete (e.g. on
something that does really help you). Let’s assume that to develop semi-conductor
business we need three things (i) semiconductor, (ii) architecture, (iii) application.
However, you never know which the right architecture is. But it’s not differentiating. So
we take lot of risk because we don’t know whether it would be accepted by the market;
but even if we win, we don’t get an advantage. At the same time, if we lose we are out of
the market.” (Executive Vice President and Chief Strategy Officer STMicroelectronics,
July, 2010).

In order to build relationship based dependence, the contract and equity partnerships
were explained. Contract as control mechanism can be seen from the following:

“But it’s important that everybody knows that there is a contract. So you know there is a
room and there are mutual dependencies on which to build further. The contract for us
also defines the boundaries within which we could operate this partnership” (Executive
Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

Further, the relationship based dependence is explained within the context of equity
investment among partners. “Contracts give the feeling that there is less demonstration
of long-term commitment in a contract. Equity seems to be like forever, unless
something wrong happens. But equity comes as a result of a contract and the
company’s contract is the way to express, also in legal terms, what the rules of the game
are.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July,
2010).

The Chief Strategy Officer of STMicroelectronics also explained that the management’s
attitude is a superior mechanism in a relationship as ‘the control behavior’. This was
considered because the contracts are there to help clarify sometimes in tough times
when a firm has to go back to the contract. A novel operating mode (business model) is
more driven by attitude; thus, firms do not refer to the contract day by day.

“The attitude of mutual dependence is really important. Let’s take some simpler
example, like if we take the normal organization there is always a hierarchy. But we
don’t use the hierarchical power very often. Personally, it’s a failure when I have to use
my hierarchical power to do things. I’d rather convince people, or be convinced, and
make joint decisions and so forth” its lot about knowledge sharing and building mutual
dependence. I think it’s the same in partnership, and sometimes you have to go back to
the contract. But when you have to go back to the contract it’s not good thing.”
(Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

The Chief Strategy Officer for STMicroelectronics further explained how knowledge is
shared in an equity based relationship, as follows:

“ST experience here is really being able to convince and understand that there is a legal
framework somewhere and they don’t really forget it. The problem is to understand the
mental representation of people or individuals in a joint venture. Knowledge sharing is
all about how individual relate to each other and it’s really about the mind people have.
It’s really about the people in the joint venture and the parents making sure that the
right mind-set is there. In some cases we want to control information, but in others we
don’t and it’s not because it’s a joint venture. But in some areas it is in the interests of
ST to have deep discussions with the joint venture partner and of course in other areas
to say that this is ST property in terms of knowledge that we should not share with our
sister company. So down to that it’s really a success beyond the formal design of the
JV.” (Executive Vice President and Chief Strategy Officer STMicroelectronics,
September, 2009)

Further management clarifies that equity also determines control between the partners
in terms of different resources and capabilities.

"We need equity for building relationships when it is difficult to define what the parties
bring to the partnership. Further, one can also involve equity when companies need a
very intimate mix of capabilities. After a while in partnerships one will not be able to
tell who belongs to what or to whom (In joint R&D for instance).” (Executive Vice
President and Chief Strategy Officer STMicroelectronics, September, 2009)

Within an equity relationship intellectual property (IP), however, was considered an
important tool as a control mechanism to protect the knowledge sharing and their own
knowledge. The partners collaborate only because two parties find an obvious interest.
However, a contract is still needed to protect the knowledge.

“It’s mostly about intellectual property creation where we need to have equity, because
soon it’s difficult to tell what different parties to relationship are contributing to the
relationship. By definition one can create knowledge by putting together different
experiences (e.g. different sets of knowledge), and therefore different parties’
involvement is an important issue here. It’s not possible to write a complete
contractual agreement. For knowledge transfer issues we are deep down interested in
technological avenues in partnerships and other strategic motives. Here, the role of
inter-firm knowledge sharing comes as inter-firm control. Hence, this point of view is
practical, but sometimes one might just admit that we have no other choice than an
equity relationship”(Executive Vice President and Chief Strategy Officer
STMicroelectronics, July, 2010)

Example of ST-Ericsson 50/50 equity joint venture:

In the case of ST-Ericsson 50/50 equity R&D investment is because it was so important
for each of the parents to relinquish control. Further, the JV is a combination of two
shareholders who are very different in nature - one from the semiconductor and other
from the telecom area. The chance is high for these companies not to understand each
other. Thus, not giving full control to any of them obliges them to make an effort to
understand each other. This diversity in the shareholding is an advantage for ST-
Ericsson. But it could become a curse if the parents do not understand each other. Hence, effective knowledge sharing has a key role in creating mutual dependence.

"Thus with a 50/50 JV there is an obligation to understand each other. One cannot just afford to disagree all the time. So you have made the effort to listen to the other guy, and that involves experience/knowledge sharing. Again, whenever you could avoid equity, please avoid it. Equity is not a perfect path, but often you need to work towards equity for many reasons. We would prefer that the partners are aligning themselves instead (without equity investment). Because if you have perfect alignments in business ways, you don’t need any equity exchange. It’s kind of saying that you are not able to make it perfect so you need to put some equity into it (e.g. partnership). (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

Relationship based mutual dependence is discussed in the context of business model innovation. Business model innovation for ST can be as simple as delivering a different service to a customer. With semiconductors, ST can either make standard product, defining them and selling them. Alternatively, it can make the product as the customer defines it and ST designs and sells to him. For ST, innovation could be technical or technological innovations, but also business model innovation, meaning innovation in term of creating new markets. A business model innovation is a combination of partners that have different relationships and understanding of the industry. Business model innovation as mutual strategic dependence was explained as follows:

“Now if you want to consider the example of something that has been innovative and we have not invented it ourselves: ST and other major players have joined in an alliance with IBM on process development. It’s a unique setup in the world and as such I think it’s certainly a business model innovation (e.g. ISDA alliance; ST, IMB, Global Foundries, among others)” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

Resource sharing based mutual strategic dependence was related to innovation and business model innovation by the ST manager. This meant that ST is building business models that are helping the company create more value. So innovations are new to someone and they create value.

"Thus, innovations could generate a higher return or stronger competitive position. And here the innovation is also how to achieve those new business models” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

To summarize, relationship-based control among firms can be seen as related to relationship based mutual dependence. Therefore, in difficult times firms need not to go back to the contract. The right incentives in a partnership also act as inter-firm control, thus binding the partners in a relationship. For example, building de-facto standards is a kind of relationship based mutual dependence among participating firms, where the mutual interests are achieved in relation to joint business development. In the case of building de-facto standards it could be to the benefit of all the partners to increase the growth rate of the market and thereby reduce uncertainty for new market access and mutual business development. Once the de-facto standards are built, the firms in the industry could focus more on differentiating their products. Thus, the incentives for every firm in the relationship are related to relationship-based control born out of relationship characteristics and knowledge sharing factors as defined in the theoretical model.
Further, in order to build relationship-based control, both contract and equity could play an important role in building mutual dependence among different companies. Contract is an initial legal framework to bind different companies together, whereas equity could be further useful when firms in the relationship are involved in joint development. Equity investment is the mechanism to share intellectual property in joint development projects. The management’s attitude was considered a superior mechanism in a relationship in terms of control behavior. However, in joint venture knowledge sharing was considered to be related to the people in the joint venture and the parents making sure that the right mind-set is there. Equity also determined control between the partners of different resources and capabilities. Resource sharing-based mutual strategic dependence was also related to innovation and business model innovation enabling the company creating more value.

6.4.2. Resource-based control

Resource-based control was discussed by the management as follows:

“Control couldn’t be equal, because there are big firms and small firms. The smaller firms couldn’t exercise the same level of control, but still they create some degree of lesser mutual dependence in their business relationships with big firms. There is the role of resource characteristics for strategic inter-firm control behavior because this resource sharing is actually aligning the strategic interests between potential partners”

The strategic nature of resource sharing was explained by the ST manager as:

“Increasingly in ST we are looking at partnering with people from other industries. Because the life of semiconductors has been a life of prevision, which means invading other industries and bringing and invading electronics to all other fields. It is bringing the capabilities of silicon more than semiconductors outside of electronics. The only way is to understand what we can do with semiconductors; we need to work with people from other industries and sometimes very unrelated industries, and then by just sharing deep experiential knowledge you have new markets. Again, the idea of knowledge transfer means that one is giving and the other is receiving. But from experience it’s never like that, because to get the energy out of a partnership, the two guys have to walk away from the meeting. So we could do something we couldn’t have achieved without this partnership and it goes very deep to knowledge and mutual experience sharing.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, September, 2009)

Knowledge sharing is related to new market creation by sharing complementary knowledge with partners from different industries and also the creation of new industries by introducing the application of semiconductors for new product development. The phases of knowledge sharing are very rapid from one product range to another to remain competitive in the market place in various quarters of the year. In some cases knowledge sharing is also a source to access a new market for semiconductor applications for new product development and thus the creation of new markets. Knowledge creation defines the boundaries of the semiconductor industry through its usage across the electronics, telecom and wireless industries. In the empirical results it is, however, difficult to evaluate the amount of knowledge sharing that has taken place among the cooperative partners.
Knowledge sharing is discussed within resource sharing context as follows:

“Knowledge sharing: usually the way it works is that there is an idea which is partly abstract and knowledge sharing/experience sharing helps to tune the ideas, and refine them. But ideas should be validated. This is really the “thinking” followed by the confrontation of reality, which is really what the knowledge sharing and experience sharing is all about. It’s important that the company is good in its ability to acquire capabilities through relationships. But building relationships between organizations is not easy. In particular it’s difficult to build relationship among small and very big organizations or two big organizations. Hence, mutual resource or knowledge dependence could be a strategic link for successful partnerships.” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

The reasons for lack of mutual resource control were considered as misunderstandings and lack of common knowledge. If companies are from two different industries, then sometimes even after some years they still may not understand each other. In this case equity deals with the situation, as with its involvement companies will do their best to build common strategic knowledge and build a mutual dependence for business development. Knowledge sharing in a strategic relationship was explained as follows:

"The relationship between a 50 year old man and a 20 year old girl clearly is a very imbalanced situation, in which the older person will know exactly what will happen and why they will be fighting. But, in principal, if the two are passionate enough to understand each other (knowledge sharing), I don’t think why there should be misalignments” (Executive Vice President and Chief Strategy Officer STMicroelectronics, July, 2010).

The relationship with competitors or customers could be also helpful in understanding the design requirement of semiconductors for a specific firm.

In connection to the evidence discussed earlier, first the resource-based control mechanism is discussed within the context of large and small firms. Large firms could exercise greater control on smaller firms, and vice versa. Resource sharing control exists in the industry because the life of semiconductor has been a life of prevision, which means defining the functions of semiconductors in new products among different industries. In this view, if the partners can understand each other, then resource-based control is exercised by sharing complementary knowledge to define the semiconductor design for a specific firm. Sometimes common knowledge about complementary resources can be lacking among partners, and as result resource-based control cannot be effectively exercised. Further, the relationship with competitors or customers can be also helpful in understanding the design requirements of semiconductors for a specific firm.

To summarize, perceived business network uncertainty is viewed within the context of alliance formation and knowledge sharing. An alliance with other partners indicates implications for resource dependence between ST and its business network. For example, in the alliance with Ericsson, ST built a joint R&D framework for mutually developing wireless semiconductor businesses. Neither partner in this alliance had enough knowledge of how to accelerate the wireless businesses in emerging markets. Therefore, the purpose was to combine mutual capabilities and gain market access. Other uncertainties in accordance with the theoretical model discussed are related to new technology applications, competitors’ strategic actions and knowledge spillover. ST’s respondent within the context of established and emerging markets discussed the
uncertainty of new technology applications for semiconductors. Established markets offer constant growth rate as market changes are less likely to happen but there could be also unexpected growth rates in established markets as result of technology change in the industry (cellular phone is move from 2G to 3G or to smart phone). In emerging markets semiconductors had hardly previously been used, so the purpose of the alliance was to position semiconductors into new markets that offered higher growth rates. In the semiconductor and related industries the customer, if a competitor, is likely to have similar capabilities. On the other hand, the customer could be a cooperative partner where firms mutually share different competencies. Therefore, cooperative development among competitors is a strategic action in the industry. One example of such cooperation is ISDA alliance between ST and other firms around IBM.

In this view ST had been leveraging both worlds of cooperation and competition. In this example, firms jointly build de-facto technological standards in the industry, indicating a mutual strategic dependence of industry competitors (e.g., relationship based control). Further, risk of knowledge spillover by cooperative partners was considered to be the least important parameter of perceived business network uncertainty. The perceived resource deficiency is seen at two levels. The first level could be the firm level, which was mentioned as the gap between the levels of sales and the given level of R&D investments required. However, this resource deficiency at the firm level is usually measured in relation to those resources (e.g. resource gaps in the firm) required to compete in the marketplace. Partnerships fill in the resource deficiency of ‘innovation’, as it brings together different partners with diverse backgrounds. The perceived resources deficiency in accordance with the theoretical model discussed are a partner’s complementary knowledge, the relationship with customers and/or competitors. Complementary knowledge is useful for sharing the risk profiles of partnering firms. Firms, as a result of complementary knowledge sharing, could participate in building standards as in the case of partnership between IBM and different competitors. In addition, the relationship with either a key customer or competitor as a perceived resource deficiency is linked to market access; in some areas ST also shares capabilities with its customers’ businesses in the value chain. Intellectual property rights are central to every deal that ST makes and it determines how ST shares knowledge. The prominent aspect of dependence between Nokia and ST is seen within the context of resource sharing based mutual dependence. This dependence is more of a firm level dependence as it is based on firm level complementary knowledge and knowledge sharing within the context of key customers. Nokia as a key customer and alliance partner of ST and provides specifications to ST for semiconductor deliveries. On other hand ST-Ericsson is building set of boxes, IC platforms, as well as digital TV platforms. In this view, all of Ericsson’s multimedia knowledge has to be utilized in the wireless world, whilst what one could learn in wireless could be reused in different applications for building sets of boxes, IC platforms, as well as digital TV platforms. Therefore, as result of this continuous knowledge sharing, the partners could select compatible technologies for building new products, and reduce uncertainty with the increasing possibility of the acceptance of new products by the customers. In order to build relationship-based control, both contracts and equity could play an important role in building mutual dependence among different companies. Contracts are an initial legal framework to bind different companies together, whereas equity could be further useful when firms in the relationship are involved in joint development. Equity investment is the mechanism to share intellectual property in joint development projects. The management’s attitude was considered a superior mechanism in a relationship in terms of control behavior. However, in joint ventures, knowledge sharing is related to the participants in the joint venture and the parents making sure that the right mind-set is there. Equity also determined control between the partners of different resources and
capabilities. Resource sharing-based mutual strategic dependence was also related to innovation and business model innovation enabling the company creating more value. If the partners can understand each other, then resource-based control is exercised by sharing complementary knowledge to define the semiconductor design for a specific firm. Sometimes common knowledge about complementary resources can be lacking among partners, and as result resource-based control cannot be effectively exercised.
7 DISCUSSION AND CONCLUSIONS

This chapter will evaluate the key empirical findings and discuss the results. Next, the conclusions of the study are discussed in relation to the previous studies in Section 7.2. In Section 7.3 a summary of the study is presented. Afterwards, the managerial implications and suggestions for future research are given in sections 7.4 and 7.5 respectively.

7.1. Results of the study

In this section, the findings of the study are discussed in relation to the theoretical framework. In the theoretical framework a priori assumption 1 is based on resource dependency theory that deals with perceived business network uncertainty. A priori assumption 2 is based on the resource/knowledge-based view of the firm that deals with perceived resource deficiency. Under a priori assumption P1 there is a subset of a priori assumptions: P1(a) new technology application uncertainty affecting knowledge sharing, P1(b) competitors strategic actions uncertainty affecting knowledge sharing, P1(c) risks of knowledge spillover uncertainty affecting knowledge sharing. P1 a priori assumptions are characterised as relationship characteristics. Under a priori assumption P2 there is a subset of a priori assumptions: P2 (a) complementary knowledge resource deficiency affecting knowledge sharing, P2 (b) cooperative relationship resource deficiency affecting knowledge sharing. P2 a priori assumptions are characterized as resource characteristics. Based on the propositions of the study, perceived business network uncertainty and perceived deficiency of resources are analyzed in relation to knowledge sharing factors. Then, inter-firm control behavior is analyzed in relation to perceived business network uncertainty and perceived deficiency of resources.

The results of the study indicate two main types of perceived business network uncertainties. The first uncertainty is related to risk profile management among partners from different industries. Risk profile management means that firms in the semiconductor industry, due to the nature of the product, must build partnerships in different industries; hence, the degree of risk is greater for these firms. To minimize the risk, firms manage the profile of their partners by choosing the right partners who could offer more opportunities for market growth. However, exposure to risk varies from industry to industry and a firm can never be sure of the level of risk in a given industry. Therefore, risk profile management is a critical activity to overcome perceived network business uncertainty. The second uncertainty is related to lack of understanding by customers for the semiconductor applications in their industry. Therefore, ST must find new applications in new fields. This was explained as a lack of common experiences among partners, consequently affecting problems in knowledge sharing.

When the nature of uncertainty is analyzed in the context of resource dependence theory it is confirmed that uncertainty coping is seen as a critical task or activity within organizations, and different mechanisms are used to cope with uncertainty. Uncertainty is reduced through the use of standard operating procedures, forecasting, buffering, decision rules and other activities that permit the rationalization of organizational activities. We could argue that risk profile management is utilized as one such mechanism. When the nature of uncertainty is compared within the context of resource dependence theory, it confirms that technologies evolve and uncertainty
decreases as inventors are able to analyze the needs of customers and the technology logic of their customer trajectory.

Firms build alliances in order to deal with business network uncertainty. An alliance with other partners indicates implications for resource dependency between a firm and its business network. For example, in the alliance with Ericsson, ST has built a joint R&D framework for mutually developing the wireless semiconductor business in emerging markets, where both the partners lacked sufficient knowledge of how to accelerate the wireless business. Therefore, while this alliance was built on the motives to combine mutual capabilities and gain market access, the partners' characteristics were based on resource sharing and the overall strategic motive of minimizing uncertainty by mutual combination of capabilities.

When the overall uncertainty findings are compared within the theoretical discussion presented in the previous chapters, it could be argued that despite widespread acknowledgement of the importance of uncertainty, it is difficult to explain the ultimate sources of uncertainty. However, some of the significant causes of uncertainty, including (i) the adaptation and diffusion or application of new technology (ii) market and customer acceptance (iii) competitors’ strategic actions, were analyzed in this study.

The knowledge sharing factor of new technology application in the context of perceived business network uncertainty was found to be related to the established and emerging markets for semiconductor applications or business development. In established markets technological changes are less likely to happen and the firm experiences constant growth rates, except when new technological changes are introduced in the industry. This poses even greater uncertainty of how semiconductors will be applied in new technology, indicating a need to share knowledge with partners to find new applications in their businesses. Thus, in established markets the uncertainty, to some extent, can be indicated by the market growth rate. Our results indicate that the nature of the market influences partnership development between partners. Therefore, in order to find new applications for semiconductors technology firms build alliances. We also found partners’ risk profile management as a key perceived uncertainty. Thus, sharing knowledge in this situation can be said to occur smoothly when the partners’ risk profiles match and they have more to gain through sharing the knowledge.

Emerging markets, on the other hand, offer higher growth rates and the likelihood of finding new technology applications for semiconductors, and market growth rates are higher and maybe known to firms coming from established markets, indicating a lesser degree of knowledge sharing need between the partners. This can be said because the market and products are in the growth stages. However, firms due to their prior experience with technology in other established markets will be able to estimate the growth rates and acceptance of the product. Thus, perceived business network uncertainty could be of a lesser extent in emerging markets, thus indicating a different motive for knowledge sharing.

In terms of the competitors’ strategic actions, our results indicate that competitors are willing to cooperate when there is a substantial gain in the relationship. Further, due to the nature of technological industry, different de-facto-standards, particularly in technological paths, exist. Therefore, partnering with the right customers is required to build de-facto technology standards that represent strategic dependence between competitors.
We could relate knowledge sharing to competitors’ strategic actions through mutual strategic dependence between the partners. It was found that due to the small number of firms (major players) in the semiconductor industry, the strategic actions of the customers were likely to influence the mutually incorporated strategies of the partners. In such a situation, firms’ perceived business network uncertainty of the partnering firms can be said to be high, which could greatly influence the degree of knowledge sharing. As the firms are mutually dependent, thus key players must share knowledge in order to keep the relationship going.

Our findings indicate in competitor’s strategic actions larger firms need to be more flexible, receptive, and adaptable in order to share knowledge. This was indicated in the results when it was mentioned that for customers (smaller firms), partnership with bigger firms is like a smooth transition from one model to another. However, for a bigger firm as in the sample of the study, the only way to win business is by leveraging their ability to relate to the customer in a flexible and adaptable manner so as to share knowledge. Thus, bigger firms need to do business in the customers’ way to ensure knowledge sharing.

When these findings are compared with theory, we would argue that in the case of alliance, a high payoff for cooperation is likely when firms are in vulnerable strategic positions. The strategic position depends on the characteristics of both firm strategy and market (Conner, 1994). The competitors’ strategic actions can also create a vulnerable strategic position for the focal-firm within an industrial network, and therefore it important to work in cooperation with other firms, including competitors. In this view it is noted in the literature that turbulent competition in high-technology industries fuels the desire of many firms to develop horizontal strategic alliance for offensive and defensive reasons, mainly caused by the growing strengths of competitors (Perry, Sengupta and Krapfel, 2004).

The risk of knowledge spillovers could not be found to be related to knowledge sharing in an alliance in the results of the study. Thus, we conclude that the risk of knowledge spillovers cannot be related to perceived business network uncertainty in the semiconductor industry.

Related to resource characteristics, our findings present resource deficiency at two levels. The first level is the firm level, which was mentioned as the gap between the levels of sales and the given level of R&D investments required. However, firm level resource deficiency is measured in relation to the resources required to compete in the market place. Partnerships are the resources at market level which fill the gap between levels of sales that can support the given level of R&D investments. Such partnerships also fill in the resource deficiency of ‘innovation’ as it brings closer different partners with diverse backgrounds. Innovation, furthermore, came up as a market resource in the results. The firm competes at a business model level and develops such partners which could mutually work on innovation in the industry and as a result provide access to the market. In this context, we assume that innovation in an industry, where different partners with diverse background join resources together, indicates knowledge sharing; however, this was not discussed explicitly by the respondent.

When these findings are compared with theory, we would argue that in industries experiencing rapid technological change, a single company rarely has the full range of expertise needed to offer timely and cost-effective new product innovations (Teece, 1987). The theoretical basis for this lies in inter-organizational exchange behavior, in which, given functional specialization and the scarcity of resources, the organizational
exchange resources are for mutual benefit (Bucklin and Sengupta, 1993; Frazier, 1983). Cooperating firms’ cumulative resources, complementary skills, and boundary-spinning activities are likely to increase the level of innovativeness of the products (Kotabe and Swan, 1995).

The knowledge sharing factors affecting perceived deficiency of resources are discussed in the following.

Our findings indicate complementary knowledge as a firm level resource could be used to fill the gap between levels of sales and the given level of R&D investments required. This resource is significant when there is technological discontinuity and de-facto standards could not be built. As mentioned in the results of the study, technological discontinuity in the semiconductor industry leads to fragmentation and lack of de-facto standards, which poses risks to all the industry actors. Our findings indicate that firms build alliances to overcome the perceived resource deficiency of complementary knowledge and join mutual efforts to build de-facto standards. Further, as the process architecture is central to compete in the market place for firms, partnering firms that build standard process architecture could reduce their respective risks as result of partnership. For example, IBM acts as a training house in which different partners pool their complementary knowledge resources. Through complementary knowledge, firms develop mutual dependence. Therefore, the complementary knowledge sharing may act as a resource in building mutual dependence among participating firms into a partnership. Therefore, we conclude that through complementary knowledge in building de-facto standards, firms share their own and the related industries’ risk profile.

Then, knowledge sharing within the complementary knowledge also came up through innovation. Complementary knowledge sharing provides the opportunity for two different teams from different firms to work together. Thus, complementary knowledge is found to be the basis of building alliances among different firms and serves as the background for knowledge sharing.

Further, from the above we see that complementary knowledge is useful for sharing the risk profiles of partnering firms. Firms, as a result of complementary knowledge sharing, could participate in building standards as in the case of partnership between IBM and different competitors. In this view, complementary knowledge sharing also represents a control mechanism among partners to stay in a relationship. Thus, in a business network, complementary knowledge is likely to lead a firm to build strategic alliance and subsequent knowledge sharing as source of building inter-firm control.

When these findings are compared with theory, we argue that it is the heterogeneity of the productive services available or potentially available from its resources that gives each firm its unique character. Further, the firm may not achieve rents, not because it has better resources, but rather the firm’s distinctive competence involves making better use of its resources. This perspective could be also understood in the context of the importance of knowledge sharing for maintaining the distinctive competencies of alliance partners, which also involves better use of their own distinctive resources and capabilities. Penrose argues that unused productive services of resources ‘shape the scope and direction of the search for knowledge’ (1959: 77). Hence, Penrose (1959) did not explicitly mention that the direction of the search for new knowledge is complementary in nature. However, we know from more recent research that the firm, due to its limited absorptive capacity, can only identify the usefulness of the complementary nature of knowledge, and therefore a new knowledge search is also
likely to be complementary in nature (Cohen and Levinthal, 1990). Therefore, the focal-firm, due its superior market position, prior experience and absorptive capacity, is likely to identify the complementary knowledge residing with the potential alliance partner and then make the decision to build knowledge transfer based cooperative relationships (i.e. strategic alliance).

Perceived resource deficiency of the relationship with either key customers or competitors with knowledge sharing is found to be linked with market access in the findings. In some areas firms share capabilities with their customers’ businesses in the value chain. To share knowledge, firms could build a contract along with equity investments. Contracts and joint equity investments by firms in a partnership are used to share intellectual property rights. Intellectual property rights and the form of alliance, are central to every deal and determine how firms share knowledge. However, in addition to the form of alliance, in a relationship with customer or competitor, internal knowledge sharing mechanisms and the individuals play an important role in knowledge sharing. Further, it is found that firms measure knowledge sharing as qualitative assessment of what has been done in a relationship with customer or competitor which is not actually mentioned in the contract. Thus, we conclude that for knowledge sharing, in a relationship with customer or competitor, the form of alliance and intellectual property rights only determine how knowledge can be shared. It is the individuals who actually share knowledge. Therefore, building good relationships within the customer or competitor alliance can lead to effective knowledge sharing.

When these findings are compared with theory, we would argue that the resource/knowledge-based literature views the firm as a bundle of resources and capabilities, and examines conditions that contribute to the realization of sustainable economic rents (Penrose, 1959; Wernerfelt, 1984). Because of (1) resource-market imperfections, and (2) discretionary managerial decisions about resource development and deployment, it is to be expected that firms differ in the resources and capabilities they control. These resources are also seen as firm-specific relationships with either key customers or competitors. Therefore, establishing a cooperative asymmetry with potential alliance partners as customers or either competitors could be a source of sustainable economic rents.

7.1.1. Partnership characteristics and control behavior

The results of the study relating to inter-firm control behaviour demonstrated it as mutual strategic dependence. It was found that for firms it is important to know how and which partners exercise control in a business relationship. Further, our results show that knowledge sharing creates mutual strategic dependence. This very clearly indicates knowledge sharing as inter-firm control behaviour.

Based on the above finding, to analyse the knowledge sharing as inter-firm control behaviour, this section will focus on analysing how mutual strategic dependence behaviour is evident in strategic alliances. Therefore, knowledge sharing will not be discussed per se, but rather only mutual strategic dependence will be analysed in the context of perceived business network uncertainty and perceived deficiency of resources as inter-firm control behaviour. This is also in accordance with the main a priori assumptions of the study.
7.1.1.1. Relationship based control

The results of the study related to perceived business network uncertainty found two types, namely uncertainty of risk profile management and lack of understanding by customers of the semiconductor applications in their business. As in this industry, due to the nature of the product, partnerships are necessary. However, exposure to risk varies for focal firm with partners from different industries. It was mentioned by the respondent that technological changes ‘completely change the cards in the whole game’; thus, firms must monitor market changes and manage partnerships in relation to that. Therefore, firms need to manage the profiles of their partners in a manner that each partner in a relationship gains and contributes. Thus, partners are mutually dependent on each other in sharing knowledge, capabilities and technology. To deal with the second uncertainty related to lack of understanding by customers of the semiconductor applications in their industry, firms need to share knowledge to find new applications of semiconductors in new products. Therefore, mutual strategic dependence reduces perceived business network uncertainty in the relationship by creating mutual strategic dependence between the partners.

The results under competitors’ strategic actions as perceived network uncertainty also indicate that firms share knowledge with partners to create mutual strategic dependence. The focal firm monitors its own and other partners’ strategic actions in a business network because such actions impact the mutually incorporated strategies of the partner firms in the business network. One reason for this was mentioned as ‘few major players in the industry.’ For example, inter-firm control behaviour can be seen as operationalized when the focal firm contributed technologically and financially in the horizontal alliance of ST, its competitors and IBM. Inter-firm control behaviour was further evident in the results of the study when ST transferred capabilities to its customers in the alliance with Western Digital and Nortel. The customers’ interest in this alliance was to gain access to desired technology and they were sure that the technology contributed by ST was going into leading-edge products. ST was eager to gain access to markets. Thus all parties were mutually dependent on each other.

In the relationship based on the perceived business network uncertainty, our findings also indicate that inter-firm control behaviour appears as a behavioural control. In order to reduce perceived network uncertainty, the focal firm exercised behavioural elements to facilitate knowledge sharing with partners. It was seen that the focal firm, being the market leader, could demand changes in ‘the methods’ of its partners. However, the focal firm instead mentioned the only way to make a partnership work is by ‘sharing’. Further, the focal firm adopted its customers’ way of doing things, being flexible, adaptable and receptive to its customers.

Our findings indicate that the right incentives in a partnership also act as inter-firm control, thus binding the partners in a relationship. The right incentives create mutual strategic dependence between partners; thus, in difficult times firms need not to go back to the contract. For example, building de-facto standards is a kind of relationship based mutual dependence among participating firms, where mutual interests are achieved in relation to joint business development. Building de-facto standards could be to the benefit of all the partners to increase the growth rate of the market and thereby reduce uncertainty for new market access and mutual business development. Once the de-facto standards are built, the firms in the industry could focus more on differentiating their products. Thus, the incentives for every firm in the relationship are related to relationship based control.
Moreover, our findings show contracts and equity investments as the means of building mutual dependence among partners. The contract plays a role in initially building boundaries within which to operate a given partnership in legal terms. However, the contract is seen as limited in time, whereas equity investment demonstrates a long term commitment. Thus, mutual dependence is increased through a contract and equity investment. In addition to contractual and equity based mutual dependence, behavioral control by convincing the others in the relationship is seen as significant source of building mutual strategic dependence. Therefore, contracts and equity investment were seen to more effective when there is behavioral control for creating mutual dependence. However, it was found that for behavioral control, people in a relationship should have the right mind set for knowledge sharing.

Equity as inter-firm control behavior was found important when what the partners brought into the partnership was difficult to evaluate in an alliance relationship for new product development. This was seen in the JV alliance between ST-Ericsson. Therefore, in order to share intellectual property rights firms could build partnership through joint financial investments. In these relationship firms share knowledge, and knowledge sharing is a mechanism of strategic inter-firm control. But in some cases firms have no other choice than joint equity investment for sharing intellectual property.

Our findings also show that cooperation among competitors is a business model innovation. Through these partnerships firms could build mutually compatible standards which could accelerate the business in a given industry. Business model innovation could increase mutual strategic dependence among partners. Innovation in this view is how to achieve these business models. For this purpose it is important to see which partners are bringing in the right mix of capabilities.

Relationship based control exists in industries because technological changes and competitor actions could completely alter the dynamics of the market and as such firms need to manage the profile of their partners in a manner that each partner in a relationship gains and contributes. This implies that firms see the mutual dependence (e.g., control) in relationships respond accordingly to new technology applications and competitors’ strategic actions. In other words, responding to new technologies and competitors could be seen as a means of control to manage the profile of their partners in a manner that each partner in a relationship gains and contributes. Firms will share knowledge with inter-firm controls when it will best result that each partner in a relationship gains and contributes, thus building a mutual dependence through knowledge sharing activities.

7.1.1.2. Resource based control

The results of the study indicated perceived deficiency of resources at two levels. At the firm level it was considered as the gap between the levels of sales and the given level of R&D investments required. This was measured at the market level in relation to those resources required to compete in the market place. That means that in a business network, firms try to fill the gap between firm and market level resource deficiency. Partnerships at the market level provide access to firm level resources. Thus, our findings demonstrate that partners sharing firm level resources are strategically mutually dependent on each other. For example, in creating this mutual dependence IBM played an important role as a training house for pooling complementary knowledge from competitors for building process technology. Further, through
partnerships firms minimize market uncertainty, as was demonstrated by the ST and Ericsson example. This serves as a greater motive to compete for partnerships, rather than just competing at the product level in a business network. It can be said that the greater the need for firm level resources, the higher the competition in a business network for partnership development with partners possessing key resources. Perceived resource deficiency can be said to be operationalized when firms develop innovation in a business network. Innovation was mentioned as different firms getting together on the basis of their competencies to build de-facto industry standards.

The findings indicate that perceived resource deficiency of complementary knowledge creates mutual strategic dependence to manage industry risk. This is done when firms facilitate each other in technological discontinuity and build industry standards. Such activity is not possible without sharing knowledge within the key market leaders and between the partners. Once industry standards are developed, only firms possessing superior process technologies can compete efficiently in the market. Thus, partners sharing firm level perceived deficient resources are strategic and mutually dependent on each other.

Relationship with either key customers or competitors as a perceived resource deficiency is linked to market access. In this view, partners were seen as market level resource, when some customer is useful in providing a link between the focal firm and any of its competitors. Inter-firm control behaviour in the context of perceived resource deficiency was materialized by the focal firm through contractual perspective and equity investment.

Resource sharing based mutual strategic dependence was also related to innovation and business model innovation, enabling the company to create more value.

Resource sharing control exists in the industry because the life of semiconductor has been a life of prevision, which means defining the functions of the semiconductor in new products in different industries. In this view, if partners can understand each other, then resource based control is exercised by sharing complementary knowledge to define the semiconductor design for a specific firm. Sometimes common knowledge about complementary resources can be lacking among partners, and as result resource based control cannot be effectively exercised. Further, the relationship with competitors or customers can also be helpful in understanding the design requirement of semiconductors for a specific firm.

Based on comparing the findings of the study with the theoretical context, the final theoretical framework is presented in Figure 18.
Factors Affecting Knowledge Sharing

Perceived business network uncertainty
Perceived resource deficiency

Theoretical Background

Alliance Motives

Factors

Control based factors

Relationship characteristics

Resource characteristics

P1a: New technology application
P1b: Competitors strategic actions

P2a: Complementary knowledge
P2b: Focal-firm's relationship with either customers or competitors

Knowledge sharing

Control

Relationship based control
Mutual strategic dependence
Resource based control

Figure 18 Extended theoretical framework
The extended theoretical framework in Figure 18 shows the control based factors within the analytical framework of the study found from the empirical results. Control is analyzed as mutual strategic dependence among partners in the relationship. Two types of control are found relevant, namely relationship based control and resource based control. To understand relationship based mutual strategic dependence control, we have analyzed the first research objective, whilst resource based mutual strategic dependence is linked to the second research objective. However, these two factors of inter-firm control are linked to the overall research question of the study, namely what are the factors that influence the sharing of knowledge between alliance partners and how do these influence inter-firm control behavior? Thus, in the extended theoretical framework mutual strategic dependence comprises relationship based mutual strategic dependence and resource based mutual strategic dependence, as analyzed in the case evidence. Relationship based mutual strategic dependence is related to the decision of an alliance to overcome perceived network uncertainty, whereas resource based mutual strategic dependence is related to the decision of an alliance to overcome the perceived deficiency of resources. In this context, the case evidence clarifies the answer to our research question of the study.

7.2. The conclusions in relation to previous studies

Our findings show overall collaborative rent-seeking behaviors characterized by high cooperation and low competition. In this behavior partners seek mutual benefit by pooling complementary resources, skills, and capabilities. Firms seek to co-produce and share value by fostering and maintaining reciprocal interdependencies (Thompson, 1967) with their partners (Norman & Ramirez, 1993). Such interdependencies may generate composite quasi-rents, referring to the economic rent generation by a resource that depends on continued association with the resources of others (Hill, 1990: 500). These interdependencies are fostered and maintained by appearing to collective strategic interests rather than narrow self-interest, and thus emphasize reciprocal exchanges among the partners.

In this context, the findings of the present study can be seen in relation to studies related to “coopetition” behavior (Nalebuff and Brandenburger, 1996; Bengtsson and Kock, 1999, 2000; Kanter, 1994). Coopetition behavior describes the firm’s strategic orientation to achieve a dynamic balance between competitive and cooperative strategies. This balance is seen in knowledge sharing based cooperation and competition behavior. The present study clarifies coopetion strategies (Nalebuff and Brandenburger, 1996; Bengtsson and Kock, 1999, 2000) by introducing the role of inter-firm cooperation and the competitive nature of knowledge sharing. Simultaneous cooperative and competitive behavior is also seen as synergetic rent-seeking behavior (Lado et al., 1997).

Inter-firm cooperation and the competitive nature of knowledge sharing in this study implies that competitive and cooperative strategies are simultaneously seen within the context of knowledge sharing as a synergistic rent-seeking behavior in knowledge based industries to influence inter-firm strategic control. The literature suggests that control is a key source of confidence in pursuing both competitive and cooperative strategies. Far from a negative, efficiency-reducing collusion, greater cooperation and a lesser degree of competition within the context of synergetic rent seeking behavior can enhance the competitive position (i.e. market position) of firms (Lado et al., 1997), because synergetic rent seeking behavior can enhance partners’ market bargaining power to build and leverage idiosyncratic, rent-yielding organizational competencies.
and simultaneously reduce the costs and risks associated with the mobilization of such competencies (Hamel et al., 1989; Ohmae, 1989; Pucik, 1988). In this view, actually synergetic rent-seeking behavior emphasizes the positive-sum efficiency enhancing efforts of both competition and cooperation.

In the present study synergetic rent seeking behavior is seen in cooperation among ST and competitors in the case of the alliance with HP, Western Digital and Nortel. As a general trend, these companies have similar semiconductor capabilities, often even manufacturing capabilities, process R&D capabilities, and product capabilities in comparison to ST. The main reason why other companies were interested in relationships was that by closely working with ST they could gain access to desired technology. ST’s partners were positive that these technologies would be going into leading-edge products, as these were managed by a leader in the semiconductor field.

Firms that exhibit synergetic rent-seeking behavior possess enhanced strategic flexibility by either holding or sticking to a wide variety of strategic options (Bowman & Hurry, 1993; Kogut, 1991). On the one hand, they can achieve competitive advantage through leveraging their rare, valuable, and imperfectly imitable resources in competitive contexts. On other hand, they can achieve collaborative advantage by (a) effectively locating genuinely cooperative partners (Barney and Hansen, 1994), (b) identifying strategic opportunities for realizing positive-sum gains (Parkhe, 1993), and (c) making the resource commitments necessary to realize the strategic goals of the alliance (Gulati et al., 1994).

To apply the above in the context of the present study, ST has built a joint R&D framework with Ericsson for mutually developing wireless semiconductor businesses. Neither of the partners in this JV had enough knowledge of how to accelerate the wireless businesses in emerging markets. Therefore, in this alliance the purpose was to combine mutual capabilities and gain market access.

The present study presents a dynamic interplay between competitive and cooperative rent seeking behavior. Previous studies see rent seeking behavior on two distinctive but interrelated continua, reflecting degrees of inter-firm lesser competitive and more cooperative orientation. Hence, strategy researchers to date have tended to view competition and cooperation as opposite ends of a single continuum (Hamel et al., 1989; Ohmae, 1989; Pucik, 1988). Therefore, this study extends the perspective of previous studies on competitive and cooperative rent seeking behavior.

7.3 Summary of the study

The aim of first chapter began with a presentation of the background and importance of the present study. In this chapter the dynamics of International strategic alliances (ISAs) and how the control is conceptualized in strategic alliance literature and present study was discussed. In the next sections key terms of the study were introduced, namely: (a) knowledge, (b) knowledge sharing, (c) cooperative alliance partners, and (d) strategic alliances. The key terms provided the definitions of the concepts utilized in the study. From this framework the research question and research objectives were analyzed. This section provided an overview about settings of the present study and why it is interesting to analyze the research question and objectives of the study. The scope, positioning and limitations of the study then followed, providing the foundations of the analytical framework and also establishing the connections to present and previous studies. The last section of this chapter presented the structure of the study.
Chapter one fulfilled its aim of providing a solid base for the other chapters of the thesis.

In the second chapter the theoretical approaches dealing with the perspective of firm boundary decisions (e.g., contractual alliances or JVs) were analyzed. These theoretical approaches are transaction cost economics, network approach and resource dependency theory. TCE is useful in terms of (1) how an organization should organize its boundary-spinning activities so as to minimize the sum of its production and transaction costs, and (2) what institutional forms are suitable in different situation. Network is a model of organization that is not based strictly on the price mechanism, or on ‘hierarchical fit,’ but on coordination through interaction and adaptation. Therefore, the network model of actors, activities and resource coordination through interaction and adaptation can be seen as the basis of a firm network boundary decisions. Resource dependency theory represents an important dimension to the issue of control through characterizing power-dependence relationships among firms as the basis of firm boundary decisions. This analysis reveals that the knowledge based perspective of the firm and resource dependency theory are the most suitable theories for analyzing the research problem and objectives within the presented scope and limitations of the present study. Further, three fundamental elements of the study (e.g., alliances, control and knowledge sharing) were introduced for further detailing in the subsequent chapter.

The third chapter presented the literature review of the three fundamental elements of the study (e.g., figure 1). These elements are knowledge sharing, inter-firm control and strategic alliances. Knowledge sharing was discussed within the context of inter-firm cooperation. Three properties of knowledge were discussed to understand the dynamics of knowledge sharing. These properties deal with the need for difference, dependence and novelty of knowledge to be shared among parties in a knowledge exchange. A reviewing of how and why knowledge-sharing takes place in JV strategic alliances followed. After this the emerging knowledge-based literature of strategic alliances inter-firm knowledge sharing was analyzed to understand the two important dynamics of knowledge sharing (e.g., knowledge creation or exploration and knowledge application or exploitation). At the end the literature of inter-firm control in strategic alliances and types of control as JV and contractual alliances was discussed. Based on the comprehensive literature review of the three elements of the study (e.g., knowledge sharing, inter-firm control and strategic alliances) the next chapter was introduced as a discussion of the knowledge sharing factors and inter-firm control behavior in strategic alliances; to ultimately provide the foundations to conduct the empirical part of the study.

The fourth chapter was about the analytical framework related to three elements of the study (e.g., knowledge sharing, control and alliances). The chapter started with the discussion of how resource dependency theory of the firm and resource/ knowledge based theory of the firm are utilized in the context of the analytical framework of the study. Further, the focal-firm strategy in unstable environments was analysed to establish the relationship in firm alliance behaviour in response to environmental uncertainty. In this view, the nature of dependency takes three forms, as firms attempt to alter their interdependence through strategic alliance (e.g., vertical, horizontal and reciprocal interdependence). This was followed by a discussion about how collaboration among strategic alliances partners is based on their mutual resources and relationship characteristics. Finally, perceived business network uncertainty (e.g., resource dependency theory) and perceived deficiency of resources (e.g., knowledge based view of the firm) are shown to be linked primarily with the collaborating firm’s relationships
and resource characteristics as described in Figure 10. A tentative framework is presented as the foundation to the methodology chapter and to conduct the empirical part of the study. The framework is based on a priori assumptions and a model. A priori assumptions are presented to discuss the tentative model of the study. A priori assumptions are used to convey an in-depth description of the factors of knowledge sharing raised in the tentative framework based on extensive literature review. The purpose of this model is to develop a final model after the empirical part of the study. The analytical framework in the chapter explored the elements (e.g., factors) of knowledge sharing as inter-firm control behaviour.

The fifth chapter presented the research methodology and empirical setting of the study. The first section analyzed the introduction, philosophical stance. Constructivism as a methodological tradition was analysed from this view. Constructivism does not question the existence of phenomena but rather one’s ability to understand them without a specific theory of knowledge. Constructivism does not approve of the traditional positivistic demands of scientific research. Traditional positivist criteria such as validity, reliability and objectivity are replaced by credibility, trustworthiness and conformability. This is followed by a discussion of realism and constructivism. In the present study, ontological realism is extends from the zone of constructivism into epistemological realism, assuming that the theories (e.g., resource-based view and resource dependency theory) used to explain phenomena are themselves nothing more than mirrors of reality. Therefore, the theoretical part of the study (e.g., mirror of reality) investigates the epistemological realist world through questionnaire building (e.g., interview guide), data collection and analysis, thus extending the analysis to the empirical world of subjective reality (e.g., empirical data collection and model illustrating). Hence, investigating this subjective realism (e.g., epistemological realism) could help in drawing some ontological conclusions as well (e.g., objective reality), thus building theory and identifying areas of further research. The research methodology discussed as ontological and epistemological realism is not in contradiction with critical realism paradigm. Rather, it supports the critical realism methodology of first building an understanding (e.g., model building) and then explaining the phenomenon (e.g., model illustrating). This was followed by information about the research strategy and design, (e.g., abduction research approach in the present study) empirical research process, data analysis and the use of Nvivo. The last section of the chapter provided an overview of the selected case and related industry description, and strategic alliances analyzed in the case study.

In the sixth chapter the results of the study were presented. The perceived business network uncertainty is seen within the context of alliance formation and knowledge sharing. An alliance with other partners indicates implications for resource dependence between ST and its business network. For example, in alliance with Ericsson, ST has built a joint R&D framework for mutually developing wireless semiconductor businesses. Neither partner in this alliance had enough knowledge of how to accelerate the wireless businesses in emerging markets. Therefore, in this alliance the purpose was to combine mutual capabilities and gain market access. The uncertainties in accordance with the theoretical model discussed are related to new technology applications, competitors’ strategic actions and knowledge spillover. The uncertainty of new technology applications for semiconductors was discussed by ST respondent within the context of established and emerging markets. Established markets offer constant growth rate as market changes are less likely to happen but there could be also unexpected growth rates in established markets as result of technological change in the industry (cellular phone is move from 2G to 3G or to smart phone). In emerging markets semiconductors had hardly previously been used, so the goal of the alliance is
about semiconductors entering new markets that offer higher growth rates. In the semiconductor and related industries the customer, if a competitor, is likely to have similar capabilities. On the other hand, the customer may also be a cooperative partner where firms mutually share different competencies. Therefore, cooperative development among competitors is a strategic action in the industry. One example of such cooperation is the ISDA alliance between ST and other firms around IBM.

In this view ST had been leveraging both worlds of cooperation and competition. In this example, firms jointly build de-facto technological standards in the industry, indicating a mutual strategic dependence of industry competitors (e.g., relationship based control). Further, risk of knowledge spillover by cooperative partners was considered to be the least important parameter of perceived business network uncertainty. The perceived resource deficiency is seen at two levels. The first level could be the firm level, which was mentioned as the gap between the levels of sales and the given level of R&D investments required. However, this resource deficiency at the firm level is usually measured in relation to those resources (e.g. resource gaps in the firm) required to compete in the marketplace. Partnerships fill in the resource deficiency of ‘innovation’, as it brings together different partners with diverse backgrounds. The perceived resources deficiency in accordance with the theoretical model discussed are a partner's complementary knowledge, the relationship with customers and/or competitors. Complementary knowledge is useful for sharing the risk profiles of partnering firms. Firms, as a result of complementary knowledge sharing, could participate in building standards as in the case of partnership between IBM and different competitors. In addition, the relationship with either a key customer or competitor as a perceived resource deficiency is linked to market access; in some areas ST also shares capabilities with its customers’ businesses in the value chain. Intellectual property rights are central to every deal that ST makes and it determines how ST shares knowledge. The prominent aspect of dependence between Nokia and ST is seen within the context of resource sharing based mutual dependence. This dependence is more of a firm level dependence as it is based on firm level complementary knowledge and knowledge sharing within the context of key customers. Nokia as a key customer and alliance partner of ST and provides specifications to ST for semiconductor deliveries. On the other hand ST-Ericsson is building set of boxes, IC platforms, as well as digital TV platforms. In this view, all of Ericsson’s multimedia knowledge has to be utilized in the wireless world, whilst what one could learn in wireless could be reused in different applications for building sets of boxes, IC platforms, as well as digital TV platforms. Therefore, as result of this continuous knowledge sharing, the partners could select compatible technologies for building new products, and reduce uncertainty with the increasing possibility of the acceptance of new products by the customers. In order to build relationship-based control, both contracts and equity could play an important role in building mutual dependence among different companies. Contracts are an initial legal framework to bind different companies together, whereas equity could be further useful when firms in the relationship are involved in joint development. Equity investment is the mechanism to share intellectual property in joint development projects. The management’s attitude was considered a superior mechanism in a relationship in terms of control behavior. However, in joint ventures, knowledge sharing is related to the participants in the joint venture and the parents making sure that the right mind-set is there. Equity also determined control between the partners of different resources and capabilities. Resource sharing-based mutual strategic dependence was also related to innovation and business model innovation enabling the company creating more value. If the partners can understand each other, then resource-based control is exercised by sharing complementary knowledge to define the semiconductor design for a specific
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firm. Sometimes common knowledge about complementary resources can be lacking among partners, and as result resource-based control cannot be effectively exercised.

Chapter seven was a discussion and conclusion chapter where the results of the study are discussed in relation to the analytical framework. Partnership characteristics and control behavior were analyzed within the context of relationship based control and resource based control. Relationship based control exists in industry because technological changes and competitors actions could completely alter the dynamics of the market and in this situation firms need to manage the profile of their partners in a manner that each partner in the relationship gains and contributes. This implies that firms see the mutual dependence (e.g., control) in relationships and have to respond to new technology applications and competitors strategic actions. In other words, responding to new technology applications and competitors strategic actions could be seen as means of control to manage the profile of their partners in a manner that each partner in a relationship gains and contributes. Firms will share knowledge as inter-firm control when it could result that each partner in a relationship gains and contributes and thus builds a mutual dependence through knowledge sharing. Resource sharing control exists in the industry because the life of semiconductors has been a life of prevision, which means defining the functions of the semiconductor in new products in different industries. In this view, if partners can understand each other, then resource based control is exercised by sharing complementary knowledge to define the semiconductor design for a specific firm. Sometimes common knowledge about complementary resources can be lacking among partners, and as result resource based control cannot be effectively exercised. Based on this, the final theoretical framework is presented. This was followed by conclusions in relation to previous studies, summary of the thesis, the managerial implications of the study and suggestions for future research.

7.4. Managerial implications

The present study is useful for the managers and policy analysts to build or understand the dynamics of relatively stable firm relationships, where firms are required to cooperate and compete for profit/value maximization within rapidly changing knowledge based industries such as semiconductors and related industries. It is important to mention again that knowledge sharing has an important role in aligning inter-firm mutual compatibility in terms of strategic objectives. In this view, through analyzing the possibility of effective knowledge sharing by managers, firms could build successful partnerships without major equity investments. However, one problem remains: it is difficult to measure the value (i.e. market worth) of knowledge assets in a company, and therefore difficult to establish IP ownership among partners within knowledge based industries. Thus, equity could establish legal IP ownerships among partners.

This study suggests to managers that when partners have complex knowledge sharing objectives which are not easily achievable by simple contractual relationships, then the role of equity investment is certainly significant as a mechanism of inter-firm control. However, equity investments in JV alliances could not align with the strategic motives/goals among partners for building stable or mutually beneficial partnerships. Therefore, knowledge sharing is likely to still have an important role in aligning the strategic objectives/goals of different partners, even in complex equity based partnerships (e.g. ST-Ericsson JV alliance). Thus, we conclude that even in equity
sharing based complex partnerships, the significance of knowledge sharing cannot be excluded for maintaining strategic inter-firm control behavior.

The findings of the study revealed behavioral aspects of knowledge sharing as inter-firm control, for example adaptive, responsive and flexible behavior of the partners. Contracts and even equity provide the initial boundaries for the relationship, whereas the behavioral aspects of cooperation provide the grounds for rapid knowledge sharing, innovation, market access and mutual business development. Therefore, this study suggests managers develop behavioral based control mechanisms also in order to deal with strategic competitive and cooperative situations and to share knowledge.

7.5. Suggestions for future research

Future research in the context of cooperative and competitive behavior could be extended in the direction of understanding how knowledge sharing in cooperative and competitive behavior affects the coopetitive advantage of firms. Traditionally, research has focused on exploring cooperative or competitive advantages individually as the dependent variable of strategy. We, however suggest exploring whether economic rent generated through knowledge sharing coopetitive relationships replaces the traditional notion of competitive advantage as the dependent variable of strategy. In order to answer this question, future research could focus on how economic rent generated through knowledge sharing coopetitive relationships affect competitive advantage. According to Bengtsson and Kock (1999, 2000), cooperation and competition behavior is the consequence of when the firm can play different roles depending on the available resources and activities performed. In this view the increased numbers of both vertical and horizontal relations give more multifaceted roles to the actors. Hence, the same actor can simultaneously have the role of a buyer, supplier, competitor, cooperative partner. As a further research direction, the different roles of actors could be investigated as knowledge sharing based coopetitive advantage.

Further, one study could attempt to explore the factors for the specific situations when competitive and cooperative rent-seeking behavior may fail to improve a firm’s competitive position. This future research could be seen in the context of when the costs associated with the maintenance and implementation of such a strategy outweighs the discounted present value of the future benefits accruing from such interdependence. In this view, this future research direction could be important to recognize the key limitations of pursuing competitive and cooperative strategies simultaneously.

The present study has focused on the synergistic rent-seeking behavior of firms. As one future research direction, it can be suggested to view ‘individualistic’ rent-seeking behavior. Here, future research could focus on how firms as a result of controlling the scarce resources of specific customers, suppliers or competitors (i.e. firm-specific knowledge and firm-specific relationship) through knowledge sharing, actually also can control the scarce strategic resources to achieve their own objectives. One other dimension in this research could be to conduct research on how a focal-firm attempts to control the scarce resources of specific customers, suppliers or competitors for its own utilization within its given business networks through knowledge sharing. For example, individualistic rent-seeking behavior could be used to also investigate how in a partnership with firms possessing complementary skills, one firm that is technologically stronger and another that has strong market access can increase their speed to market in the hope of capturing their own first mover advantages. Further,
this research can be extended to see how individualistic rent-seeking behavior could be used to gain the competencies and market power needed to neutralize or block the motives of some specific competitors.
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APPENDIX 1  INTERVIEW GUIDE FOR FIRST INTERVIEW AT STMICROELECTRONICS

September 23, 2009.

Mr.
Corporate Vice President
Corporate Business Development
GENEVA Worldwide Headquarters
STMicroelectronics
39, Chemin du Champ des Filles
C. P. 21
CH 1228 Plan-Les-Ouates
GENEVA, Switzerland.

Dear Mr.

With reference to our earlier communication in 2008, we are pleased to have obtained approval to conduct this study at STMicroelectronics Corporation. Mr. Alexander Jurman, Corporate External Communications STMicroelectronics, was informed about it from Jean-Marc Chery (Executive Vice President, Chief Technology Officer) and contacted us to organize interviews at STMicroelectronics.

Thanks for your confirmation for the interview/meeting starting at 9:00 am on September 25, 2009 at your office. The resulting publications: [(i) case study as ST internal joint publication at your unit (ii) case study as empirical part of doctoral dissertation] are protected under copyright law and belong to (a) STMicroelectronics as the case company, (b) the researcher, Mr. Khalid M. Bhatti and (c) HANKEN School of Economics, Finland. A couple of weeks after the interview, you will be provided with the written text of your interview before it is utilized in the study text. At that point, you may change, modify or delete any information, as you feel fit. The purpose of the study is purely scientific/academic, and therefore no part of the acquired information will be provided to the media.

The study deals with analysing knowledge sharing activities through strategic alliances and joint ventures among STMicroelectronics-related companies. Within this context, we want to analyse the objectives of inter-firm knowledge sharing among independent firms within the setting of (a) contractual strategic alliances, and (b) minority equity sharing alliances such as joint ventures. We want to investigate whether knowledge sharing plays a significant role as control and governance mechanism among ST and its partners.

Thanks for your interest in participating in this study. Through this study we hope to build a comparative understanding about the knowledge transfer activities in knowledge-based industries.

I look forward to having fruitful interview/meeting with you.

Yours Sincerely,
Q.1
Please give a general view of “knowledge sharing” for business activities in terms of your firm’s partnerships with its customers, suppliers and with some specific competitors (e.g., customers, suppliers, customers and suppliers as competitors):

- What is knowledge sharing or knowledge transfer?
- Why and how do firms transfer knowledge?
- Why and how is information sharing different from knowledge transfer?

Q.2
Please describe with three particular cases experience of knowledge sharing with specific partner firms [e.g., cooperative partner(s) such as (i) suppliers (ii) customers (iii) customers and suppliers as competitors] in the past 5-7 years.

Q.3
What factors (positive or negative) motivated the firm to share its knowledge in these cases (e.g., question 2) with specific (i) suppliers, (ii) customers and (iii) customers and suppliers as competitors?
Q.4
In your view, do you think that customers and suppliers are likely to become competitors (e.g., direct and indirect competitors) as a result of knowledge sharing? If yes, please explain how and why?

Q.5
In your view, do you think JVs and M&As have been an effective strategy to manage the problems of an increased number of competitors caused by knowledge sharing in the past?

Q.6
Would you consider knowledge sharing in contractual strategic alliances and minority equity sharing alliances as a control mechanism (i.e., a governance mechanism) without a full-fledged merger or acquisition? If yes, in what situations (conditions) is it an appropriate strategy instead of majority equity sharing JVs and M&As?

Q.7
Are there any tools or benchmarks to support managerial negotiations and subsequent decisions for analysing the mutual conditions among partners whereby knowledge sharing (e.g., knowledge sharing via contractual strategic alliances, minority equity sharing alliances) could be effective as a control and governance mechanism instead of majority equity sharing in JVs or M&As?

Q.8
In your view, do you think that the reasons for knowledge transfer (i.e., the motives for knowledge transfer) are likely to be different in the following business relationships within the context of your own prior industry experience?

(a) Knowledge transfer in vertical linkages (e.g., contractual strategic alliances, joint ventures) among partner firms [e.g., (i) suppliers (ii) customers and (iii) customers and suppliers as competitors].

(b) Knowledge transfer in horizontal linkages (e.g., contractual strategic alliances, minority equity sharing alliances such as joint ventures) among cooperative partner firms [e.g., (i) suppliers (ii) customers and (iii) customers and suppliers as competitors].

Please explain the reasons for your of answer(s) [(a) and (b)] with some suitable industry examples of knowledge sharing with specific cooperative partner(s) as (i) suppliers and (ii) customers (iii) suppliers and customers as competitors for both vertical and horizontal alliance types respectively.

Note: We can codify your examples as company names A, B, C in the written text.
Q. 9
In your view, do you think that the knowledge transfer motives in vertical cooperative relationships (e.g., contractual strategic alliances, joint ventures) among partner firms [e.g., (i) suppliers and (ii) customers (iii) customers and suppliers as competitors] are likely to be linked with the following factors? If yes, say how and why:

a. Knowledge transfer among partner firms is likely to be linked with the objective of controlling and utilizing knowledge among partners and building and controlling some shared competences (e.g., knowledge created as result of knowledge sharing) in particular product or service area.

b. Knowledge transfer among partner firms is likely to be linked with the objective of controlling and utilizing firm-specific market relationships (e.g., relationships created as result of knowledge sharing with exclusive, suppliers, customers, customers and suppliers as competitors) among partners, thus building and controlling a new set of market relationships for also building and controlling shared competences (e.g., knowledge created as result of knowledge sharing) in a particular product or service area.

Q. 10
In your view, do you think that knowledge transfer motives in horizontal cooperative relationships within contractual strategic alliances, joint ventures among partner firms [e.g., (i) suppliers and (ii) customers (iii) customers and suppliers as competitors] are likely to be related with the following factors? If yes, please provide some examples, how and why:

a. Knowledge transfer among partner firms [e.g., (i) suppliers and (ii) customers (iii) customers and suppliers as competitors] is likely to be related with the objective of utilizing cooperative partners’ “firm-specific knowledge” and building and controlling new set of competences in a particular product or service area of some actual or potential competitors.

If yes, what are the strategic consequences of effectively governing (e.g., controlling) a new set of competences of a partner firm through knowledge sharing?

b. Knowledge transfer among partner firms is likely to be linked with the objective of controlling and utilizing cooperative partners “firm specific market relationships” (e.g., cooperative partner relationships with exclusive buyers, customers, competitors maintained through knowledge sharing) thus also building and controlling a new set of relationships in particular product or service area to compete effectively with some actual or potential competitors.

If yes, what are the strategic consequences of effectively governing (e.g., controlling) a new set of firm-specific relationships for competing effectively within a new set of shared competences (e.g., knowledge created as result of knowledge sharing) within the domain of specific products and services.
Q. 11

Do you think that lack of resources and market relationships are major reasons (among others) for knowledge sharing with specific partner(s) to maintain a particular set of competences (e.g., knowledge) within the domain of specific products and services?

Discuss the importance and role of the following factors in building and controlling some particular set of shared competences (e.g., knowledge) in some specific products and services through knowledge sharing with exclusive partners:

- Complementary knowledge of cooperative partner (e.g., suppliers, customers, customers and suppliers as competitors).
- Relationship with key customers of cooperative partner (e.g., suppliers, customers, customers and suppliers as competitors).
- Relationship with key competitors of cooperative partner (e.g., suppliers, customers, customers and suppliers as competitors).
- Other factors.

Q. 12

Please also discuss other factors in addition to deficiency of resources (e.g., lack of resources and market relationships) which could influence a firm’s knowledge sharing decision with exclusive partners (e.g., suppliers, customers, customers and suppliers as competitors).

Q. 13

Do you think that overall market uncertainty (e.g., uncertain demand and supply conditions) is also another reason (among others) of knowledge sharing among exclusive partner(s)? And as a result of knowledge sharing is it possible to (i) maintain relationships with existing suppliers, customers and competitors within a particular set of competencies (e.g., products and services) and (ii) build relationships with new suppliers, customers and possibly also competitors within a new set of competences (e.g., knowledge of new products and services development)?

Discuss the importance and role of the following factors in building and controlling some particular set of competences (e.g., knowledge) in some specific products and services through knowledge sharing with exclusive partners (e.g., customers, suppliers, customers and suppliers as competitors):

- Selection of new technologies for new product development and customer acceptance
- Strengths of competitors and their strategic actions
- Risk of knowledge spillovers via cooperative partner(s).
Q. 14

From the point of view of market uncertainty (e.g., uncertain supply and demand conditions), do you think that the following factors could also influence knowledge sharing between partners (e.g., suppliers, customers, customers and suppliers as competitors) for effective control and coordination of market uncertainty?

a. Challenges related to the right selection of new technologies for building new competencies, and subsequent uncertainty about customer acceptance of new product.

b. Competitors’ (e.g., customers and suppliers as competitors) strengths in terms of (i) industry specific capabilities and subsequent actions and (ii) threats of competitors (e.g., customers and suppliers as competitors) in building new sets of competencies (e.g., knowledge of building new substitute products and services).

c. Risk of knowledge spillovers to specific competitors and potential competitors (e.g., customers and suppliers as competitors) through previous or existing suppliers, customers and competitors (e.g., customers and suppliers as competitors).

d. Other factors

Q. 15

Please also discuss other factors in addition to market uncertainty (e.g., uncertain supply and demand conditions) which could influence a firm’s knowledge sharing decision among cooperative partners (e.g., suppliers, customers, customers and suppliers as competitors) to effectively control and coordinate its business activities and resources. Within the context of these additional explanations, please describe what could be the possible motives of knowledge transfer with different types of cooperative partners (e.g., knowledge sharing among suppliers, customers, customers and suppliers as competitors) within vertical and horizontal alliances.
APPENDIX 2   INTERVIEW GUIDE FOR SECOND INTERVIEW AT STMICROELECTRONICS


Corporate Vice President
Corporate Business Development
GENEVA Worldwide Headquarters
STMicroelectronics
39, Chemin du Champ des Filles
C. P. 21
CH 1228 Plan-Les-Ouates
GENEVA, Switzerland.

Subject: Request for final/second interview(s) with Mr. Loïc Liétar at STMicroelectronics

Dear Mr.

The first interview on 25th September, 2009 was a very valuable experience. Based on the first interview, we have designed the present interview to conclude the study.

Looking forward for forthcoming interview on Friday 02:00 p.m., 23rd July 2010.

Yours Sincerely,

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                                      http://www.pervezghauri.com
Q. 1

What are “business model innovations” as mentioned in the earlier interview within the context of knowledge/experience sharing?

What is the nature of “business model innovations” which are also linked to the nature of cooperation itself (e.g., strategic alliance or JV) among suppliers, customers and competitors?

Q. 2

How and why does knowledge/experience sharing have significant effects on the creation of “business model innovations” and is it also related to the creation of new markets?

Please give industry partnership examples for both (a) established markets [e.g., the telecom industry or some other examples] and (b) emerging markets [e.g., bringing electronics to health care or some other examples] for semi-conductor business development?

Q. 3

Differentiate between platform-based capabilities vs. IC-based capabilities and how these are related to acquiring capabilities for new business models in the case of partnerships within your industry.

How is the (above mentioned) process related to the access (creation) to both established (e.g., telecom industry or some other examples) and emerging markets (e.g. bringing electronics to healthcare or some other examples)?

Q. 4

What are the characteristics of the following markets (in your own words):

(a) Established markets (e.g., the telecom industry or some other examples) for semiconductor business development.

(b) Emerging markets (e.g., bringing electronics to healthcare, or some other examples) for semiconductor business development.

Q. 5

What are the most important factors related to capabilities acquisition within the context of knowledge sharing?

What could be the role of the following projects be for “knowledge sharing” and subsequent capability acquisition (as mentioned in the first data collection round)?

(a) Platform-based projects
(b) IC-based projects

Q.6
What is the significance of inter-firm control strategy in a partnership?

Please also elaborate your answer within the following context (based on the previous data collection round):

a. Majority equity or equal-equity sharing JVs, where effective inter-firm control is partly also achieved through “equity investments” among partners to facilitate effective experience sharing? Please explain.

b. Contractual or minatory equity sharing JV alliances, where effective inter-firm control is achieved through mutual interests or strategic motives “alignment” (e.g., see the conditions in the model, among others) among partners to facilitate effective knowledge/experience sharing?

Note:
Please provide some examples for each of the above situation(s) in terms of both established and emerging markets for semiconductor related businesses.

Q.7
What is role of “business model innovations” for improving a “firm market position” within its value chain? How and why?

Please elaborate your answer within the following context:

(a) Established markets for semiconductor businesses (e.g., telecom industry or some other examples).

(b) Emerging markets for semiconductor businesses (e.g., bringing electronics to healthcare or other examples).

Q.8(a)
What could be the potential sources for lack of alignment of strategic interests among potential partners and subsequent difficulties in knowledge sharing?

Elaborate your answer within the following contexts (based on the previous data collection round):

(a) Partners in new emerging markets from two very unrelated industries.

(b) Partners with no prior experience of partnership in the past for the given business settings.
Partners with a lack of understanding of how their own prior experiences, knowledge and capabilities could be utilized and combined as mutual experiences (e.g., experience sharing) for a given partnership and subsequent business development.

Other reasons, if any.

Q.8(b)
What are possible reasons for your agreement or disagreement with the following:
The greater the sources of misalignments among partners, as mentioned above in a, b, c and d above, then the greater is the role of equity based financial investments (e.g., building equal-equity or majority equity JVs) for building stronger partnerships and vice versa.

Q .9
Why are contractual strategic alliances or monitory equity JVs preferred instead of (i) equal-equity JV and (ii) majority equity JVs?
Elaborate your answer within the following (based on the first data collection round) aspects:
(a) Partners in established markets (partners from two related industries)
(b) Partners with greater prior experience of partnership in the past for the given business settings.
(c) Partners with an understanding of how their own prior experiences, knowledge and capabilities could be utilized and combined as mutual experiences (e.g., deep knowledge sharing: experience sharing) for a given partnership and subsequent business development.
(d) Other reasons, if any.

Q .10
What is the significance of inter-firm control among partners?
Please elaborate your answer within the following contexts (based on the first data collection round):
(a) Corporate level control (board level decision), which is largely achieved through equity investments through building an ownership structure (e.g., equal-equity JV, majority-equity JVs) for achieving effective “legal ownership control” among partners.
(b) Operational level control, which is largely achieved through dialogue with potential partners and sharing the right experience/knowledge (e.g., see model of the study) for achieving effective “strategic control” among partners (e.g.,
strategic control likely to have strategic consequences for business development.)

Q.11
What is the relationship between legal-control (e.g., ownership-specific control) vs. strategic-control (e.g., strategic interests’ alignment specific control) for maintaining an overall effective control among partners in your various business lines or operations?

Which one of the following is more relevant for building partnerships in semiconductor related businesses - how and why?

- Ownership-specific control vs. strategic control

Q.12
Do you think that equal-equity JVs actually share equal-risk among partners?

If no, what factors (see the factors in the model of the study, among others) could influence one partner being likely to be exposed to greater risks during actual or real-time business engagements/developments in the following cases:

(i) Semiconductor business development for established markets (e.g., the telecom market or some other examples)

(ii) Semiconductor business development for emerging markets (e.g., bringing electronics to health care or some other examples)

Q.13
Why was ownership structure significant in a 50/50% JV between ST and Ericsson instead of a contractual strategic alliance or minority equity JV (to work effectively for mutual businesses development)?

Q.14
Why was contractual structure significant between ST and NOKIA instead of a minority equity or equal equity JV (to work effectively for mutual businesses development)?

Q.15
Do you think that the nature of “risk sharing” among partners is not only a financial risk sharing through building an ownership structure?
Q. 16
Do you think that risk sharing among partners is also related to strategic interests alignment risks (e.g., see the model) for subsequent appropriate experience sharing among partners?

Q. 17
What is the nature of risk in the case of a contractual strategic alliance among partners without building a JV based ownership structure?

Q. 18.
What is the situation of your cooperation with your competitors?

Please elaborate you answer within the following contexts (based on the first data collection round):

(a) What could be the nature of “customer push” (e.g., mentioned in the previous data collection round) that your firm would like to enter into in cooperation with competitors?

(b) What could be the strategic objectives you wanted to achieve through such relationships (alliances or JVs with competitors)?

Q. 19
What is the nature of partnership among firms (e.g., as mentioned in the first data collection round) that could lead to building de facto standards, avoiding technological discontinuity or adapting well to such discontinuities?

Q. 20
What is the nature of the “clearing house function of world major semiconductor firms (e.g., as mentioned in first data collection round) as knowledge integrators” between firms: (a) across firms within a single industry, and (b) across firms within different industries? And what are the strategic consequences of building the clearing house function of a firm in both established and emerging markets?
APPENDIX 3 INTERVIEW GUIDE FOR INTERVIEW WITH STMICROELECTRONICS-NOKIA ALLIANCE

Appendix 3: Interview guide for interview with STMicroelectronics-Nokia Alliance

January 10, 2011.

Tykistökatu 4B
20520 Turku
FINLAND.
www.stericsson.com

Subject: Studying alliance between STMicroelectronics and Nokia

Dear....

We are in the process of studying STMicroelectronics alliance and JV partnerships with Nokia, Ericsson and IBM. In connection with this we have conducted some detailed interviews with Corporate Vice President Corporate Business Development in GENEVA Worldwide Headquarters, STMicroelectronics.

The study deals with analysing knowledge sharing activities through strategic alliances and joint ventures between STMicroelectronics and a related group of companies (e.g., NOKIA, Ericsson, IBM). In this context, we wanted to analyse the objectives of inter-firm knowledge sharing among independent firms within the setting of (a) contractual strategic alliances, and (b) equal equity sharing alliances such as joint ventures. We believe that knowledge sharing is likely to play a significant role as control and governance mechanism among ST and its partners.

To fulfill the requirement of a PhD study we are required also to obtain two more interviews with some personnel who could discuss the motives and benefits of alliance between NOKIA and STMicroelectronics. The duration of each interview will be approximately 1 hour and 30 minutes. The interviewer will travel himself to arrange the interviews.

A couple of days after the interviews, the interviewees will be provided with a written text of their own interview before it is utilized in the study text. At that point, they may change, modify or delete any information as they feel fit. The purpose of the study is purely scientific/academic.

Thanks for your interest in participating in this study. Through this study we can build a comparative understanding about knowledge transfer activities in knowledge-based industries within Europe and beyond.

An interview guide is provided to explain the nature of the interview. However, all the questions will be asked and explained by the interviewer in the actual interview setting.

When the study is completed, we plan to share the research results with your department.

I look forward to having fruitful interviews/meetings.
Yours sincerely,
Please give a general view of “knowledge sharing” for business activities in your firm’s partnership with STMicroelectronics:

- What is knowledge sharing or knowledge transfer?
- Why and how do firms transfer knowledge?
- Why and how is information sharing different from knowledge transfer?

Please describe the project’s experiences of knowledge sharing with STMicroelectronics in the last couple of years.

What factors motivated the firm to share its knowledge in these cases (i.e. Question 2) between NOKIA and STMicroelectronics?

In your view, why was a contractual alliance preferred instead of a JV between Nokia and STMicroelectronics?
Q. 5
Would you consider knowledge sharing in contractual strategic alliances as a control mechanism (i.e. governance mechanism) instead of a JV? If yes, in what situations (conditions) is it an appropriate strategy instead of equal-equity or majority-equity sharing JVs?

Q. 6
How is the strategic alliance and licensing of NOKIA semiconductors technology by STMicroelectronics useful for NOKIA and STMicroelectronics?

Please also discuss other factors related to perceived deficiency of resources (e.g. lack of resources and market relationships) which could influence a firm’s knowledge sharing decision with exclusive partners (i.e. suppliers, customers)?

Q. 7
From the point of view of market uncertainty (i.e. uncertain supply and demand conditions), do you think that the following factors could also influence knowledge sharing between partners (i.e. suppliers, customers) for effective control and coordination of market uncertainty?

e. Challenges related to the right selection of new technologies for building new products, subsequent uncertainty about customer acceptance of new product.

f. Competitors (i.e. customers and suppliers as competitors) strengths in terms of threats as competitors building new set of competencies.

g. Risk of knowledge spillovers to specific competitors and potential competitors through your previous or existing suppliers, customers.

h. other factors

Q. 8
Please also discuss other factors in addition to market uncertainty (i.e. uncertain supply and demand conditions) which could influence a firm’s knowledge sharing decision among cooperative partners?

Please describe that what could be the possible motives for knowledge transfer with different types of cooperative partners within vertical and horizontal alliances?

Q. 9
What is the role of knowledge sharing as a control mechanism between NOKIA and STMicroelectronics instead of joint equity investment (i.e. Joint venture)?
Q.10
What knowledge sharing related factors have created strategic dependence between Nokia and STMicroelectronics?

Q.11
Do you think these factors in the diagram have created mutual strategic dependence, and to what extent?
APPENDIX 4  INTERVIEW GUIDE FOR INTERVIEW WITH STMICROELECTRONICS- ERICSSON ALLIANCE

January 10, 2011.

Mr.
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Subject: Studying JV alliance between STMicroelectronics and Ericsson

Dear Mr.

We are in the process of studying STMicroelectronics alliance and JV partnerships with Ericsson, Nokia and IBM. In this regard we have conducted some detailed interviews with the Vice President, Corporate Business Development in GENEVA Worldwide Headquarters, STMicroelectronics.

The study deals with analyzing knowledge sharing activities through strategic alliances and joint ventures between STMicroelectronics and a related group of companies (NOKIA, Ericsson, IBM). In this context, we wanted to analyze the objectives of inter-firm knowledge sharing among independent firms within the setting of (a) contractual strategic alliances, and (b) equal equity sharing alliances such as joint ventures. We believe that knowledge sharing is likely to play a significant role as control and governance mechanism among ST and its partners.

To fulfil the requirement of a PhD study we are required also to carry out two more interviews with some personnel who could discuss the motives and benefits of JV alliance between Ericsson and STMicroelectronics. The duration of each interview will be approximately 1 hour and 30 minutes. The interviewer will travel himself to arrange the interviews.

A few days after the interviews, the interviewees will be provided with a written text of their own interviews before they are utilized in the study text. At that point, they may change, modify or delete any information as they feel fit. The purpose of study is purely scientific/ academic.

Thanks for your interest in participating in this study. Through this study we can build a comparative understanding about knowledge transfer activities in knowledge-based industries in Europe and beyond

An interview guide is provided to explain the nature of the interview. However, all the questions will be asked and explained by the interviewer in the actual interview setting.

When the study is completed, we plan to share the research results with your department.

I look forward to having fruitful interviews/meetings.

Yours Sincerely,
Q.1
Please give a general view of “knowledge sharing” for business activities in your firm’s partnership with STMicroelectronics:

- What is knowledge sharing or knowledge transfer?
- Why and how do firms transfer knowledge?
- Why and how is information sharing different from knowledge transfer?

Q.2
Please describe the projects experiences of knowledge sharing with STMicroelectronics in the last couple of years?

Q.3
What factors motivated the firm to share its knowledge in these cases (i.e., Question 2) between Ericsson and STMicroelectronics?

Q.4
In your view, why was a JV was preferred instead of a contractual alliance between Ericsson and STMicroelectronics?
Q. 5
Would you consider knowledge sharing in an equal-equity JV strategic alliances as control mechanism (i.e., governance mechanism) instead of a majority-equity JV? If yes in what situations (conditions) is it an appropriate strategy instead of majority-equity sharing JVs or M&As?

Q. 6
How is the equal-equity JV alliance and joint wireless businesses developments are useful for Ericsson and STMicroelectronics?
Please also discuss other factors related to perceived deficiency of resources (e.g., lack of resources and market relationships) which could influence a firms knowledge sharing decision with exclusive partners (i.e., suppliers, customers)?

Q. 7
From the point of view of market uncertainty (e.g., uncertain supply and demand conditions), do you think that the following factors could also influence knowledge sharing between partners (i.e., suppliers, customers) for effective control and coordination of market uncertainty?

1. Challenges related to the right selection of new technologies for building new products, subsequent uncertainty about customer acceptance of new product.
2. Competitors (i.e., customers and suppliers as competitors) strengths in terms of threats as competitors building new set of competencies.
3. Risk of knowledge spillovers to specific competitors and potential competitors through your previous or existing suppliers, customers.
4. other factors

Q. 8
Please also discuss other factors in addition to market uncertainly (i.e., uncertain supply and demand conditions) which could influence a firm’s knowledge sharing decision among cooperative partners?
Please describe that what could be the possible motives for knowledge transfer with different types of cooperative partners within vertical and horizontal alliances?

Q. 9
What is the role of knowledge sharing as control mechanism between Ericsson and STMicroelectronics in the case of equal-equity JV. Why equal-equity JV was built instead of majority equity investment (i.e., majority equity Joint venture) or building a merger?
Q.10
What knowledge sharing related factors has created strategic dependence between Ericsson and STMicroelectronics?

Q.11
Do you think these factors in the diagrams have created mutual strategic dependence and to what extent?
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