HELSINKI SCHOOL OF ECONOMICS
Faculty of International Business

KNOWLEDGE PROTECTION IN INTERNATIONAL CONTRACT-BASED STRATEGIC ALLIANCES

Master's Thesis
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ABSTRACT

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Knowledge Protection in International Contract-Based Strategic Alliances

Background

In modern economy firms increasingly use international alliances to access strategic resources. Knowledge transfer in strategic alliances has been extensively studied in the recent years. Knowledge protection is another significant phenomenon that contributes to alliance and firm performance. This issue becomes even more important when complex technological know-how is involved. However, despite wide recognition of importance, knowledge protection in strategic alliances has been largely neglected. The present thesis attempts to fill this gap and to provide a basis for further research.

Objective of the Study

This study analyzes how a firm can protect its core competencies in the context of an international contract-based strategic alliance when complex technological know-how is involved. This problem is especially challenging due to the fact that there are fewer means for protection of complex technological knowledge within a contract-based alliance.

Research Methods

The problem is first analyzed from a theoretical point of view. The resulting framework is used to build a case study of an Austrian firm Swarco Futurit. Four interviews with the top management of the company were conducted in the form of guided discussion.

Findings

A framework was developed linking knowledge protection and influencing factors such as: firm specific characteristics, knowledge characteristics, perceived partner characteristics and relational characteristics. Using the empirical findings the framework was revised to include risk perception of managers as an important factor affecting knowledge protection levels. This thesis integrated various approaches to knowledge protection into a holistic framework that can be drawn on for further research in this relatively new area.

Keywords: contract-based, strategic alliances, knowledge management, knowledge protection strategy, perceived risk

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1. INTRODUCTION

1.1. Background

In modern economy the global factor markets are becoming more and more open. In this environment knowledge has become one of the key drivers of competitive advantage (Teece 1998). As a result, firms need to pay ever increasing attention to knowledge management issues. These issues become even more important in the context of strategic alliances; it is no wonder then, that knowledge management in strategic alliances has recently been studied in great detail both theoretically and empirically (Eunni et al. 2006). Most of the existing research, however, has concentrated on knowledge creation and transfer, leaving knowledge protection relatively under-researched.

Many alliances are created specifically for the sake of knowledge and capability access, which makes firms lower their barriers for more efficient cooperation and improved alliance performance (Hamel 1991, Mowery et al. 1996, Inkpen & Beamish 1997, Das & Teng 2000). In case of complex products and services like high-tech systems, knowledge transfer issues become extremely important (Gulati & Singh 1998). Knowledge can often be transferred even when there is no strategic intent on both sides. Unintended knowledge transfer is one of the reasons for alliance failure (Das & Teng 2003), and yet, in many cases managers act reactively to problems that arise, instead of proactively analyzing the potential risks, and ways to handle them. To preserve the competitive advantage and ensure successful cooperation, alliance managers have to balance the protection of their firms' know-how vs. the needs of effective cooperation (Kale et al. 2000, Norman 2002, Jolly 2004).

On one hand when knowledge is codifiable, intellectual property rights protection methods can be used: such as copyrights, patents or trademarks (Hall 1992, 1993). On the other hand, when complex technologies with a lot of tacit know-how are involved,

equity-based strategic alliances such as international joint ventures or wholly-owned subsidiaries are often used to mitigate the risks of knowledge transfer (Kogut & Zander 1993, Mowery et al. 1996, Das & Teng 1996). However, there are cases when other factors, than the concerns associated with the presence of complex technologies, affect alliance structure, and a firm enters a contract-based relationship (Gulati & Singh 1998, Barney 1999, Williamson 2002). In this case the firm has to find other means and strategies to lower the risks of such cooperation, and protect its core competencies from appropriation by the alliance partner.

This thesis will analyze the existing literature to integrate existing approaches to knowledge protection from the point of view of the technology supplier firm. A case of an Austrian firm Swarco Futurit will be studied to improve the understanding of the issue. The paper will concentrate on the situation when knowledge protection is the most challenging: when knowledge is tacit and when the relationship is contract-based. The fact that the knowledge is tacit removes most of the formal legal means to protect it. The fact that the relationship is contract based leaves the firm without the equity controls that could be used to reduce the risks of cooperation and partner opportunism.

1.2. Research Gap

Knowledge creation, transfer and application in strategic alliances have been studied by a number of scholars (Hamel 1991, Inkpen & Beamish 1997, Inkpen 1998, Khanna et al. 1998, Simonin 1999). Knowledge protection on the other hand, despite wide recognition of importance (Dierickx & Cool 1989, Hamel et al. 1989, Oliver 1997, Fahy 2000, Hoffmann & Schlosser 2001, Das & Teng 2003, Zhao 2004, Simonin 2004), has received far less attention from researchers. The relatively few existing studies have either concentrated on one or two aspects of knowledge transfer, or have been too wide to provide enough insight specifically into complex knowledge protection within contract-based alliances. Baughn et al. (1997) have presented a generalized framework overview, noting different factors that can contribute to the risks within strategic alliances, and mechanisms of mitigating these risks. Lorange (1997) described black-

box strategies for protection of core competencies in general. Influence of relational capital on control and proprietary asset protection in alliances was studied by Kale et al. (2000) and Folkesson (2006). Finally, the way various factors affect the extent and selection of knowledge protection mechanisms was studied by Makhija & Ganesh (1997), Norman (2002) and González-Alvarez & Nieto-Antolín (2005).

Many authors recommend equity-based alliances for limiting risks when complex technological know-how is involved (Kogut & Zander 1993, Gulati 1995, Das & Teng 1996, Mowery et. al 1996, Inkpen 1998, Gulati & Singh 1998). Generally in the context of knowledge management equity-based alliances have received the more attention in the literature than contract-based alliances (Beamish 1987, Hennart 1988, Harrigan 1988, Kogut 1988, Yan & Gray 1994, Inkpen & Beamish 1997, Luo 2002). However, it is often the case that firms don't have an option of entering into an equity-based relationship with a partner and instead establish a contract-based partnership.

To the best of the author's knowledge there have been few attempts at taking a more unified look at complex knowledge protection in strategic alliances. The present research will attempt to integrate existing approaches and create an integrated framework for analyzing how various firm and alliance factors affect risks and knowledge protection choices in contract-based strategic alliances. The research will use a case study to further develop and improve the framework.

1.3. Research Problem and Questions

To fill the above research gap the research problem can be formulated as follows:

- How can a firm protect its core competencies in the context of an international contract-based strategic alliance when complex technological know-how is involved?

To find a solution to this problem this study will attempt to find answers to the following questions:

- What are the factors affecting knowledge protection within a contract-based strategic alliance?
- What mechanisms are available for knowledge protection in the context of a contract-based strategic alliance?
- How do these various factors affect the choice of the knowledge protection mechanisms?

1.4. Definitions and Limitations

This study will concentrate on alliances where *high technology knowledge* is involved. Grant (1996) describes such knowledge as highly complex and requiring integration of different but complementary knowledge. Formal means of protection such as patents, copyrights and license agreements are generally not applicable in this case.

Analogously to Parkhe (1993c) and Gulati & Singh (1998), *strategic alliances* will be defined as any sustained voluntary cooperative agreements between firms that involve complex cooperation and sharing of resources and capabilities. Due resource limitations, this research will only consider *international alliances*, and will not go into problematics of domestic alliances, which can be very different in different regions of

the world. The study will take a look at the dynamics of the behavior within the alliance as opposed to the choices made prior to entering the alliance; more specifically the issue of knowledge protection will be studied within *contract-based* relations, where equity controls are unavailable. These relations for example can take a form of joint R&D arrangement, joint production, distribution agreements, technology swap, buyer-supplier relationship, and others (Das & Teng 1998b).

The term *control* will be used according to Das & Teng (1998a) as "a regulatory process by which the elements of a system are made more predictable through the establishment of standards in the pursuit of some desired objective or state"

Knowledge protection will be viewed as a form of *control*. Similarly to Green & Welsh (1988) *knowledge protection strategy* is not be limited to formally designed plans, but will be treated as a general approach a firm has towards knowledge protection. The mechanisms employed don't have to be a part of a carefully designed strategy, but there can be *ad hoc* measures that have evolved over the years of operation under various influences.

In the same manner as in Norman (2002), this study will adopt a perspective of one partner within the alliance - *the focal firm*, since both partners can be considered facing symmetrical issues and decisions related to knowledge protection within the alliance.

1.5. Thesis Structure

The structure of the thesis will be based around the research problem and questions. First the paper will provide the grounding for the rest of the thesis by presenting the resource-based view of the strategic alliances. It will then proceed to explain the reasons behind contract-based alliances, and specify in more detail what kind of alliances the study is about. An international dimension of strategic alliances will also be briefly described. Next, knowledge transfer mechanisms will be presented to show where

knowledge protection might be needed. Various factors affecting knowledge protection need and extent will be evaluated, followed by the description of current approaches to knowledge protection in strategic alliances. The literature review will be concluded with a proposal of an integrated framework for evaluation of knowledge protection issues and devising knowledge protection strategies in international contract-based strategic alliances.

The paper will proceed to describe the methodology employed for the empirical research. The reasons for using a case study of one firm will be explained. After that the findings of the empirical research will be presented and discussed. Based on the analysis a revised framework will be proposed. Summary of the paper, scientific contribution, managerial implications and suggestions for future research will conclude the thesis.

2. LITERATURE REVIEW

2.1. Alliance Structuring: Contract-Based Alliances

Due to complexity of the phenomenon, numerous theories have been used to analyze strategic alliances: such as transaction cost theory (Williamson 1975, 1985; Hennart 1988), game theory (Parkhe 1993c), resource based view (Wernerfelt 1984, Barney 1991), real options theory, resource dependence model, organizational learning, etc. Alliances are essentially used to gain access to resources of other firms; hence among the mentioned theories it is probably the resource-based view that provides the best foundation for analyzing the knowledge transfer between partners within a strategic alliance (Das & Teng 1998b, 2000, Peng 2001).

This section will first introduce a resource-based view of strategic alliances to provide the basis for the analysis. It will then continue to describe the alliance process to provide a context for the knowledge transfer and protection, and explain why firms can choose a contact-based alliance structure even though knowledge transfer is involved. Finally an international dimension of the problem will be presented.

2.1.1. Resource-Based View of Strategic Alliances

Unlike previous economic theories that were looking at the environment, resource-based view concentrates on the intrinsic properties of the firm: resources that define the firms' capabilities (Barney 2001). Some of these resources due to their value, immobility and non-substitutability, are the ones that contribute to long-term firm heterogeneity and lead to a sustained competitive advantage (Reed & DeFillippi 1990).

Fahy (2000) sums up this view in a model linking key resources, management's strategic choices, and sustainable competitive advantage leading up to superior performance (Figure 1).

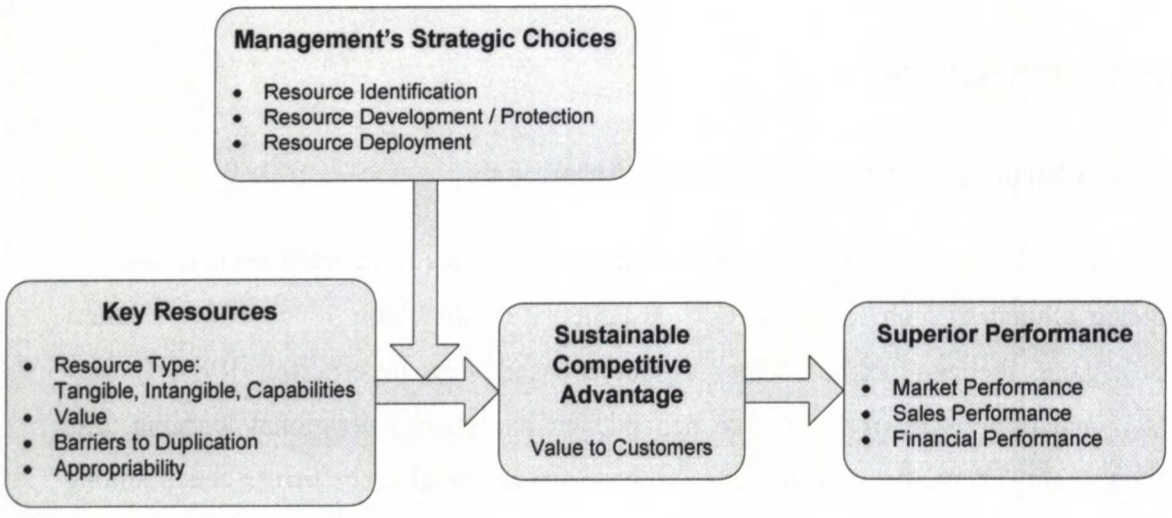

Figure 1: *A resource-based model of sustainable competitive advantage. Adapted from Fahy (2000)*

The figure suggests that not all resources are of equal value to sustainable competitive advantage; hence management's strategic choices are vital in identification, development, deployment and protection of these resources. Even though this study will concentrate on protection of the key resources within a strategic alliance, it can be clearly seen that protection is tightly linked with other management processes and characteristics of the resources themselves.

Knowledge is argued to be the most strategically-significant resource of the firm (Grant 1996), and any company involved in technology business has to take knowledge transfer especially seriously. Complex technological know-how is one of the most important resources contributing to a sustainable competitive advantage, since it tends to have all the required attributes: value, rareness, inimitability and non-substitutability (Barney 1991, 2001, Fahy 2000). Complex technologies are often embedded within the organization since they tend to consist of many interlinked parts such as product knowledge, product development knowledge, process technologies, manufacturing know-how, etc.

The fact, that strategic resources are highly immobile and non-substitutable, is actually one of the major reasons for firms to create strategic alliances (Das & Teng 2000). Firms use alliances to gain access to such resources when it is impossible or costly to obtain them on the open market (Barney 1999). For example, when a company is entering a foreign market, it might be forced to use a local partner, to circumvent government restrictions, or to obtain local market knowledge (Beamish 1987, Yan & Gray 1994, Baughn et al. 1997). A government contract of a local firm can be considered a unique and valuable resource, which makes this firm an attractive partner. A similar resource which is especially important in developing markets is local networking: good relations with local officials and organizations. It is often the case that the firm contributes technological knowledge and the partner contributes local networking (Jolly 2004). In these kinds of cases the focal firm does not necessarily intend to transfer high-tech knowledge within the alliance, but due to the nature of the firm's products and close cooperation within the alliance this knowledge becomes more accessible for the partner. In this situation even in the absence of opportunistic behavior unintended transfer can easily occur.

2.1.2. Alliance Process

It is evident that a solution to the knowledge transfer protection problem begins by acknowledging and analyzing all relevant aspects of an alliance, and only then devising strategies for solving this problem. This section will present the view of Baughn et al. (1997) on the alliance process specifically in the context of knowledge protection, and then identify the stages relevant to the present study.

Baughn et al. (1997) break down the alliance process into four stages:

1. Assessments prior to initiating the alliance
2. Bargaining and initial alliance structuring
3. Managing and controlling the alliance

4. Evolution and trust in alliance relationships

The first stage involves assessing the value and properties of intellectual capital involved in the alliance. Components that are most likely to be subject to inadvertent transfer should be identified. Possible competitive consequences of alliance partner gaining the intellectual assets should be evaluated. For example if for the alliance counterpart the unstated goal has been to obtain these capabilities, they will not need the alliance as soon as they achieve this goal, and are now more competitive than they were before entering the alliance. This also means that one has to anticipate the partner intent and potential for learning and evaluate own transparency (Hamel 1991). Baughn et al. (1997) have noticed that firms often underestimate partners' willingness and capacity for learning. Nevertheless even when the partner does not have a strategic intent to learn, they may absorb and use important knowledge gained from the alliance.

The next stage is bargaining and initial alliance structuring. Bargaining is greatly affected by the power relationship between the firms, which in turn is dependent on the needed resources that the focal firm controls and on the extent to which the other firm lacks alternative providers for these resources (Bacharach & Lawler 1981, Baughn et al. 1997). As mentioned above there may also be external influences on bargaining such as government regulations in a local market. The resulting structure of the alliance defines initial flow of assets and the amount of interaction between the firms. Even though the alliance structure has a great effect on knowledge transfer within the alliance, one must be aware that the formal agreements often cover only a portion of knowledge and capabilities that could potentially migrate between the partners.

The third stage is managing and controlling the alliance. This is where cooperation and "race to learn" take place (Hamel 1991) and where risks of unintended transfers and opportunistic behavior are the highest. Baughn et al. (1997) recommend that the operating interfaces within the alliances should not be left to chance, but should be carefully designed and managed.

The relationship within the alliance is dynamic and evolving based on changing market conditions and inter-partner interactions. This evolution is the fourth stage. Changes in the external and internal environment mean that, if the alliance is to survive for a longer duration, the alliance structure from the start should provide some flexibility.

This alliance process of Baughn et al. (1997) described above can be presented in a simple diagram (Figure 2).

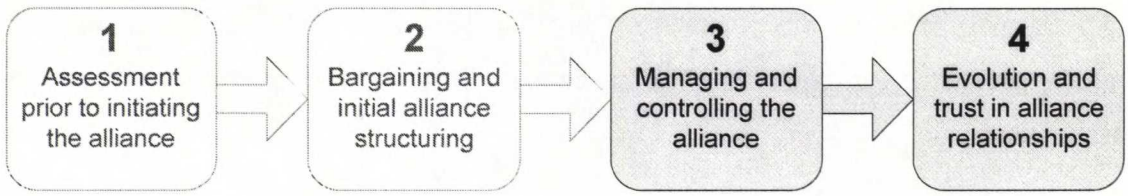

Figure 2: *Alliance process and the focus of the study*

The highlighted stages of the process are the focus of the present study, since alliance structure (being the contract-based alliance), is already selected. However some assessment and reassessment mentioned in the first stage has to be done within all stages to accommodate for alliance dynamics. Bargaining also continues during alliance evolution as partners' positions often change in relation to markets and development of their own capabilities (Yan & Gray 1994, Inkpen & Beamish 1997, Makhija & Ganesh 1997).

2.1.3. Contract-Based Strategic Alliances

When entering into a strategic alliance there are various ways to structure the relationship. Barney (1999) and Williamson (2002) suggest transaction cost theory reasoning for analyzing the choice between different types of governance structures, such as making a purely market transaction, having a long term contract, making an equity alliance or acquiring a capability. Every next choice reduces the risks of

opportunism, but is more costly than the last, since it will involve more complex governance mechanisms.

Formal agreements have little effect on learning (Hamel 1991), and consequently the success of the partner in alliance. That's why alliance structure is often used to both improve knowledge transfer and to protect key resources from appropriation (Roehl & Truitt 1987). Many authors have pointed out that complex technologies are more likely to be transferred within an equity alliance (Kogut & Zander 1993, Mowery et al. 1996, Inkpen 1998). This is done to retain a high degree of control over the knowledge transfer processes. An equity-based alliance also allows better options for monitoring these processes.

However there are cases when other considerations then purely knowledge transfer issues must be taken into account. According to Barney (1999) the following reasons for using a contract-based alliance instead of an acquisition or an equity-based alliance can be identified:

- Legal constraints
- Acquisition may reduce value of the capabilities
- Acquisition or equity relationship may be costly to reverse
- There may be substantial "unwanted baggage" inextricably tied with the desired capabilities
- Leveraging acquired capabilities can be costly
- Governance costs of an equity-based alliance are higher than those of a contract-based alliance

This study is focusing on the cases when the structure is already chosen – a contract-based strategic alliance. Such alliances don't involve sharing or exchange of equity nor

creation of a new organizational entity, and thus can be negotiated relatively quickly. Employees of the partners usually work together within their own organizational hierarchies, since even when personnel transfer is involved they remain responsible to their employers.

Non-equity alliances often allow a lesser degree of control. It is impossible to describe every circumstance and eventuality in a contract, and even more so when knowledge transfer is involved. Contract-based alliances are thus vulnerable to opportunistic behavior, and disagreements regarding ownership of the jointly developed intellectual property may arise (Baughn et al. 1997).

Non-equity alliance can be split into two categories: bilateral contract-based alliances and unilateral contract-based alliances (Gulati 1995, Das & Teng 2000). The *unilateral contract-based alliance* has a well defined transfer of property rights. This kind of alliance is usually limited to licensing, distribution and some R&D agreements. The main distinguishing feature of this alliance structure is that the organizations can carry out their tasks independently of each other. This implies that the level of integration in such alliances is low. Tacit knowledge is rarely transferred in such alliances, and explicit knowledge is often covered by detailed and specific contacts (Hagedoorn & Hesen 2007).

The present study is focused more on *bilateral contract-based alliances* that imply a joint sustained production of property rights: for example joint R&D, joint marketing, joint production or complex long-term supplier-buyer relationships. These kind of contracts are usually incomplete and open-ended (Das & Teng 2000), and imply a higher level of integration. This type of non-equity partnership is preferable when the collaboration is short-term and project-based (Hagedoorn & Hesen 2007), but at the same time repeated over a longer period of time (Gulati 1995, Poppo & Zenger 2002, Luo 2002).

2.2. International Dimension

In addition to gaining access to partners' resources and capabilities, strategic alliances are an important means of internationalization (Yoshino & Rangan 1995, Buckley & Casson 1998a, 1998b). To reduce the internationalization costs and risks firms often use partners to help with production, technologies, marketing, local connections, laws and regulations (Beamish 1987). Knowledge protection issues become especially prominent in international alliances. Cross-borer alliances span different legal environments and cultural attitudes regarding intellectual property rights (Baughn et al. 1997, Jolly 2004). Levels of available protection can also vary substantially. This is especially noticeable when a firm from a developed market enters a developing market, when not only legal protection is unavailable, but even the requirement for such protection is not well understood and accepted. Based on the personal experience of the author in international projects in Russia and Ukraine, it is often the case that in these markets knowledge is not treated as something of great value compared to tangible resources, when considering buying decisions. Interestingly enough this attitude is often combined with a very high willingness to learn from a foreign technology partner, i.e. knowledge is considered important, something that should be learned, but not something that should be paid for. To compensate for the risks of cross-border cooperation a significant share of international alliances is equity based.

In the international strategic alliances government involvement may affect the choice of the alliance structure. In addition, when the government is a prominent partner, a legal framework cannot always be relied upon to enforce an agreement (Baughn et al. 1997), since the government structures can often affect how the legal framework is applied.

In many cross-border alliances, the differences in partners' contributions are clearly visible (Jolly 2004). A foreign partner usually comes into alliance with new technologies and products, marketing knowledge, finance and management expertise. A local partner often contributes local work force, land, local relations and local market

knowledge. Both parties want to learn the expertise of the partner, and both parties want to limit the learning of the other partner.

To sum up, knowledge protection in international strategic alliances is facing a significantly different environment compared to domestic alliances. The complexity is increased since with every new country present in the alliances another legal and cultural environment is added into the mix.

2.3. Factors Affecting Knowledge Protection in Strategic Alliances

This section will analyze the first research question: what are the factors affecting knowledge protection within an international contract-based strategic alliance? The section will begin by describing the knowledge transfer processes, and specifying which processes are the most important in the context of complex knowledge and contract-based alliances. It will then proceed to take a look at firm specific characteristics that can affect knowledge protection in the alliance. After that, other factors affecting the extent and the need for knowledge protection will be analyzed. The factors can be grouped as firm specific characteristics, knowledge characteristics, partner characteristics and relational characteristics.

2.3.1. Knowledge Transfer Mechanisms in Strategic Alliances

One of the core purposes of strategic alliances is to facilitate and manage knowledge transfer (Mowery et al. 1996, Das & Teng 2000). Knowledge protection should be discussed in relation to the actual knowledge transfer processes employed in the alliances, since these processes are also the most likely route for unintended knowledge transfer.

Inkpen (1998) identifies four generic management processes that create a path for knowledge transfer between alliance partners:

- personnel transfers
- technology sharing
- interactions such as regular communication, visits and tours
- linkages between strategies

Personnel transfers allow employees of one partner to get directly immersed in the environment of the other partner, which definitely reduces the barriers for tacit knowledge transfer. *Technology sharing* is defined by Inkpen (1998) as a mechanism that provides access mainly to explicit knowledge, such as specifications, documentation and technology demonstrations. Various direct *interactions* between partners such as regular communication, visits and tours provide means for transfer of both explicit and tacit knowledge. And finally the *linkage between strategies* allows for better understanding between the partner organizations, which in turn facilitates all types of knowledge transfer.

In the context of transfer of complex technological know-how within a contract-based alliance only two of these processes are within the scope of this study: *personnel transfers* and various other *interactions* (regular communication, visits, tours, etc). *Technology sharing* as defined by Inkpen (1998) is not applicable, since it is mostly used for the transfer of explicit knowledge. Protection for explicit knowledge has been studied extensively, and can usually be achieved through IPRs and contracts. *Linkages between strategies* are hard to achieve without common equity, which puts this management process outside of the scope of this study too.

All of the above processes facilitate both intended and unintended knowledge transfers. This means that without any control mechanisms they can be dangerous, since the

partner could acquire critical knowledge vital to the competitive advantage of the focal firm. To evaluate the need for control mechanisms for knowledge protection, the firm should first consider its own characteristics, and then evaluate characteristics of the knowledge involved, partner characteristics and relational characteristics (Baughn et al. 1997, Norman 2002).

2.3.2. *Firm Specific Characteristics*

Various firm specific factors can affect the resulting knowledge protection strategies: firm's goals within the alliances, prior experience in managing the alliances, ownership of complementary assets. Focal firm characteristics are especially important in the context of contract-based alliances, since there is no common entity created by the partners.

Goals within alliances

Strategic goals within the alliance will define the extent of cooperation between the partners (Gulati & Singh 1998). This will affect the knowledge transfer mechanisms, which will in turn affect the required knowledge protection measures.

Experience with managing strategic alliances

Experience of managing strategic alliances can affect how company approaches knowledge protection in the alliance (Norman 2002). Negative experiences with partner opportunism may cause the firms to establish stricter and more formal knowledge protection mechanisms, whereas absence of such experiences will lower the perceived risk and hence the protection level.

Ownership of complementary assets

An important factor that can affect the level of protection is a possible requirement of complementary assets to successfully exploit the acquired knowledge. Knowledge in many cases is an intermediate good and before it can be sold, it has to be packaged into a product or service. Hence the absence of complementary assets may limit the usefulness of acquired knowledge to the partner (Teece 1998; Anand & Galetovic 2004). These complementary assets can be patents, related technologies, access to financing, access to customers, manufacturing capabilities. If a complementary asset on its own is not available on the factor market it becomes a bottle neck to exploiting the acquired knowledge, thus reducing the risks associated with knowledge appropriation by the partner.

2.3.3. Knowledge Protection Level

The level of knowledge protection in a strategic alliance depends on how a firm evaluates its risks in the alliance (Norman 2002). When the perceived risks are high, the firms will be more protective of their critical knowledge. Norman (2002) separates the factors that influence the level of protection into two groups: resource characteristics and relational characteristics. Baughn et al. (1997) separate these factors a bit differently: into resource characteristics and partner characteristics. Hence the factors influencing the level of protection can be summed up in the following way:

- Knowledge characteristics
- Perceived partner characteristics
- Relational characteristics

Knowledge characteristics

Knowledge characteristics that affect the protection level are the importance of knowledge to the *core competency* of the firm, *tacitness* of the knowledge and *causal ambiguity* associated with this knowledge (Norman 2002, González-Alvarez & Nieto-Antolín, 2005).

Core knowledge and capabilities will be protected much more carefully than peripheral knowledge, since according to RBV the potential loss of core knowledge to the partner will very likely affect long-term competitiveness of the firm (Dierickx & Cool 1989, Norman 2002).

Tacitness of knowledge is another significant characteristic that affects the level of protection. Tacit knowledge due to is very nature is harder to transfer (Kogut & Zander 1993, Teece 1998). However, it is hard to protect technological knowledge in strategic alliances due to the closeness and duration of cooperation (Das & Teng 1998b), and since alliances actually simplify the transfer of tacit knowledge, firms view appropriation of tacit knowledge as more serious than the appropriation of explicit knowledge (Norman 2002).

Causal ambiguity improves knowledge protection by making the associated knowledge harder to imitate for the partner. At the same time it also makes it harder to use this knowledge for the focal firm itself. King & Zeithaml (2001) and González-Alvarez & Nieto-Antolín (2005) in their studies have found out that the negative effect of causal ambiguity on the focal firm performance is greater than the positive effect of protection of the technological know-how. This implies that the use of causal ambiguity for knowledge protection is of limited value.

Perceived partner characteristics

The level of protection is also affected by the perceived learning intent and absorptive capacity of the partner (Norman 2002).

The *perceived learning intent* of the alliance partner is the extent to which the focal firm believes that the partner is focused on appropriating knowledge in the alliance. Sometimes the partner is satisfied with access to the knowledge and capabilities in the alliance and is not actively seeking to acquire and internalize this knowledge (Inkpen 1998, Grant & Baden-Fuller 2004). In this case the motivation to learn can be quite low, and fewer protection measures are required. When the firm perceives its partner as highly motivated to learn and to internalize the knowledge, it is more likely to control the knowledge transfer process (Norman 2002). This motivation can be observed through the amount of resources the partner is assigning to the knowledge transfer within the alliance (Simonin 1999). The more resources are assigned the more seriously the knowledge transfer is treated by the partner.

Learning intent on its own is not sufficient for a successful knowledge transfer. *Absorptive capacity* is the ability of the partner to receive, adapt and internalize the knowledge (Teece 1998). This ability is greatly affected by the resource overlap between the alliance partners. The more related is the knowledge of the partners, the easier it is to absorb the knowledge. Hence when a firm perceives its partners knowledge as being very close to its own, it is more likely to increase its protectiveness (Norman 2002).

Relational characteristics

Norman (2002) also cites trust within the alliance as an important characteristic affecting firm's actions within the alliance. When a firm trusts its partner, it is more likely to make itself more vulnerable to opportunistic actions of the partner. At the same time the openness lowers the costs and improves the efficiency of knowledge transfer, and hence is likely to improve alliance performance (Kale et al. 2000).

It is important to differentiate between knowledge-based trust and deterrence-based trust (Gulati 1995, Kale et al. 2000). Knowledge-based trust develops when partners interact with each other and learn about each other, thus making the partner behavior more predictable based on knowledge about the partner. Deterrence-based trust is built upon strictly utilitarian grounds, when the firm believes that the partner will behave in a trustworthy manner due to the negative consequences outweighing potential benefits that may arise in case of opportunistic behavior.

Relations outside the alliance can also affect the way the firm treats knowledge protection. As Reed & DeFillippi (1990) point out - the relationship between the firm and the customer produces ambiguity for rivals and creates a barrier to imitation. In addition, long term relationships with the customers, suppliers and government agencies can deny the same relations to the potential competitors.

2.4. Knowledge Protection Mechanisms in Strategic Alliances

This section will analyze the second research question: What mechanisms are available for knowledge protection in the context of a contract-based strategic alliance? As previously mentioned, not all possible knowledge protection mechanisms are applicable in this context. First an existing model by Makhija & Ganesh (1997) will be presented. The model links the nature of learning involved and the nature of appropriate control mechanisms. Mechanisms appropriate in the context of this study will be pointed out. After that relational controls and internal means of protection will be discussed.

2.4.1. The Relationship between Learning of Capabilities and Control Mechanisms

Makhija & Ganesh (1997) hypothesized a model (Table 1) in which the choice of control mechanisms would be linked to the nature of the knowledge involved. Highly codifiable knowledge requires lower-order learning and can be managed through more formal mechanisms such as contracts. The more implicit knowledge, such as for example manufacturing processes or incremental innovations, requires higher order-learning and consequently less formal control mechanisms.

	Nature of Learning	Examples of Capability Transfer	Nature of Appropriate Control Mechanisms	
Codifiability of knowledge: High	Lower-Order Learning	Capital and Assets Raw Materials Regulatory Permits	Contracts	Nature of Control Mechanism: Formal
		User of Partner's: Distribution channels Patents and Licenses Skilled Personnel	Structural Grouping & Departmentalization Formal Authority Relationships Standardized Procedures & Rules Planning & Budgeting	
		Incremental Innovation: Refinement of existing product or technology	Supervision	
		Internalization of Partner's: Manufacturing Process Government Relations Marketing Know-how Management Processes	Performance Evaluation Teams & Task Forces Meetings & Organized Personal Contact Transfer of Managers / Lateral Movements	
Low	Higher-Order Learning	**Extensive Innovation:** New Technological Breakthroughs	Rituals, Traditions and Ceremonies (reinforcing shared values and beliefs)	Informal

Table 1: *The relationship between learning of capabilities and control mechanisms (Makhija & Ganesh 1997)*

However the model is only partially applicable to the present study. This research is concentrating on the tacit knowledge in the context of contract-based relationships,

whereas all of the hierarchical control mechanisms and some of the less formal mechanisms and suggested by Makhija & Ganesh (1997) are easier to implement within an equity-based alliance. The fact that the knowledge is transferred within a contract-based strategic alliance greatly narrows down the selection of available mechanisms. In general, the means of control related to structure and hierarchy in a contract-based alliance are not available due to absence of common entity, which leaves mostly internal resource and relational controls (Astley et al. 1984).

2.4.2. Relational Capital and Knowledge Protection

One way to curb opportunistic behavior in the absence of contractual or structural means is to build up trust-based relational capital (Das & Teng 1998a, Kale et al. 2000). Relational governance may help to overcome the limitations of contracts, when tacit knowledge is involved (Poppo & Zenger 2002). In general in recent years many researchers have come to the conclusion that formal contracts and trust between partner organizations are likely to act as complements and improve the outcomes of cooperation (Poppo & Zenger 2002, Luo 2002)

Trust between organizations can be considered as the agglomeration of trust between the individuals (Kale et al. 2000). Daily interactions among employees involved in the alliance help to develop interpersonal relations and trust (Baughn et al. 1997). Strong interpersonal ties both create a path for learning about other firm's capabilities and at the same time provide information about partner's reliability (Kale et al. 2000). This relational protection can also be described as partner's commitment not to act opportunistically even in the absence of formal limitations, and hence not to attempt to either appropriate knowledge or use this knowledge to the detriment of the focal firm.

Deterrence based trust can also be developed, and threat of retaliation is one way to accomplish it. Anand & Galetovic (2004) mentions a threat of intensified competition when important resources are appropriated. This is especially applicable in the case of horizontal strategic alliance, when it is likely that partners are present on the same

product market. Lorange (1997) proposes another type of threat – cutting off the partner from future developments in technological know-how by the focal firm. For this type of threat to be effective the firm has to regularly signal its developments to the other party. This type of threat is applicable in both horizontal and vertical strategic alliances. Existence of such threats from the focal firm, reduces the incentive of the partner to misbehave and to act opportunistically, and hence reduces the need for other means of knowledge protection.

2.4.3. Internal Structures and Employee Discipline

A number or researchers suggest using internal structures and employee specific measures to reduce unintended knowledge transfer. Baughn et al. (1997) suggest erecting a "collaborative membrane" that will be used to manage the flows of knowledge and skills. Creating a "collaborative membrane" implies that partner interface points should be defined, staffed appropriately, and continuously monitored. While such a membrane will limit the unintended transfers it will at the same time make it harder to transfer perfectly valid resources required for the success of the alliance. Hamel et al. (1989) point out that limiting the unintended transfers in the end depends on loyalty of the employees.

2.5. Theoretical Framework

Comfortable relation within the alliance does not necessarily mean that all partners are benefiting equally in terms of increased competitiveness (Hamel 1991). One has to acknowledge "transparency by default" and "transparency by design" and to improve the gains from participating in an alliance a firm should be proactive in both learning and protecting its core competencies.

Complex tacit knowledge is hard to imitate, but alliance partners purposefully lower barriers to transferability to exchange knowledge. This makes knowledge-based resources more vulnerable to unintended transfers (Das & Teng 2000, Jolly 2004). One

partner might behave opportunistically and attempt to outlearn the other (Hamel 1991). Even without a strategic intent, that partner may absorb and use important knowledge gained from the alliance (Baughn et al. 1997). This is why companies must develop safety measures against unintended, informal transfers of information (Hamel et al. 1989). At the same time alliance partners need to find a balance between protecting their intellectual capital and sharing knowledge that is required for carrying out the projects for which the alliance was created (Baughn et al. 1997).

Inkpen & Beamish (1997) recommend adoption of strict policies and shielding mechanisms to protect key competencies, but how can one do it effectively while doing the opposite: sharing some of the knowledge with the partner? Lorange (1997) on the other hand suggests flexible and dynamic contractual protection, latent retaliatory power and hands-on managerial involvement as a strategy for achieving cooperation while protecting core competencies.

Analysis of the existing literature has shown that many issues of knowledge management in strategic alliances have been studied. However there have been much fewer studies on knowledge protection and no research has attempted to build a holistic approach to evaluate knowledge protection in strategic alliances. Building heavily upon the literature review, an integrated framework has been developed (Figure 3). This framework attempts to provide a solution to the research problem of the study: How can a firm protect its core competencies in the context of an international contract-based strategic alliance when complex technological know-how is involved? The proposed framework takes into account the limitations imposed by the contract-based alliance structure and by the fact that resources that should be protected involve complex technological know-how.

Within this framework the focal firm should evaluate its own factors, knowledge characteristics, partner characteristics, and relational characteristics. These factors affect both knowledge transfer mechanisms and the choice of knowledge transfer mechanisms.

Based on this analysis the firm should devise appropriate strategies for protecting the knowledge within the alliance while limiting the negative effects of this protection on the required knowledge transfer.

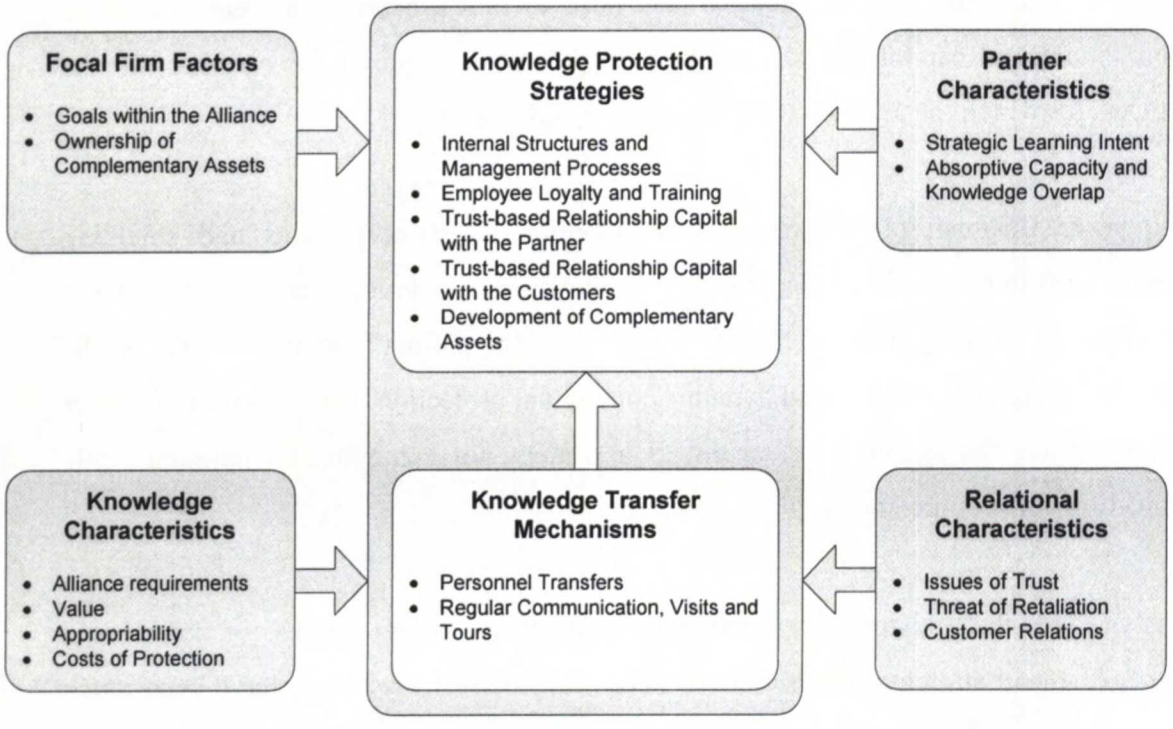

Figure 3: *Theoretical framework of knowledge protection in a contract-based strategic alliance*

The above mentioned factors will highlight the need for knowledge protection and should help the firm make informed decisions about designing appropriate knowledge protection strategy.

The following sections will briefly describe the parts of the model and how they affect the knowledge protection strategy. For detailed description of these factors see literature review.

Focal Firm Factors

Firm's own characteristics and existing strategies should be evaluated in relation to knowledge transfer and protection:

- Firm's experience in alliances in general
- Strategic goals within the alliance
- Ownership of complementary assets

These factors will most likely affect the need and the extent of protection more than the choice of actual protection mechanisms.

Knowledge Characteristics

Knowledge assets of the focal firm should be classified in relation to the firm's goals within the alliance:

1. Knowledge that has to be transferred to the partner
2. Knowledge that has to be used to ensure the fulfillment of the common alliance goals, but that should not be appropriated by the partner
3. Knowledge that should not be transferred and should stay outside of the alliance

For the above groups (especially for the items 2 and 3) the following characteristics should be evaluated:

- How valuable is the knowledge, how close is it to the core competencies of the focal firm?

- Appropriability and barriers to duplication in the context of the alliance
- Costs of protection vs. the benefits of alliance success

Value of the knowledge and costs of protection will affect the extent of required protection, whereas appropriability will affect both the extent of protection and the choice of mechanisms.

Partner Characteristics

Partner characteristics and potential for opportunistic behavior should be evaluated:

- What is the absorptive capacity of the partner? What is the knowledge overlap between the focal firm and the partner?
- Does the partner seem to have a strategic intent to outlearn?
- Is the partner already in the same market? If not how likely is the partner to attempt to enter the market?

Partner characteristics will mostly affect the extent of protection.

Relational Characteristics

Various relational characteristics of the partnership should be considered:

- Issues of trust
  - Has the firm worked with the partner before?
  - What were the results of this cooperation?
  - Are there a lot of personal ties between the parties?

- Are there personal links between the companies?

- Relations outside the alliance that can affect relations within the alliance (e.g. relations with customers, suppliers, government agencies, etc)

Relational characteristics partially act as means of protection themselves; hence they will both affect the requirement for protection and other protection mechanisms that can used.

Knowledge Transfer Mechanisms

Based on the limitations of contract-based alliances and the fact that the complex technological know-how is tacit, the following transfer mechanisms are at the firm's disposal:

- Personnel transfers

- Regular communication, visits and tours

Both of these transfer mechanisms are most likely to affect the choices of the protection mechanisms, since protection only makes sense in the context of contacts between the partners. It is important to remember that even though a firm is not planning to transfer or provide access to some particular knowledge, simply due to the nature of long term cooperation, unintended transfers may happen even in the absence of opportunistic behavior of the partner.

Knowledge Protection Strategy

Finally, based on the evaluations of the factors above, knowledge protection strategy should be devised:

- Internal structures: create and manage collaborative membrane
- Train employees, make sure that everyone communicating with the partner is aware of the firm's strategy and risks associated with the alliance
- Build trust-based relationship capital
  - With the partner to reduce the risk of opportunistic behavior
  - With other organizations (suppliers, customers, government agencies) to introduce ambiguity for competitors
- Build deterrence based trust for example by signaling retaliation in case of opportunistic behavior

It is important that in the firms where knowledge plays an important part, knowledge protection is handled more proactively. This way future risks may be reduced even before the damage is done.

3. RESEARCH METHODOLOGY

This section will discuss research methodology of the empirical study and the reasons for making the choices that were made. It will start by building the research design. It then will proceed to data collection and data validity. After that company and interviewee selection rationale will be presented followed by how the findings will be analyzed. Finally the data collection process as it happened will be described.

3.1. Research Design

Research design is the planning of the overall research strategy (Ghauri & Grønhaug 2002). The quality of the underlying research design greatly affects the quality of whole study. Research design is in turn influenced by many factors. One could group these factors into research specific and researcher specific. Research specific factors are basically research goals: what does the research intend to accomplish? Researcher specific factors are mainly constraints and limitations, such as: researcher qualifications, available time and resources, researcher's personal goals.

Ghauri & Grønhaug (2002) provide a link between the research design and the problem structure.

Research design	**Problem Structure**
Exploratory	Unstructured
Descriptive	Structure
Causal / Explanatory	Structured

Table 2: *Research design choices for various problem structures. Adapted from Ghauri & Grønhaug (2002)*

Exploratory research is used when the problem is not very well understood, and one has to get a deeper insight into the factors and processes that are involved in the problem. Descriptive and causal research methods are used in cases when the problem is well structured and understood.

Research methods can also be split up into qualitative and quantitative. Quantitative methods are focused on testing and verification, and use a very logical and critical approach. Usually the observer is quite distant from data, and hence more objective. The results of such research can usually be generalized to other similar situations.

Qualitative methods on the other hand have an emphasis on understanding through making observations in natural settings and interpreting these observations (Ghauri & Grønhaug 2002). Qualitative methods attempt to provide a holistic perspective on the subject, but possibilities of generalization of results are limited, only individual comparisons are usually possible.

Compared to other scientific fields in economics, international strategic alliances are a relatively new field of study, and due high level of complexity and the need for theory advancement qualitative methods are especially applicable (Parkhe 1993a). More specifically the issue of knowledge protection in contract-based international strategic alliances has not been studied in much detail yet. A combination of exploratory and explanatory research design will be used for this paper. A single case study of a technology firm will provide an insight into approaches to knowledge protection in the firm's partnerships and will help to illustrate the model developed in the "framework" section of this thesis. This study will attempt to achieve a greater understanding of the issues involved, by observing and interpreting the observations, but without trying to generalize.

Researcher factors have also affected the research design:

- Researcher goals: master's thesis
- Time constraints
- Access to the case company

The first two points, i.e. the fact that it is a master's thesis and the time limitations, reduce the scope and scale of the research. The author's extensive access to the case company on the other hand, will permit a deeper understanding of the case.

3.2. Data Collection

Both primary and secondary data will be used for the case. Secondary data for the case will be collected from the company web site. This data will mostly be company background and some operational figures.

Gummesson (2003, 2005) suggests that all research is interpretive and methodologies should adapt to the complexities of the subject studied. Alliances, being extremely complex involving multiple perspectives, are a particularly complex subject that requires a flexible approach. That is why interviews in the form of guided conversations, where interviewer can steer the conversation depending on the information received, are especially suitable for investigating the sensitive knowledge protection issues. Due to time and resource limitations, and due to the fact that the case company is in Austria while the researcher is in Finland, the interviews will be conducted over a video conferencing program Skype. The sound will be recorded, so that it could be transcribed after the interview.

During the interview, the researcher will first ask permissions to use the company name, the interviewee names, and a permission to record the interview. Then the research will be briefly introduced, to give the respondent an idea of what aspects of their activities

are of interest to the researcher. After that the interviewee will be asked to briefly describe his own status and tasks at the company.

The guiding questions are based around the theoretical framework developed in the previous sections (Figure 3 on page 28). First the questions about the firm itself and its alliances will be discussed to provide the context for the rest of the discussion (see Appendix: Interview Guide). After that various factors that affect knowledge protection within the alliance will be discussed: knowledge characteristics, partner characteristics and relational characteristics. Finally knowledge transfer mechanisms and knowledge protection strategies of the firm will be investigated.

3.3. Data Validity

To ensure the quality of data collected a number of tests should be passed (Yin 2003):

- Construct Validity
- Internal Validity
- External Validity
- Reliability

Construct Validity

To ensure construct validity, four informants will be used within the case company and will be interviewed based on the same set of guiding questions. The interviewees will be selected as the ones most likely to be involved in the firm's strategic alliances on various levels, from making overall strategic decisions to directly participating in everyday interactions. The respondents will also be asked to check the resulting report to find any errors or omissions.

Internal Validity

Internal validity will be improved using an explanation building and logic model techniques. The explanations will use both the case and the framework developed in the literature review to analyze the collected data.

External Validity

External validity will also be improved by revising the framework based on the case and linking the case to the literature review. This way the revised framework can later be used for a multiple case study or a more quantitative approach.

Reliability

Data reliability will be ensured through sufficient description of case company selection, interviewee selection, interview process documentation, and through recordings of the interviews.

3.4. Case Company Selection

To illustrate and explore the framework developed in the literature review part of the study, the following criteria were used to select the case company:

- Presence of complex technological know-how
- International presence
- Contract-based strategic alliances
- Possibility of interviewing sufficient number of persons within the time and resource limitations on various levels of the company

An Austrian traffic signal manufacturer Swarco Futurit has fulfilled all of the criteria. The author was familiar with the company due to prior cooperation in various international projects.

3.5. Interviewee Selection

The criteria for the interviewee selection were the following:

- Knowledge of company strategy
- Knowledge of company operations
- Knowledge of company partnerships
- Broad knowledge of technical issues
- Sufficient time with the company

This meant that in a company the size of Swarco Futurit, managing directors and product managers would be the best sources of information. All managing directors of Swarco Futurit have kindly agreed to be interviewed. The permission to interview the product manager was received after the interviews with the directors. In addition, the managing director of Swarco Europe (the company that owns Swarco Futurit and is directly involved in its operations) was also interviewed to provide a more strategic perspective on the issues.

The following persons were finally interviewed:

Name	Position	Company	Time with the company
Alexander Swarovski	Managing Director	Swarco Europe	13 years
Franz Silhengst	Managing Director (Technical Issues)	Swarco Futurit	23 years
Friedrich Hofstadler	Managing Director (Marketing and Sales Issues)	Swarco Futurit	18 years
Walter Popp	Product Manager (Railway Products)	Swarco Futurit	3 years

Table 3: *List of persons interviewed for the case study*

3.6. Case Analysis

The findings will be analyzed by matching them to the framework developed in the literature review. New findings from the case will be used to further develop the framework. Using classification by Yin (2003) *pattern matching* and *explanation building* techniques will be used. The results should form a base for further research.

3.7. Interview Process

The case interviews were conducted during April and March of 2008. All interviewees gave a permission to use their name in the final report. The interviews lasted about 40 minutes each and the audio was recorded with special plug-in software for a video conferencing program Skype. Two out of four interviews have been done with live video feed (Mr. Silhengst and Mr. Swarowski), and the remaining two - with audio only. Video conferencing over Skype has somewhat improved the quality of interaction compared to a basic phone conversation, but of course it is not a substitute to personal

live communication. At the same time, in absence of many distractions present in personal face-to-face communications, the 40 minutes were used very efficiently to cover a lot of questions.

Mother tongue of all interviewees was German, but the interviews were made in English. As a result clarification of the questions in different terms was sometimes required. However all in all language and understanding were not an issue during the interviews.

Not all of the questions turned out to be applicable to the case, and to some interviewees. For example the product manger Mr. Wirth was not asked the questions related to overall company strategy.

Immediately after the first interview the guiding questions had to be revised somewhat. For example the phrase "strategic alliance" sounded too big and abstract to some of the interviewees, hence synonymous phrases were used, such as "long term partnership" or "long term cooperation". From the context of the discussion it was clear that the partnerships of case company fully fall under the strategic alliance definition used in this study.

After every interview, all the answers were transcribed. After the last interview a complete case description was written up encompassing all the answers. The case description was sent to the interviewees asking for comments or corrections to find if there were any mistakes. Managing director of Swarco Futurit Mr. Silhengst has confirmed the accuracy of the information presented in the case.

4. CASE STUDY

The case study is structured in the following way: first the company background will be given to provide the context for the observations. Then the findings will be presented. The findings will be entirely descriptive using only the data from the interviewees. After that the findings will be discussed and analyzed in relation to the proposed framework. Finally a revised framework will be presented.

4.1. Company Background

The case company is Swarco Futurit, one of the world leaders in manufacturing of LED (Light Emitting Diode) traffic signs and traffic signals for both road and rail. Swarco Futurit is a leading company of the Traffic Management division of Swarco Group, a large multinational specializing in various traffic-related solutions. Swarco Futurit's core competence is development of optical technologies for its traffic signs and signals. Various requirements and factors have to be taken into account when developing traffic signs and signals, for example: light intensity, clearness of the symbol display, solidity, weather resistance, energy consumption, requirements for maintenance and longevity.

In 2000 Swarco Futurit invested 10 million Euro into the construction of a new Technology and Development Center in Burgenland, Austria. This center houses production lines, injection molding machinery and professional testing and light measuring environments.

In addition to the manufacturing and product development Swarco Futurit provides customers with customized solutions and consulting services in the analysis and optimization of the traffic flows.

Structurally Swarco Futurit is a part of Swarco Europe which is in turn a part of Swarco Group. Swarco Futurit turnover for 2007 was about 55 million Euro out of 450 million

of the whole Swarco Group. Swarco Futurit currently employs about 250 persons and has customers in over 60 countries worldwide.

4.2. Findings

This section will present the findings of the interviews. The findings will be structured according to the framework presented in the literature review, and are entirely based on the information from the interviewees. In addition to the information strictly relevant to the framework the findings will contain some context to improve understanding and possibly identify improvements for the framework.

First the section will present the company and its goals as told by the interviewees. Then it will describe the kind of knowledge that is core to Swarco Futurit and the kind of knowledge that is used in Swarco Futurit partnerships. It will then proceed to describe partners and relations with the partners s perceived by Swarco Futurit's management. After that knowledge transfer and knowledge protection approaches will be described.

4.2.1. Swarco Futurit

Swarco Futurit according to all directors is a *product* company. It doesn't sell technology or systems, but it manufactures and sells products. Major products of the company are railway traffic signals and variable message signs (VMS). According to Franz Silhengst, about 10 years ago there was a major strategy shift at the company, when it was decided to move out of the components and systems business. Swarco Futurit, for example, has stopped developing its own controllers for the signals, and concentrated on the actual traffic signals and signs. This way many former direct competitors became the firm's suppliers and customers. The company picked a worldwide niche market where very few companies had deep knowledge and experience – optics for traffic signals and signs. In retrospect this strategic shift was a smart move: the turnover grew from 5 million Euro ten years ago to 55 million Euro today.

To analyze knowledge protection in Swarco Futurit's partnerships it is important to have a context of the market where the firm operates. Mr. Silhengst identified four major product levels in this industry:

Level	Product	Short Market Description
1	LED	Large volume manufacturing for various applications
2	LED on electronic board	Large volume manufacturing for various applications
3	LED on electronic board with an electronic driver	Medium volume, application specific
4	The whole unit with the signal: enclosure, optics, LEDs, controllers	Niche market

Table 4: *Product levels in the LED application market*

Swarco Futurit operates on the fourth level of this chain. It develops and produces a complete final product with the required parameters. The following section will describe the knowledge involved in this activity.

4.2.2. Knowledge

All interviewees have practically identically identified the core competencies of Swarco Futurit:

- Design and production of plastic parts, usage of own tools
- Light systems development, optics, lab research, simulations
- Application of LEDs and semiconductors, energy savings, cost savings

To explain this in a less technical language, Swarco Futurit is able to either take standard components, or order custom made components with special parameters, and build the signaling product that satisfies the customer requirements.

Most of the knowledge is very complex and is deeply embedded in the firm, its engineers and its connections with customers and suppliers. There are relatively few patents and according to Mr. Swarovski, their importance to the company is slowly decreasing. Technologies in general are being developed faster, and product life cycles are shortening. "Before, it was ten years for the signal. Now, it's two-three years", said Mr. Silhengst.

An illustrative example of the special knowledge that Swarco Futurit has, is dealing with *phantom light*. Phantom light is an illusion that the light signal is switched on when in fact it is not. This can happen when the sunlight falls onto the signal at a certain angle, and is reflected from internal structures of the signal and LEDs. In case of traffic signals, phantom light is an important safety issue. Swarco Futurit has the knowledge of not only how to deal with the problem (some of the more explicit parts of this knowledge are patented, e.g. Silhengst et al. (2001)), but also how to simulate, measure and evaluate the phenomena, how to specify the requirements related to the phenomena. Swarco Futurit also participates in developing standards related to phantom light together with European standards bodies.

4.2.3. Partners

Swarco Futurit's partners can be broadly split up into two groups: suppliers and customers. Interestingly, when asked to identify the most important strategic alliances, Franz Silhengst (managing director responsible for manufacturing and development) has identified partnerships with electronic component suppliers, whereas Friedrich Hofstadler (managing director responsible marketing and sales) and Alexander Swarowski (managing director of the holding company Swarco Europe, responsible for business development) has first named the customer partnerships. The firm has a long

experience in such international long-term cooperation. The longest lasting partnership is active already since year 1998.

Both managing directors of Swarco Futurit have stated that current partners have very different interests, and hence in their opinion there is a relatively low likelihood of opportunistic behavior.

Suppliers as Partners

Electronic component suppliers tend to be very large companies that manufacture components in immense volumes. These partners are usually making designs and modifications very specific to Swarco Futurit's requirements. According to all interviewees, it is highly unlikely that these partners would attempt to appropriate the knowledge that becomes accessible through the partnership. As Mr. Popp pointed out LED suppliers for example have a great know-how in LED manufacturing, but low knowledge of optics and relatively low knowledge of LED applications, compared to Swarco Futurit.

However Mr. Silhengst did mention an interesting incident. This incident raises doubts on the accuracy of perception there is virtually no risk of knowledge appropriation for Swarco Futurit. One LED supplier did try to enter level 4 market (see Table 4) after learning about the products within the cooperation with Swarco Futurit. After two years of development, they have admitted their failure and the fact that they don't have enough skills or equipment to build the final products. The potential competitor transferred the results of this work to Swarco Futurit, and continued cooperation in the area of LED manufacturing.

Customers as Partners

Main customers and long term partners of Swarco Futurit are large local and international system integrators that use the traffic lights in complete traffic management systems. With Swarco Futurit they gain access to the plastics tooling and design, optical systems know-how, LED application knowledge. Swarco Futurit on the other hand, receives scale and sales network from these partners, which is required for efficient operation.

4.2.4. Relations

Swarco Futurit at the moment has no equity joint ventures, it only long term contracts. "From technical point of view there would be no benefit in a joint venture", says the managing director Franz Silhengst.

Due to complexity of the specifications, importance of quality and availability, the relations with the partners are very long term. The contracts are usually about five years long, with an option of extension for another four years. Contracts with the same partners rarely change over time; if the cooperation goes well, they tend to be simply extended.

Issue of trust is definitely present in the relations. It takes time before trust develops. Good relations have to be maintained: for example with many Asian partners there are around 5-10 visits every year. Mr. Silhengst also indicated that reciprocity in the relationship is very important: "If the partner is more open, we become more open too". Partner's business field also affects the level of trust. Clearly the relations will be more guarded if the partner's field is very close. And yet, relational issues in Swarco Futurit are not managed and are left to the discretion of the managers who participate in communication with the partners.

Swarco Futurit never had to participate in any legal proceedings in relation to appropriation of their explicit knowledge. At the same time Swarco Europe's managing director Alexander Swarowski says that the company is always on the look out, ready to prosecute, if it will feel its property rights are violated.

4.2.5. Knowledge Transfer

Knowledge transfer in Swarco Futurit's partnerships takes place through regular communications, company visits, factory tours and exchanges of technical specifications. In general communication happens on all levels in the organization from top management to the specialists, but it is the product managers who are responsible for all communications related to technical issues.

According to railway signal product manager Walter Popp, knowledge transfer and exchange in Swarco Futurit partnerships is extremely complex and extensive. Know-how related communication usually starts with 30-50 pages of specifications, providing the base for the exchange. Detailed description of products and components are involved, containing a great number of parameters like forward voltages, power consumption, wave lengths, angles, changes of various characteristics with the temperatures. This communication process becomes very complicated when every parameter change has to be confirmed on various levels, and quite often coordinated with various other partners. One of the reasons for this complexity is because a large number of safety and reliability standards are involved. For example if an LED component has to be changed due to availability issues, the parameters have to be checked so that the replacement component fits the specifications, and the end customer has to be notified of any critical changes.

4.2.6. Knowledge Protection

All interviewees admitted that there are no specific conscious knowledge protection mechanisms in Swarco Futurit, i.e. it's not a strategy by design, but a strategy by

default. Mr. Hofstadler went even further by saying that this is something that the company should probably think more about, since with the company growth, the risks increase. And yet, even today there exist a number of factors and mechanisms to mitigate the risks of unintended knowledge appropriation in the strategic alliances of the company.

Both Swarco Futurit's managing directors evaluated knowledge appropriation risks as quite low mainly due to perceived absence of intent on the part of the partners. "I don't have a feeling that they would go out with this technology, what would they do with it?" said Mr. Silhengst. Swarco Futurit is staying in a relatively small worldwide niche market that would require significant time and capital investments to penetrate.

Some of the core technologies are patented. Swarco Futurit has a relatively small number of patents most important ones of which are world wide. All respondents downplayed long term importance of patents for the firm for a number of reasons. Both Mr. Silhengst and Mr. Hofstadler said that patents are expensive to maintain for a relatively small company like Swarco Futurit, and that the life cycle of the products is getting shorter all the time, which reduces the value of patent protection. Mr. Swarowski also stressed the fact that competitors are catching up, and patents alone are clearly insufficient to stay ahead; one must constantly innovate by improving quality and efficiency of the firm's operations and products.

Contracts are used to reduce some of the risks of cooperation. For example there is always a non-disclosure or confidentiality agreement; there are clauses about rights to the technologies and IP developed within the partnership.

Another way to reduce risks is the knowledge of relevant standards. Swarco Futurit participates in standards development in Europe, which benefits both the end users and the firm. Participation in standards development allows the company a greater

knowledge of all the requirements, and allows the product to be more compatible with the standards early on in the design phases.

Knowledge management and protection within Swarco Futurit's partnerships is implicitly the responsibility of the product managers. While there is no formal policy, this fact was repeatedly stated by the respondents. Mr. Hofstadler said that everyone is responsible for their areas and they are informed of this fact, but at the same time there is no standard. Mr. Swarowski also stated that there is *informal coordination* in relation to knowledge issues.

When asked more specifically about what knowledge is disclosed within the partnerships, the respondents stated that the communication would usually be very open, and if the partner requests for more detailed information, it would usually be provided, especially in the case of suppliers. In Mr. Silhengst's opinion this information would be used only to help Swarco Futurit and improve the quality of the components supplied.

At the same time some of the information is kept secret. Mr. Silhengst and Mr. Popp said that a complete solution is never shared, only required parameters for a concrete module, and only at the level required within this partnership. More specifically according to Walter Popp, calculations, testing methods, manufacturing details and costs are kept secret, while the final parameters are very open.

4.3. Analysis and Discussion

This section will analyze how the case matches the theoretical framework developed earlier in this paper. It will describe how the identified factors affect knowledge protection within the case company. It will note the observations that fit within the framework and the observations that require further analysis. Lastly a revised framework will be proposed.

4.3.1. Swarco Futurit Firm Specific Factors

Swarco Futurit has specific goals within every alliance. Through its supplier partnerships Swarco Futurit attempts to access high quality components fitting very specific requirements. Through customer partnerships it attempts gain access to larger sales networks and to increase the scale of own production. These goals in the context of complex technological requirements demand a very high level of cooperation with the partner, which increases the risks of appropriation.

Swarco Futurit has an extensive experience in technological partnerships with its suppliers and customers. All interviewed directors stated that they didn't feel that the risks and consequences unintended knowledge transfer were significant. Yet Mr. Hofstadler admitted that this feeling could be overconfident, simply due to the fact that until now there have not been any serious problems.

4.3.2. Knowledge Characteristics

According to interviewees, informally there is grouping of knowledge into one that should be shared with the partner and one that shouldn't be. This matches with the recommendation of the framework.

There is also a clear understanding of what are the core competencies of Swarco Futurit. It is the design and manufacturing of plastic parts, optics and LED applications. This evaluation also matches the suggestion of the framework.

The technical knowledge related to these core competencies is both explicit (e.g. product and component specifications) and tacit (e.g. design, testing, manufacturing processes). The core explicit knowledge is held within a small number of patents and various specifications. According to the respondents the core technological know-how is deeply embedded within the company, its processes and its employees. However due

to sustained cooperation on all organizational levels of the partners, this complex know-how also becomes susceptible to unintended transfer (Das & Teng 2000).

In contrast with the framework it seems that contracts do affect protection of tacit knowledge too, although indirectly. For example Swarco Futurit's contracts have clauses have confidentiality clauses, and clauses about IPR ownership. These clauses target explicit knowledge, but at the same time they reduce the perceived partner intent to act opportunistically, which in turn reduces the need for other knowledge protection means.

The interviewees have said that in their market product life-cycles are shortening, and Mr. Swarowski has pointed out that one way to protect competitive advantage is to constantly innovate quicker than the competitors. Hence innovation will reduce the negative consequences of appropriation of older knowledge.

4.3.3. Partner Characteristics

Swarco Futurit management evaluates the perceived learning intent of their partners as quite low. The partners seem to be more focused on accessing Swarco Futurit's capabilities than actively acquiring them (Grant & Baden-Fuller 2004).

However absorptive capacity of the partners can be very high. Even though according to the interviewees, there is an obvious gap between the knowledge of Swarco Futurit and their partners, this gap is relatively small. The suppliers are often dealing with similar components and processes, and the system integrators are actually building systems based on Swarco Futurit's products. An example, when one of Swarco Futurit's suppliers actively attempted to enter the same market, illustrates this point. Even without active learning at first, simply by passive accumulation of knowledge during cooperation the partner might reach a point, when they feel like it is only a small step to achieve the same results, and this perception would prompt them to behave

opportunistically. This example supports the finding of Baughn et al. (1997) that firms tend to underestimate partner's willingness and capacity for learning.

4.3.4. Relational Characteristics

The respondents have indicated that the issue of trust within Swarco Futurit's partnerships is very important, which is why they actively engage in trust building activities (Das & Teng 1998a). There is regular communication and company visits. There is also risk taking by being open with the partner about the technical details. According to Mr. Silhengst, this openness increases trust between the organization and reduces the need for protection. During successful cooperation this reciprocal openness is gradually increasing, which improves cooperation and performance of the alliance. Reciprocity was also mentioned as a control mechanism by Das & Teng (2001b) and was considered specifically applicable in the case of bilateral contract-based alliances.

The interviewees point out the complexity of communications and relations with their suppliers and customers. In addition Swarco Futurit participates in standards development with European agencies. These complex relations create ambiguity for the potential competitors (Reed & DeFillippi 1990), and limit potential risks partner opportunism related to knowledge transfer.

4.3.5. Knowledge Transfer Mechanisms

All knowledge transfer mechanisms indicated in the framework are actively used for knowledge transfer. For tacit knowledge there are regular communications, company visits, factory tours, and for more explicit knowledge there is exchange of technical specifications.

4.3.6. Original Framework Fit

Many of the factors present in the case match the framework developed in the literature review very well. The following diagram illustrates how the findings can be placed within the original diagram (Figure 4).

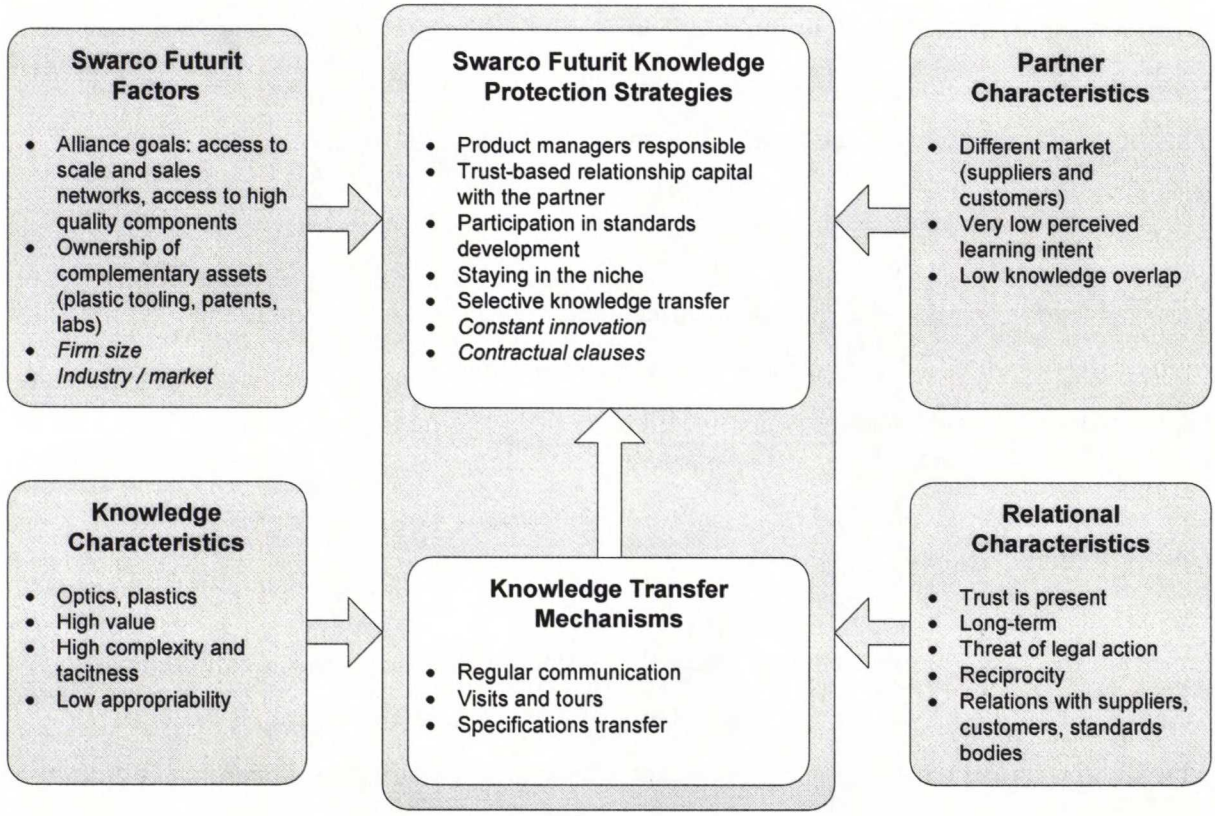

Figure 4: *Theoretical framework applied to the case of Swarco Futurit*

Nevertheless some factors don't receive much attention within the framework while they could have a significant effect on the way a firm would treat knowledge protection within a strategic alliance. Observations that are new but that nevertheless fit into the existing framework are emphasized in the figure in *italic*. These observations are discussed in more detail in the next section.

4.3.7. New Findings

Based on the interviews one can conclude, that managers in the company implicitly evaluate potential risks before deciding on the control measures, or in this case - knowledge protection mechanisms. Partner trust also plays an important role in decisions related to knowledge protection. That is why in addition to factors presented in the original framework it is important to evaluate how the managers of the focal company evaluate trust levels and potential risks, their probability and consequences. This link between trust, risk and control seems a close match to the framework proposed by Das & Teng (2001a).

Risk perception within the case was affected by various factors mentioned in the framework presented earlier in the paper, but new factors were observed too, such as contract characteristics, market structure and partner's position in this market.

Contract characteristics

Based on the case, contract clauses affect the protection levels. Even though contracts cannot directly specify tacit knowledge, they can specify enough of explicit knowledge which will make it harder to appropriate and apply tacit knowledge. According to the interviewees, contracts affect perceived partner opportunism in relation to knowledge appropriation and application. Complex contracts are in general are an important feature of non-equity alliances especially when high technology is involved and duration of cooperation is long (Argyres et al. 2007).

Market Structure / Industry Specifics

Swarco Futurit is in the niche market, with relatively few worldwide and local players. To enter the market a potential competitor has to make a significant investment in know-how, labs and manufacturing facilities. These significant barriers to entry reduce the perceived risk.

Partner's Position in the Market

Mr. Silhengst has mentioned that partner's business field affects their firm's attitude towards knowledge protection. Interestingly this finding contradicts the results of Simonin (2004) study, who found out that level of protectiveness was not affected by the competitive overlap between the partners.

Firm Size

Size of the company can affect the available protection mechanisms too. Smaller companies due to smaller scale of operations cannot afford to have employees dedicate a large portion of their time to knowledge management and protection issues. It can be speculated that similarly to the Swarco Futurit's case, where it's the product managers who manage the knowledge related to their products, in many firms knowledge management and protection responsibilities would be distributed among various employees.

Constant Innovation

Constant innovation was mentioned by the interviewees as an important mean to stay ahead and this way protect the firm's competitive advantage. In case of Swarco Futurit innovation reduces perceived negative consequences of knowledge appropriation by the alliance partners.

4.4. Revised Framework

Based on the case findings a revised framework can be proposed emphasizing the role or risk perception by the managers of the focal firm. This framework is based on integrating trust, risk and control concepts from Das & Teng (2001a) and knowledge protection concepts from Norman (2002).

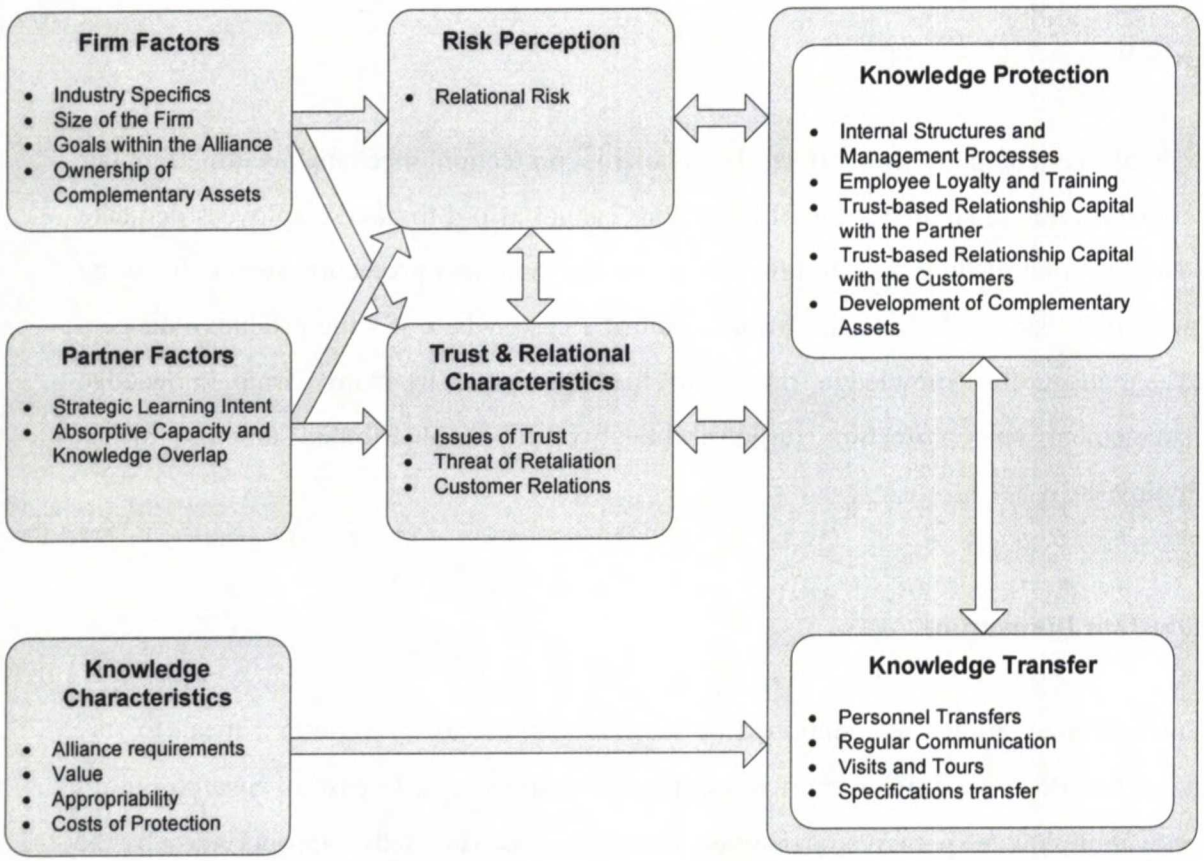

Figure 5: *Revised integrated framework of knowledge protection in a contract-based strategic alliance*

The new integrated framework adds an important dimension to understanding of knowledge protection in strategic alliances – perception of risk. Based on the cased and the extant literature (Das & Teng 2001a) this perception is affected by existing control measures (knowledge protection mechanisms) and trust toward the partner. Both trust and risk perception are also affected by the firm and partner factors, such as size of the firm, industry specifics, firms goals within the alliance, perceived learning intent of the

partner, absorptive capacity of the partner, and overlap of knowledge between the focal firm and its partner. Knowledge characteristics are also an important factor affecting choice of mechanisms both for protection and transfer.

5. CONCLUSION

This section will conclude the thesis by summarizing the literature review, the case study and showing the scientific contribution. It will also present managerial implications and suggest themes for further research.

5.1. Summary

There have been numerous studies about knowledge management in strategic alliances. However these studies have concentrated on knowledge creation, transfer and application. An important issue of knowledge protection within strategic alliances has been relatively neglected and there have been few studies about this subject. This thesis aimed to provide further insight into knowledge protection in strategic alliances, by integrating existing approaches and using an exploratory case study. The research has focused on protection of complex technological know-how in contract-based alliances, since in these circumstances knowledge is harder to protect and there are fewer means to do it.

The research problem of the thesis was:

- How can a firm protect its core competencies in the context of an international contract-based strategic alliance when complex technological know-how is involved?

The problem was broken down into sub-questions that were answered by the literature review and the case study. The review of existing literature identified a number of factors affecting knowledge protection in strategic alliances. These factors can be categorized as firm specific factors, partner specific factors, relational factors and knowledge characteristics. A framework linking these factors with knowledge transfer and protection was proposed. The issue of knowledge protection in contract-based strategic alliances differs from equity-based strategic alliances, since many equity and

hierarchical control mechanisms are not available in contract-based alliances. The fact that knowledge is complex and tacit restricts protection measures even further by making unavailable many of the formal means, such as explicit specification of knowledge in the contracts, patents or licenses,.

The case of the Swarco Futurit largely supported the framework, but a number of new factors were uncovered and incorporated into a revised framework. The major case finding was the effect of managerial risk perception on the knowledge protection approaches in the company. Other new factors were the company size, market size, industry specifics and the role of innovation.

5.2. Scientific Contribution

This paper expands the body of existing knowledge management research by identifying the importance of knowledge protection and the factors that affect it in the context of international contract-based strategic alliances. The main contribution of the integrated framework is that it stresses the importance of risk perception influence on knowledge protection, where risk perception is in turn affected by the protection measures themselves, firm characteristics, partner characteristics and trust toward the partner.

This case study also matched the claims of a number of previous works. The way various factors affected knowledge protection closely followed the proposals by Norman (2002) and Baughn et al. (1997). However the case of Swarco Futurit has shown that there are more factors that can affect knowledge protection, such as industry specifics and risk perception. Co-dependence of risk, trust and control mechanisms has been previously described by Das & Teng (2001a). A revised framework integrates these approaches and provides a base for further empirical investigation.

5.3. Managerial Implications

The framework developed in this study can provide guidance for better knowledge protection management in strategic alliances. At the moment the approach this issue in most firms is informal and unsystematic, but with the growth of the firm and growth of importance of knowledge in firms sustained competitive advantage, risks related to knowledge appropriation by alliance partners increase, and hence require a more serious attitude.

The managers should evaluate all relevant factors and risks associated with unintended knowledge appropriation in strategic alliances and device appropriate measures that limit these risks. Firm characteristics, partner and relational characteristics, knowledge characteristics, knowledge transfer needs and mechanisms, and all the associated risks should be kept in mind when engaging in strategic alliances, to be able to implement appropriate level of protection.

Depending on the affecting factors, knowledge protection can be implemented in various ways. Employees and managers involved in partner interactions should be made aware of the issue and the associated risks. Trust building techniques should be used to improve confidence level in the partner and reduce the risk of opportunism. Clear signals should be sent to the partners demonstrating readiness to act in case of opportunistic appropriation and use of important knowledge. Finally complex knowledge should be constantly developed, hence making older knowledge that was appropriated less valuable.

5.4. Further Research

Further research should advance the understanding of knowledge protection in strategic alliances. Influence of various factors should be evaluated empirically. For example such factors as the focal firm size, industry characteristics, market structure and role of innovation can be considered. These factors affect both the level of perceived risk and have a more direct effect on the availability of the protection mechanisms. Partner nationality is another factor that can conceivably affect both alliance performance and knowledge protection (Parkhe 1993b). Knowledge protection can also be evaluated in the context of risk management process stages: such as risk identification, risk assessment and risk treatment. Effect on contracts on perceived risk related to knowledge appropriation should also be considered. Another possible line of research can be about the evolution of knowledge protection strategies as the firm grows and gains experience from its alliances. Knowledge protection subject is in general under-researched and hence more case studies would greatly improve understanding of the issues involved.

6. REFERENCES

6.1. Publications

Anand, Bharat; Galetovic, Alexander (2004) How market smarts can protect property rights. *Harvard Business Review*. 82 (12) December 2004, pp. 72-79

Argyres, Nicholas S.; Bercovitz, Janet; Mayer, Kyle J. (2007) Complementarity and Evolution of Contractual Provisions. *Organization Science.* 18 (1) pp. 3-19

Astley, W. Graham; Sachdeva, Paramjit S. (1984) Structural Sources of Intraorganizational Power: A Theoretical Synthesis. *The Academy of Management Review*. 9 (1) January 1984, pp. 104-113

Bacharach, Samuel B.; Lawler, Edward J. (1981) Power and Tactics in Bargaining. *Industrial and Labor Relations Review*. 34 (2) January 1981, pp. 219-233

Barney, Jay (1991) Firm Resources and Sustained Competitive Advantage. *Journal of Management*. 17 (1) pp. 99-120

Barney, Jay (1999) How a firm's capabilities affect boundary decisions. *Sloan management review*. 40 (3) pp 137-145

Barney, Jay (2001) Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management*. 27 (6) November 2001, pp. 643-650

Baughn, C. Christopher; Johannes G. Denekamp; Stevens, John H.; Osborn, Richard N. (1997) Protecting intellectual capital in international alliances. *Journal of World Business*. 32 (2) Summer 1997, pp. 103-117

Beamish, P. W. (1987) Joint ventures in LDCs: Partner selection and performance. *Management International Review*. 27, pp. 23–37.

Buckley, P. J.; Casson M. C. (1998a) Analyzing Foreign Market Entry Strategies: Extending the Internalization Approach. *Journal of International Business Studies*. 29 (3) 3rd Qtr. 1998, pp. 539-561

Buckley, P. J.; Casson M. C. (1998b) Models of the Multinational Enterprise. *Journal of International Business Studies*. 29 (1) 1st Qtr. 1998, pp. 21-44

Das, T. K.; Teng, Bing-Sheng (1996) Risk Types and Inter-Firm Alliance Structures. *Journal of Management Studies*. 33 (6) pp. 827-843

Das, T. K.; Teng, Bing-Sheng (1998a) Between Trust and Control: Developing Confidence in Partner Cooperation in Alliances. *The Academy of Management Review*. 23 (3), July 1998, pp. 491-512

Das, T. K.; Teng, Bing-Sheng (1998b) Resource and Risk Management in the Strategic Alliance Making Process. *Journal of Management*. 24 (1), pp. 21-42

Das, T. K.; Teng, Bing-Sheng (2000) A Resource-Based Theory of Strategic Alliances. *Journal of Management*. 26 (1), pp. 31–61

Das, T. K.; Teng, Bing-Sheng (2001a) Trust, Control, and Risk in Strategic Alliances: An Integrated Framework. *Organization Studies*. 22 (2), pp. 251-283

Das, T. K.; Teng, Bing-Sheng (2001b) A risk perception model of alliance structuring. *Journal of International Management*. 7 (1) Spring 2001, pp. 1-29

Das, T. K.; Teng, Bing-Sheng (2003) Partner analysis and alliance performance. *Scandinavian Journal of Management*. 19 (3), September 2003, pp. 279-308

Dierickx, Ingemar & Cool, Karel (1989) Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science*. 35 (12) December 1989, pp. 1504-1511

Eunni R.; Kasuganti R.; Kos A. (2006) Knowledge Management Processes in International Business Alliances: A Review of Empirical Research, 1990-2003. *International Journal of Management*. 23 (1), pp. 34-42.

Fahy, John (2000) The resource-based view of the firm: some stumbling blocks on the road to understanding sustained competitive advantage. *Journal of European Industrial Training*. 24/2/3/4, pp. 94-104.

Folkesson, Mia (2006) Social Capital and Strategic Alliance Risk Reduction, The impact of social relationships on alliance personnel's perception of risk and firm level risk reduction. Master's Thesis, *Helsinki School of Economics*

Ghauri, Pervez N.; Grønhaug, Kjell (2002) Research Methods in Business Studies. *Pearson Education Limited*

González-Alvarez, Nuria; Nieto-Antolín, Mariano (2005) Protection and internal transfer of technological competencies - The role of causal ambiguity. *Industrial Management & Data Systems*. 105 (7) pp. 841-856

Grant, Robert M.; Baden-Fuller, Charles (2004) A Knowledge Accessing Theory of Strategic Alliances. *Journal of Management Studies*. 41 (1) pp. 61-84

Grant, Robert M. (1996) Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal*. 17 (Special Issue: Knowledge and the Firm) Winter 1996, pp. 109-122

Green, S. G.; Welsh, M. A. (1988) Cybernetics and Dependence: Reframing the Control Concept. *The Academy of Management Review*. 13 (2) April 1988, pp. 287-301

Gulati, Ranjay; Singh, Harbir (1998) The Architecture of Cooperation: Managing Coordination Costs and Appropriation Concerns in Strategic Alliances. *Administrative Science Quarterly*. 43 (4) December 1998, pp. 781-814

Gulati, Ranjay (1995) Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances. *The Academy of Management Journal*. 38 (1) February 1995, pp. 85-112

Gummesson, Evert (2003) All research is interpretive! *The Journal of Business and Industrial Marketing*. 18 (6-7) pp. 482-492

Gummesson, Evert (2005) Qualitative research in marketing. *European Journal of Marketing*. 39 (3-4) pp. 309-327

Hagedoorn, John; Hesen, Geerte (2007) Contract Law and the Governance of Inter-Firm Technology Partnerships - An Analysis of Different Modes of Partnering and Their Contractual Implications. *Journal of Management Studies,* 44 (3) pp. 342-366

Hall, Richard (1992) The strategic analysis of intangible resources. *Strategic Management Journal*. 13, pp. 135-44

Hall, Richard (1993) A Framework Linking Intangible Resources and Capabiliites to Sustainable Competitive Advantage. *Strategic Management Journal*. 14 (8) November 1993, pp. 607-618

Hamel, Gary (1991) Competition for Competence and Inter-Partner Learning Within International Strategic Alliances, *Strategic Management Journal*. 12 (Special Issue: Global Strategy) Summer 1991, pp. 83-103

Hamel, Gary; Doz, Yves L.; Prahalad, C. K. (1989) Collaborate with Your Competitors and Win. *Harvard Business Review*. 67 (1) January - February 1989, pp. 133-139

Harrigan, K. R. (1988) Joint Ventures and Competitive Strategy. *Strategic Management Journal*. 9 (2) March - April 1988, pp. 141-158

Hennart, Jean-Francois (1988) A transaction costs theory of equity joint ventures. *Strategic Management Journal*. 9 (4) July - August 1988, pp. 361-374.

Hoffmann W. H.; Schlosser R. (2001) Success Factors of Strategic Alliances in Small and Medium-sized Enterprises - An Empirical Survey. *Long Range Planning*. 34 (3) June 2001, pp. 357-381

Inkpen, Andrew C.; Beamish, P. W. (1997) Knowledge, Bargaining Power, and the Instability of International Joint Ventures. *The Academy of Management Review*. 22 (1) January 1997, pp. 177-202

Inkpen, Andrew C. (1998) Learning and knowledge acquisition through international strategic alliances. *Academy of Management Executive*. 12 (4), pp. 69-80

Jolly, Dominique R. (2004) Bartering technology for local resources in exogamic Sino-foreign joint ventures. *R&D Management*. 34 (4) pp. 389-406

Kale, Prashant; Singh, Harbir; Perlmutter, Howard (2000) Learning and Protection of Proprietary Assets in Strategic Alliances: Building Relational Capital. *Strategic Management Journal*. 21 (3) Special Issue: Strategic Networks, March 2000, pp. 217-237

Khanna, Tarun; Gulati, Ranjay; Nohria, Nitin (1998) The Dynamics of Learning Alliances: Competition, Cooperation, and Relative Scope. *Strategic Management Journal*. 19 (3) March 1998, pp. 193-210

King, Adelaide Wilcox; Zeithaml, Carl P. (2001) Competencies and Firm Performance: Examining the Causal Ambiguity Paradox, *Strategic Management Journal*. 22 (1) January 2001, pp. 75-99

Kogut, Bruce; Zander, Udo (1993) Knowledge of the Firm and the Evolutionary Theory of the Multinational Corporation. *Journal of International Business Studies*. 24 (4), pp. 625-645

Kogut, Bruce (1988) Joint Ventures: Theoretical and Empirical Perspectives, *Strategic Management Journal*. 9 (4) July - August 1988, pp. 319-332

Lorange, P. (1997) Black-box protection of your core competencies in strategic alliances. In P. Beamish and J. Killings (eds.), *Cooperative Strategies, European Perspectives*. New Lexington Press, San Francisco, CA, pp. 59-73

Luo, Yadong (2002) Contract, Cooperation, and Performance in International Joint Ventures. *Strategic Management Journal*. 23 (10) pp. 903-919

Mowery, David C.; Oxley, Joanne E.; Silverman, Brian S. (1996) Strategic Alliances and Interfirm Knowledge Transfer. *Strategic Management Journal*. 17 (Special Issue: Knowledge and the Firm) Winter 1996, pp. 77-91

Oliver, Christine (1997) Sustainable Competitive Advantage: Combining Institutional and Resource-Based Views. *Strategic Management Journal*, 18 (9) October 1997, pp. 697-713

Parkhe, Arvind (1993a) "Messy" Research, Methodological Predispositions, and Theory Development in International Joint Ventures. *The Academy of Management Review*. 18 (2) April 1993, pp. 227-268

Parkhe, Arvind (1993b) Partner Nationality and the Structure-Performance Relationship in Strategic Alliances. *Organization Science*. 4 (2) May 1993, pp. 301-324

Parkhe, Arvind (1993c) Strategic Alliance Structuring: A Game Theoretic and Transaction Cost Examination of Interfirm Cooperation. *The Academy of Management Journal*. 36 (4) August 1993, pp. 794-829

Peng, M. (2001) The resource-based view and international business. *Journal of Management*. 27, pp. 803-829

Poppo, Laura; Zenger, Todd R (2002) Do Formal Contracts and Relational Governance Function as Substitutes or Complements. *Strategic Management Journal*. 23 (8) pp. 707-725

Reed, R.; DeFillippi, R. J. (1990) Causal Ambiguity, Barriers to Imitation, and Sustainable Competitive Advantage. *Academy of Management Review*. 15 (1) pp. 88-102

Roehl, Thomas W.; Truitt, J. Frederick (1987) Stormy Open Marriages are Better: Evidence from US, Japanese and French Cooperative Ventures in Commercial Aircraft. *Columbia Journal of World Business*. 22 (2) Summer 1987, pp. 87-95

Simonin, Bernard L. (1999) Ambiguity and the process of knowledge transfer in strategic alliances, *Strategic Management Journal*. 20 (7) July 1999, pp. 595-623

Simonin, Bernard L. (2004) An empirical investigation of the process of knowledge transfer in international strategic alliances. *Journal of International Business Studies*. 35 (5), September 2004, pp. 407-427

Teece, David J. (1998) Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets. *California Management Review*. 40 (3) Spring 1998, pp. 55-79

Wernerfelt, Birger (1984) A Resource-Based View of the Firm. *Strategic Management Journal*. 5 (2) April - June 1984, pp. 171-180

Williamson, Oliver E (1975) Markets and Hierarchies: Analysis and Antitrust Implications. *Free Press, New York*

Williamson, Oliver E. (1985) The Economic Institutions of Capitalism. *The Free Press, New York*

Williamson, Oliver E. (2002) The Theory of the Firm as Governance Structure: From Choice to Contract. *Journal of Economic Perspectives*. 16 (3) Summer 2002, pp. 171-195

Yan, Aimin; Gray, Barbara (1994) Bargaining Power, Management Control, and Performance in United States-China Joint Ventures: A Comparative Case Study. *The Academy of Management Journal*. 37 (6) December 1994, pp. 1478-1517.

Yin, Robert K. (2003) Case Study Research, Design and Methods. 3rd Edition. *Sage Publications, Inc. Thousand Oaks, London, New Delhi.*

Yoshino, M. Y.; Rangan, U. S. (1995) Strategic alliances: an entrepreneurial approach to globalization. *Harvard Business School Press, Boston*

Zhao, Minyuan (2006) Conducting R&D in Countries with Weak Intellectual Property Rights Protection. *Management Science*. 52 (8) August 2006, pp. 1185-1199

6.2. Other Sources

Silhengst, Franz; Hofstadler, Friedrich Peter; Otto, Alexander (2001) Optical element for traffic signs, display panels or the like. *United States Patent*. Swarco, Futurit Verkehrssignal (US), No 6249375. Available from http://www.freepatentsonline.com/6249375.html and http://www.patentstorm.us/patents/6249375.html

7. APPENDIX: INTERVIEW GUIDE

Introduce the Interview

- Thank the interviewee for agreeing to the interview
- How much time do you have for the interview?
- This conversation will be recorded, is that OK?
- Can I use your name in the study?
- I will provide you with the case report, and if you are interested with the whole paper.

Introduce the Research

Knowledge protection in the international contract-based strategic alliances:

- International Alliances / Partnerships – long term cooperation
- No ownership or equity involved
- Knowledge that is important but that is hard to define, hard to patent, hard to document

Background of the Interviewee

- What is your position in the company?
- What are your tasks?
- How long have you been in the company?

Firm Related Characteristics

- What are the main products of the company?
- What are the core competencies of the company, can you provide examples?
- What type of knowledge is used in your company, can you provide examples?
- Do some important knowledge assets in your company require other assets to be used? How does having complementary assets affect your knowledge protection strategies?
- Does your company act tough with competitors (legal protections, tough price competition, marketing)?
- Do you show to your partners that you are ready to defend your interests?

Alliance and Contract Related Questions

- What kind of international partnerships does your firm have?
- What are the reasons in your company for contract-based strategic alliances instead or equity-based strategic alliances?
- What kind of knowledge / technology related terms do you have in the contracts?
- Do contracts change over time? Does your approach to contracts with the same partner change over time? If yes how?
- How does your firm evaluate performance in the alliance?

Knowledge Related Characteristics

- What kind of knowledge is usually involved in your alliances? Examples?

- What value is assigned to the knowledge involved in the alliance?

Partner Related Characteristics

- Are partner's intentions evaluated?
- Do you evaluate what resources the partner is contributing to the alliance?
- Do previous alliances with the partner affect your knowledge transfer processes?

Relational Characteristics

- Are issues of trust managed in your alliances?
- Are social relations in any way managed in your alliances?
- How do the relations with the partner change?
- Do your relations with the end customers affect your relations with the technology partners

Knowledge Transfer Mechanisms

- How do you exchange knowledge with your partner?
- Does your company formally plan knowledge transfer related processes for the alliance?
- Are there special persons from your firm dedicated to facilitating and managing knowledge transfer?

Knowledge Protection Strategies

- Does your company evaluate risks related to the transfer technological know-how?
- Does your company have ready-made routines for strategic alliances where learning is involved? Or is it different for every alliance?
- How does your company structure the cooperation with the partner?
- How do your protection measures change with the alliance age?
- Are there persons dedicated to managing knowledge protection?