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BALANCING KNOWLEDGE SHARING AND PROTECTION IN COLLABORATIVE INNOVATION – THE ROLES AND DYNAMICS OF CONTRACTS, IPRs, AND TRUST

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ABSTRACT

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This thesis familiarizes on the dilemma of knowledge sharing and protection in collaborative innovation between separate firms. Firms should provide their partners with all needed knowledge, but on the other hand they need to make sure they don't lose knowledge that is vital for their own business. Firms have many possibilities to protect knowledge from leaking out. This thesis studies the roles and dynamics of intellectual property rights, particularly patents and trade secrets, and contracts as knowledge protection mechanisms that enable knowledge sharing. The use of these protective mechanims has effects on trust between the partners and therefore also on the knowledge sharing willingness. If not enough knowledge is shared between the partners, the collaborative innovation is set to fail in the results. Firms therefore have to find a balance between sharing and protection of knowledge. The roles and dynamics of contracts, trust and IPRs are studied empirically in four cases of collaborative innovation between two firms. The data is collected by interviews in a large Finnish forestry industry company.

Keywords: Collaborative innovation, Knowledge, Sharing, Protection, Contract, Trust, Intellectual property rights

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Pro gradu – tutkielman tavoitteena on tutkia, miten yritykset tasapainoilevat tiedon jakamisen ja suojaamisen välillä innovaatioyhteistyöprojekteissa, ja miten sopimukset, immateriaalioikeudet ja luottamus voivat vaikuttaa tähän tasapainoon. Yritysyhteistyössä yritysten täytyy jakaa tarpeellista tietoa kumppanilleen, mutta toisaalta niiden täytyy varoa, etteivät ne menetä ydinosaamiseensa kuuluvaa tietoa ja kilpailuetuaan. Yrityksillä on useita keinoja tietovuodon estämiseen. Tutkielmassa keskitytään patenttien, sopimusten ja liikesalaisuuksien käyttöön tietoa suojaavina mekanismeina. Kyseiset suojamekanismit vaikuttavat luottamukseen kumppaneiden välillä, ja täten myös näiden halukkuuteen jakaa tietoa kumppanilleen. Jos kumppanit eivät jaa tarpeeksi tietoa toisilleen, voi yhteistyö epäonnistua. Sopimusten, immateriaalioikeuksien ja luottamuksen rooleja ja vuorovaikutusta tutkitaan kahdenvälisissä yhteistyöprojekteissa. Tutkielmassa esitellään neljä case-esimerkkiä, jotka on koottu suomalaisen metsätoimialan yrityksen haastatteluista.

Hakusanat: Innovaatioyhteistyö, tieto, jakaminen, suojaaminen, sopimus, luottamus, immateriaalioikeudet

FOREWORD

Writing of this thesis has been interesting and challenging. During the writing process I had the opportunity to be part of a research team at Technology Business Research Center and learn how academic research is combined with practice. In the beginning of this thesis process I was perhaps more clueless than ever before in my studies, but now I realize that the learning process has been successful and I even got inspired by the research.

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ABREVIATIONS

CL	Commerce law 1987/355
ECA	Employment Contracts Act 2001/55
EU	European Union
EPO	European Patent Office
KBV	Knowledge-Based View
IP	Intellectual Property
IPR	Intellectual Property Right
LLA	Law of Legal Acts 1929/228
NDA	Non Disclosure Agreement
PA	Patents Act
PC	Penal Code 1889/39
RBV	Resource-Based View
TCE	Transaction Cost Economics
TRIPS	Agreement on Trade Related Aspects of Intellectual Property Rights
UTPA	Unfair Trade Practices Act 1978/1061
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

1 INTRODUCTION

This study examines the balancing of knowledge sharing and protection in collaborative innovation by means of intellectual property rights, trust, and contracts. It is part of the InnoSpring Access –project of Technology Business Research Center at Lappeenranta University of Technology.

1.1 Background of the study

Due to the highly competitive and innovative business environment, firms choose to increasingly rely on collaborative efforts (Ring et al. 2005). This has especially been the case in research and development of new products and innovations for the last decades (Hertzfeld et al. 2006, Ring et al. 2005). Firms decide to collaborate for multiple reasons, getting access to external knowledge through collaborating with firms with complementary knowledge and resources being among the most important reasons (Blomqvist et al. 2005; Hoecht & Trott 2006; Teece 2000). In the tight competitive situation that many firms face these days, it is important to gain some kind of added value that will help the particular firm to stand out from its competitors. One way to gain this kind of competitive advantage is to collaborate with partners that can help each other to gain something bigger, better or just be faster than the rest.

The objectives of collaboration can vary greatly. They could be cost reduction, exploitation of economies of scale, organizational learning, development of new skills, the sharing or minimizing of risks, access to new markets and new technologies, shutting out competitors from markets or particular activities etc. (Argandoña 1999). Several studies have however identified sharing of knowledge (e.g. technology, know-how and organizational capability) as the dominant objective of collaborative

innovation (Inkpen & Crossan 1995; Kale et al. 2000; Larsson et al. 1998). There is a view of alliances as vehicles for organizational learning in which collaborative innovation is presumed to be motivated by the desire to acquire knowledge from the partner. Grant & Baden-Fuller (2004) argue however that the primary advantage of collaboration is *accessing* rather than *acquiring* knowledge. In today's global market sustaining competitive advantage requires knowledge assets (Teece 2000 p. 26). That is why creating new knowledge and innovations is usually an objective of collaborative innovation, for which existing knowledge assets of the partners need to be used optimally. The objective of the collaboration might not be the same for all the firms in the collaboration. Even if the objectives are different they can support each other and make the collaboration succeed.

Collaborative innovation between firms always includes certain amount of risk because it involves two or more separate firms. Collaborative innovation projects are also opportunities to learn. The positive sides of learning from partner are understandable since, for example, the costs of doing it alone could be preventing. However, the other partner could be more efficient in learning from the other and create bargaining power in the collaborative innovation negotiations. (Baughn et al. 1997) Therefore some sort of control is needed. Internalisation, that means doing everything alone, or making inflexible and strict contracts offer control over risks, such as unintended knowledge leakage (Williamson 1993). However, both open collaboration with a partner and internalisation have their own challenges in attaining new knowledge and through that some kind of competitive advantage.

1.2 Definitions

Appropriability regime

The term *appropriability* is used to describe the ease of imitation. An innovators right to his inventions is not strong enough and needs to be protected. “Appropriability is a function both of the ease of replication and the efficacy of intellectual property rights as a barrier to imitation (Teece 2000 p.19)." *Appropriability regime* is defined as the chosen methods, and their efficacy, that are used to protect the innovation from expropriation. Depending on the chosen methods, an appropriability regime can be weak or strong in protecting the innovator's right to the innovation.

Collaborative innovation

Collaborative innovation is defined as collaboration between two or more different firms in order to achieve competitive advantage by creating new innovations that might not be possible alone. Collaborative innovation can exist in multiple levels: it can exist between firms, projects, groups, or individuals.

Competitive advantage

A firm's competitive advantage is defined as a value creating strategy that is not simultaneously implemented by any other current or potential competitor, and that other competitors are unable to duplicate (Barney 1991). In an intellectual property point of view competitive advantage could be, for example, the benefit that comes from either inventing and owning, or having the right to exclusively use the value creating asset.

Contractual governance

Contractual governance is defined as a ways of formal control to control the risks of collaborative innovation (such as knowledge leak, or uncertainty) by contracts. Contractual governance helps the firms to prepare for changes in

the business environment by creating the agreed upon boundaries of the collaboration.

Governance

Governance is defined as combination of legal and social control mechanisms for coordinating the partners' resource contributions and responsibilities in the collaboration, and the allocation of outcomes (Todeva & Knoke 2005).

Innovation

Schumpeter (1934) defined an economic innovation as introduction of a new good that the customers are not yet familiar with. An innovation could be for example a new method of production or new material that brings economic benefit for the innovator (Schumpeter 1934). Increase in innovation rates improves the state of the whole country's economy. An innovation can have both radical and incremental changes to products, services, or processes. Innovations are especially typical in the areas of business and technology and an objective of innovative activities can be seen as being solving a problem. Innovation does not have to be totally new.

Intellectual property

Intellectual property has some similarities to the concept of intangible assets in accounting. Intellectual property is however narrower than intangible assets. It includes intellectual property rights, such as patents, trademarks, and copyrights and so on, but does not include regulatory licenses for example. On the other hand intellectual property involves all the intangible knowledge created through collaborative innovation, which makes it broader than intangible assets in accounting. (Cloutier & Gold 2005)

Intellectual property rights

Intellectual property rights (IPRs) can offer protection over one's inventions. The intellectual property right is created in some cases, as the invention is created, and in some cases, it needs to be applied for. Intellectual property right can also be seen as gained through continued use. Intellectual property rights include patent, copyright, trademark, petty patent, utility model etc. In broader definition, also trade and business secrets can be called intellectual property rights. The objective of IPRs is to create an exclusive right for the holder to use the invention.

Relational governance

Relational governance is a view that emphasizes that the governance of interfirm relationships involves more than contracting. Interfirm exchanges emerge from the values and processes found in social relationships. In relationally governed collaborations the enforcement of obligations, promises, and expectations occurs through social processes that promote flexibility, solidarity, and knowledge exchange. (Poppo & Zenger 2002)

1.3 Overview of the literature

Contributions to the literature of research partnerships and knowledge sharing within have been made by scholars from a number of disciplines. Knowledge sharing and protection in research partnerships are of interest for also other disciplines apart from legal, social and management perspectives that are focused on in this study, like technology policy, economical, social science and public administration. (Hagedoorn et al. 2000) This chapter will introduce some studies of knowledge sharing and protection within the context of research partnerships. Table 1 summarizes the main studies related to the topic of this study.

Table 1. Comparison of the previous related research (3 pages)

Author	Article & Journal	Context	Research question	Theories	Key concepts	Methodology	Main findings
Adler 2001	Market, hierarchy, and trust: The knowledge economy and the future of capitalism, Organization Science	Discussion and comparison of the different coordination mechanisms: price, authority, and trust for knowledge-based assets	What are the current waves of changes in the organizational forms and how should they be interpreted?	Economic, and organizational theory	Knowledge, trust, marktet, hierarchy, capitalism	Theoretical	There are ideal-typical forms of organization: market/price, hierarchy/authority, and community/trust
Baughn et al., 1997	Protecting intellectual capital in international alliances, Journal of World Business	Protecting of intellectual capital in international collaboration, Framework for assessing and implementing the process of learning, sharing and protecting	What is the relationship between risk, trust and control in relation to knowledge leakage?	Not available	Learning, Intellectual property, Governance, Trust	Qualitative, interviews with over 200 alliance sponsors from North America, Western Europe and Asia	Ongoing interaction could reduce the fears of partners and increase trust
Blomqvist et al., 2005	Playing the collaboration game right – balancing trust and contracting, Technovation	Trust, contracts and intellectual property in asymmetric R&D collaboration	How can trust and contracting be balanced in asymmetric R&D collaboration?	Not available	Trust, Contract, Asymmetry, R&D collaboration	Qualitative, Case study of asymmetric collaborative innovation project	Trust and contracts can be seen as complementary modes of governance, not as alternatives
Bönte & Keilbach, 2005	Concubinage or marriage? Informal and formal cooperations for innovation, International Journal of Industrial Organization	Formal and informal coopera-tions between vertically related firms	What are the determinants of firms' choices between different modes of vertical R&D cooperation?	Not available	R&D cooperation modes, Spillovers, Appropriabili-ty, Innovation	Quantitative, Data of formal and informal knowledge exchange between vertically related firms	Innovation dynamics and absorptive capacity seem to be drivers of vertical R&D cooperation

Author	Article & Journal	Context	Research question	Theories	Key concepts	Methodology	Main findings
Heiman & Nickerson, 2004	Empirical evidence regarding the tension between knowledge sharing and knowledge expropriation in collaborations, Managerial and Decision Economics	Knowledge management practices make knowledge more transparent which increases opportunism hazards that can be safeguarded against via governance choice	How can firm manage the transfer of agreed-upon knowledge in their collaborations while avoiding expropriation of other economically valuable knowledge?	KBV, TCE	Knowlede transfer, opportunism, governance, tacitness, problem-solving complexity	Data from Cooperative Agreements and Technology Indicators (CATI) database, interviews, and survey	Managerial awareness of the existence of the effects of knowledge tacitness and problem-solving complexity on costs, knowledge sharing, and value creation is critical in achieving the goals.
Hoecht & Trott, 1999	Trust, risk and control in the management of collaborative technology deve-lopment, Inter-national Journal of Innovation Management	Conceptual model. The risk of knowledge leakage during technological collaborations	What is the relationship between risk, trust and control in relation to knowledge leakage?	Not available	Trust, Risk, Research management, Information leakage	Theoretical	Individuals, their autonomy and trust in them have a key role.
Hoecht & Trott, 2006	Innovation risks of strategic outsourcing, Technovation	Innovation related risks in strategic outsourcing	How can the outsourcing firms minimize the outsourcing-related risks?	Not available	Trust, Control, Innovation	Theoretical	Firms should be very cautious in sharing out knowledge about their competitive advantage.
Hurmelin-na-Laukkanen et al., 2007	The Janus-face of the appropriability regime in the protection of innovations: Theoretical re-appraisal and empirical analysis, Technovation	The Janus-faced nature of the appropriability regime in protecting innovations: the trade off between protecting and sharing of knowledge	How does the Janus-faced nature of appropiability regime affect its formation?	Strategy research, RBV, DCV, KBV	Approriabili-ty regime, Tacit knowledge, Intellectual property, Open innovation	Quantitati-ve, survey of 299 Finnish companies	An intermediate position in appropriability issues might be the most effective strategy, and could provide the firm with more control and alternatives to react proactively to opportunities

Author	Article & Journal	Context	Research question	Theories	Key concepts	Methodology	Main findings
Inkpen & Currall, 2004	The coevolution of trust, control and learning in joint ventures, Organization Science	Evolution of trust, Control and learning In joint ventures	How does the relationship between trust and control affect collaborative processes?	Not available	Trust, Control, Learning	Theoretical	The level of interfirm trust is a determinant of the control mechanisms that evolve in collaboration
Klein Woolthuis et al., 2005	Trust, contract and relationship development, Organization Studies	Trust vs. contracts, and the relationship between trust and contracts	How trust and formal contract are related?	TCE, Contract theory,	Trust, Contracts, Control	Longitudinal case-studies	Trust and contracts need not be opposing alternatives, trust and contracts can well be complements because contracts are in practice often not used in strictly legal fashion with opportunism as a central point
Poppo & Zenger, 2002	Do formal contracts and relational governance function as substitutes or complements? Strategic Management Journal	Managers have to use different governance mechanisms in interorganizational relationships that match known exchange hazards	Do contracts and relational governance work as subsitutes or complements?	TCE	Outsourcing, trust, contracts, relational governance	Empirical method: survey	The importance of contracts may decline with time as, as trust emerges in a relationship
Teece, 1986	Profiting from technological innovation: implications for integration, licensing and public policy, Research Policy	Innovating firms often fail to obtain significant economic returns from innovation	Why a fast second or even a slow third might outperform the innovators?	Not available	Innovation, intellectual property, appropriability regime	Theoretical	Innovating firms without the requisite manufacturing and complementary assets may die even if they are best at innovation

Research partnerships have been studied in various researches in the management perspective (see Hagedoorn et al. 2000). A lot of research has been made on alliance planning, formation and governance (See for example Ferguson et al. 2005; Ring et al. 2005). Also the role of trust in collaboration has been studied by number of scholars. (See for example Inkpen & Currall 1998 and 2004, Hoecht & Trott 1999, 2006, Baughn et al. 1997, Blomqvist et al. 2005.)

Hoecht and Trott (1999) studied theoretically the trade-off between access to knowledge in technology based research and development and the risk of losing sensitive information to competitors. They concentrated on the risk of knowledge leakage and the relationship of that risk with trust and legal control mechanisms. According to their study, different technology development strategies can be placed on inward-looking – outward-looking axis, where the need for legal and social control can be determined on the chosen strategy's place on the axis. They argue that the risk in collaborative innovation cannot be controlled solely by management approaches and legal contracting, but need to be operated by social control and the development of mutual trust between the firms. A more recent paper by Hoecht and Trott (2006) discusses the risk of knowledge leakage and problems with innovating in collaborative innovation. In their paper Hoecht and Trott find that there is a reason for sharing knowledge. On the other hand firms must not lose one's core skills and competitive advantage to competitors in the process of collaboration. They emphasize on the important role of trust in the management of these collaborative relationships. Legal contracts, though necessary, are criticized for the lack of flexibility and lengthy and expensive contract negotiations.

From legal perspective, collaboration can be seen managed by formal contracts (see for example Lyons & Mehta 1997; Ferguson et al. 2005). Formal contracts are needed for example to determine the collaborative relationship, to prepare for unstable conditions, to divide tasks and to allocate results. Unwritten principles of law enable the firms in collaborative innovation

to contract in the ways that suit the requirements of the collaborative innovation the best. However, the same principles insist loyalty between the partners, especially in collaborative projects that are seen long-haul in legal perspective. There is automatic legal control in the Finnish labor law about employee's loyalty towards the employer and in the contract law about partner's loyalty towards its sub-contractors or other business partners. Additionally there are agreements than can be made within the firm and with collaborative partners.

Baughn et al. (1997) have also found the innovation dilemma that was mentioned earlier with Hoecht and Trott. Also Baughn et al. studied alliance partners' problems in trying to balance protection of intellectual assets with the information sharing needed to carry out the tasks for which the alliance was created for. They are concerned about the negative outcomes of possible knowledge leakage and state that in order to succeed collaborative innovation needs to balance learning and knowledge sharing with intellectual capital. The authors use research data including interviews with alliance sponsors from three continents. Based on the data they conclude that firms have problems in regulating the knowledge and skills outflows that are due to firm's inattentiveness to the learning potential of its partners as well as over-reliance on structural and contractual means of protection. They state that in managing and controlling collaborative innovation the firm should use human resource practices and be more active in monitoring knowledge flows. They emphasize on the role of trust in the collaboration relationships and distinct between interpersonal and interfirm trust.

Trust and contracts tend to have a label of substitutes in some older studies, but in recent studies criticism towards that view has arisen. Today many scholars and researchers find trust and contracts as complements. Blomqvist et al. (2005) studied the roles of trust and contracts in asymmetric R&D collaboration. They recognized the critical role that intellectual capital and intellectual property rights have in the collaboration. In order to gain

intellectual property through collaborative innovation the partners need to have trust in each other. However, contracts are the only safe way to allocate the results that legally belong to the creator. Although contract may be the only safe way of protecting the intangibles, it can hardly be totally waterproof without being inflexible. Trust can be seen as the other side of the coin of a legally binding contract.

Trust can ease the communication in and between the firms. Tsai and Ghoshal (1998) discover in their empirical paper that social capital – social interaction, trustworthiness and shared vision have significant effects on resource exchange, and they therefore promote innovative activity. This means that if the firms in collaboration are sincere and they have the same goals and hopes from the collaboration they will feel more willing to share their knowledge in order to achieve those mutual goals.

Some previous studies have looked at formal and informal control more carefully as critical choice of governance for the collaborative innovation. Bönte and Keilbach (2005) studied the choice between formal and informal control. Based on their data of German innovating firms they state that informal vertical cooperation is more common form of cooperation than the formal one. Formal cooperation is also usually associated with higher costs than informal cooperation. Informal cooperation means in their study that the firms informally exchange knowledge without having formal contracts or other formal ties to each other. The firms that prefer formal cooperation are typically also engaged in informal cooperation as well. Interestingly they found that appropriability is a key determinant in cooperative efforts. If a firm is able to protect its innovations by protection mechanisms like secrecy, complexity and lead time, it will be more likely to cooperate in the first place. Even the incoming knowledge spillovers were not as important determinants for collaboration as the protection issues.

When it comes to formal and informal governance, the word appropriability regime usually comes up. This is what is meant by the protective mechanisms for innovations. The protection is still not always depended on the internal control. It can be argued that external factors affect to firm's ability to protect its knowledge assets. Teece (1986) was one of the first researchers to come up with an idea of appropriability regime. An innovator's right to his invention is not strong enough and needs to be protected. It depends on external factors if the innovator is able to capture the profits from the innovation. The important dimensions of an appropriability regime are according to Teece the nature of the technology, and the efficacy of legal mechanisms of protection. (Teece 1986)

The basic elements of appropriability such as knowledge tacitness or explicitness as well as the legal means such as patents and copyrights could be seen as double-edged sword according to Hurmelinna et al. (2007). Appropriability regimes increase protection of intellectual capital but also make the transfer of knowledge more difficult and increase challenges in learning and utilizing the knowledge within the collaboration. The purpose of the study by Hurmelinna et al. was to analyze the characteristics of the appropriability regime and to concentrate on issues that had been overlooked before. They compared the pluses and minuses of weak and strong appropriability regimes. The study was a review of previous research and the empirical data was collected from Finnish industrial firms. In the study it was found that a strong appropriability regime enhanced knowledge sharing. This can be explained by two facts: first, the intellectual property of the company is protected, which increases the willingness to collaborate and second, the existence of the IPR protection suggests that relevant knowledge exists in explicit form, that is easier to transfer among partners.

1.4 The objective of the study

The objective of the study is to examine how a firm can manage its collaborative innovation between sharing and protecting of knowledge assets. This study familiarizes with three important factors affecting collaborative innovation: trust, contracts and intellectual property rights. The purpose is to find out how the role and dynamics of these three factors affect to the knowledge sharing between firms.

This study concentrates mainly on collaborative innovation projects and the sharing of knowledge within the participating project firms. Here knowledge protection is defined as the protection of all knowledge of the firm that is valuable in business perspective. It could be technical innovations within the firm or innovations created with a partner. It could also be the tacit knowledge of the employees. The use of intellectual property rights and different contracts are examined. Out of intellectual property rights, patents and trade secrets have been chosen to be studied because they are the most important IPRs for the collaborative innovation examined in this study. Although trade secrets are traditionally not counted as intellectual property rights in the Finnish discussion of IPRs, they are still definitely a form of intellectual property protection which is why they are discussed and defined also as one form of IPRs here. Also the effects of trust and labor legislation are being concentrated on. Other means of protection, such as technical means of preventing knowledge from leaking out of the firm, will not be discussed in this study. The means of protection dealt in this study are chosen because of their effects on knowledge sharing propensity.

Point of view is mainly in dual partnerships, which means collaboration of two partners. Empirical research is made to test how an innovative globally functioning firm finds these factors affecting the collaborative innovation within forest industry. The objective is to contribute information to the firms on

how they could improve the knowledge sharing without fear of knowledge expropriation.

Contribution to the literature is the contracts, IPRs and trust dealt together in relational control and legal perspective. The main idea is to examine how legal control and relational control can be combined in the governance of a collaborative innovation. There is a research gap in the literature of combining trust, contracts and intellectual capital in a research on how to balance between sharing and protection. This study will try to tackle some of that gap.

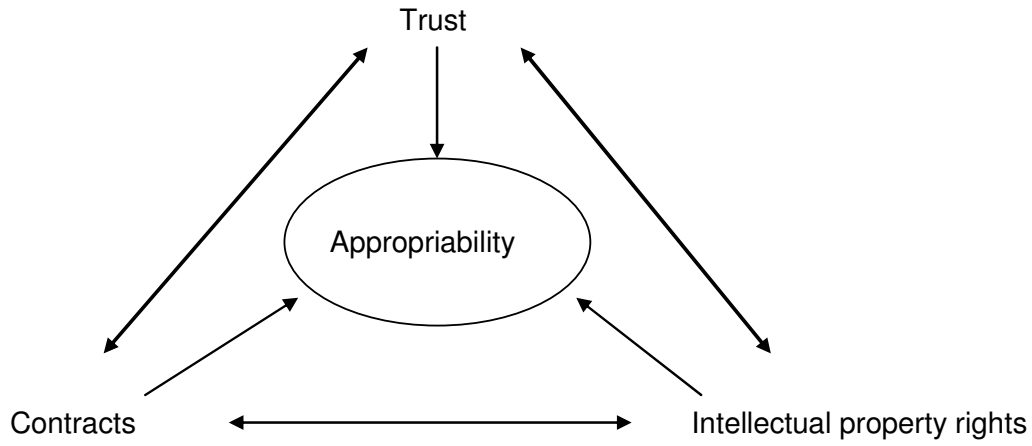

Figure 1. Theoretical framework of the study

Restrictions will be made in the geographical area investigated into Finland because this is the country of origin of the companies in the empirical part, and the legislation concerning contracts and IPR varies a lot from country to another. Of intellectual property only patents and trade secrets will be dealt more detailed since they are the most used mode of protecting intellectual property. They are also the most important ones for the firms in the empirical part as they do technical collaborative innovation.

1.5 Research questions and main theories

The main research question of the study is:
How do governance mechanisms enable knowledge sharing, and at the same time protect a firm's own intellectual property in collaborative innovation?

And the sub-questions are:

1. *What are the factors that affect a firm's willingness to share knowledge?*
2. *What is the role of intellectual property in sharing and protection of knowledge?*
3. *What is the role of trust in sharing and protecting knowledge?*
4. *What is the role of contracts in knowledge sharing and protection of a collaborative innovation?*
5. *How can IPRs, trust and contractual governance be combined to optimize knowledge sharing and protection?*

Main theories related to the topic of the study

There are several theories related to the topic of this study. The most important theories behind this study - transaction cost economics, resource-based view, and knowledge-based view - are presented.

Transaction cost economics (TCE) is one of the most quoted theory related to contracts and trust issues. It is one very significant theory behind this study as well. According to TCE firms strive for minimizing costs related to their business activities (Williamson 1985). Lower costs increase profit, which is the ultimate reason why any firms exist, to yield profit to their owners. In collaborative innovation the transaction costs are a bit different than if the firm was to take the go-alone strategy. Coordination costs that come from finding new knowledge, negotiating with partners, drawing up contracts etc. and

motivation costs that help the collaborating firms to head for the same goal are among those costs (Ibid). The more uncertainty the collaborative innovation involves, the greater are the costs. On the other hand, intellectual capital can help to decrease transaction costs. If there is trust between the partners the resources used in the monitoring of the collaboration are naturally smaller. Building trustworthy relations to one's partners help decrease costs. Building a good image and brand is really important to firms these days as it inspires confidence in possible partners and eases the negotiations. (Ibid.) In contracting perspective, TCE is striving for efficient contracts that help the firm to gain value and lower costs of possible hazards in the future. It can also decrease the need for a formal contract, or at least the contract may not need to be as strict as in a situation where trust is weak. Contracts, on the other hand can help to increase trust, as the knowledge is better protected people dare to share it more without fear of losing it.

In the study of contracts and contract law there is no actual theory, since contracting is based on the free wills of the partners that are understood to be completely rationally minded actors. "The theory of contracts" is used to describe a theory on how to make good contracts. In collaboration the aim of the partners is to build up long-term dynamic contracts with trustworthy partners. It does not necessarily involve IPRs and trust between partners. It is therefore not sufficient in studying the complex contracting between partners. (Nystén-Haarala 1998 p. 206) Therefore theories from other disciplines, such as TCE that has developed from economic studies, need to be used to fully understand the purposes of contracting. As said before, TCE is a theory that is needed in understanding the efficiency of the contracts. Some other theories want to use contracting in order to reach monopoly in the markets. The purpose of a monopoly is to shut down natural competition between different actors on the markets, which is actually very ineffective and dangerous to healthy competition and fuctioning markets. In TCE point of view contracting is a ways to serve economizing effects instead. (Nystén-Haarala 1998 p. 206-207)

Resource-based view of the firm (RBV) has its basis in firm's internal resources being the most important success factors in the firm's organizational strategy formation. (Lönnqvist et al. 2005) Intellectual property helps a firm to achieve competitive advantage. Intellectual property rights, good and open relationships to suppliers and customers, and know-how within the firm can be counted as being these important resources.

Knowledge is a resource. The knowledge-based view (KBV) emphasizes the role of knowledge as a competitive advantage. Knowledge is the only thing that can give a firm sustainable competitive advantage in the long run. All technological innovations are dependent on knowledge creation. (Lönnqvist et al. 2005) New innovations need protection in order to function as competitive advantage to its inventor. Hence, intellectual property rights strategy offers a firm sustainable competitive advantage if known how to use it profitably.

1.6 The structure of the study

This chapter has introduced the topic of the study, backgrounds, the motivations, overview of the related literature, and objectives. It has illustrated the framework of the research and defined the most important concepts. Overall picture of the topic has been illustrated in the form of a theoretical framework of the research. The research questions presented are answered in the following chapters.

The second chapter introduces collaborative innovation and why it is considered a good way of innovating. It discusses the benefits gained from sharing knowledge with partners. Issues that affect a firm's willingness to share knowledge are presented. Those factors include characteristics of knowledge, learning and absorptive capacity.

Third chapter introduces the governance modes for controlling the different knowledge sharing related factors presented in chapter two. The history, theory and use of intellectual property rights and critical view towards IPRs are presented. Also the risks and benefits related to knowledge sharing, and on the other hand too much protection are dealt with. Out of relational governance, trust and its antecedents, objectives, forms, and its relation with contracts are discussed. Contractual governance shows the legal side of controlling the collaborative relationship. Different legal contracts controlled by Finnish legislation are discussed in the form of employment contracts and other agreements.

Fourth chapter introduces the empirical study methods for the factors dealt in the theory chapters. It presents ways of doing qualitative empirical study, and especially case study that is the research method of this study. Quality and validity of the data and the limitations of the study are assessed.

Fifth chapter concludes what is said in the theory and what is found from the empirical data. Framework of how the studied concepts interact in collaborative innovation is provided. Finally, conclusions about the theory and the empirical findings are made and further research suggestions are proposed.

2 KNOWLEDGE SHARING IN COLLABORATIVE INNOVATION

In knowledge-based competitive climate firms of all sizes attempt to benefit from collaboration with firms with complementary knowledge (Blomqvist et al. 2005). Collaborative innovation is an innovation-based relationship (Hagedoorn et al. 2000). In order to create innovations, whether they are brand new inventions or improvements to existing inventions knowledge has to be shared between the firms. A firm's alliance partners are the most important source of new ideas and information that result in new technology and innovations (Dyer & Singh 1998). Learning and internalising critical knowledge from partner can be an important objective of a collaborative innovation (Kale et al. 2000; Grant & Baden-Fuller 2004). There has been found evidence in previous studies on innovations that a significant amount of innovations can be tracked back to customers' or suppliers' initial idea (Dyer & Singh 1998). Firms engage in collaborative innovation to gain knowledge that will help the firms innovate together.

Research partnerships can take many forms from arrangements to support informal knowledge sharing among partners to the creation of entirely new research entities. Some include many organizations, while others go on exclusively between two partners. They might have specific technological goals, or they may be product focused. Others are arranged with customers or suppliers in order to solve a particular problem. (Hertzfeld et al. 2006) Knowledge about how the collaboration is organized is needed in order to understand how openly the firms are willing to share knowledge. Williamson has described the different ways of organizing collaboration as *market, hybrids,* and *hierarchical organization.* (Williamson 1991) He placed them on a line between market and hierarchical organization. Figure 2 demonstrates the different organizational forms of collaboration.

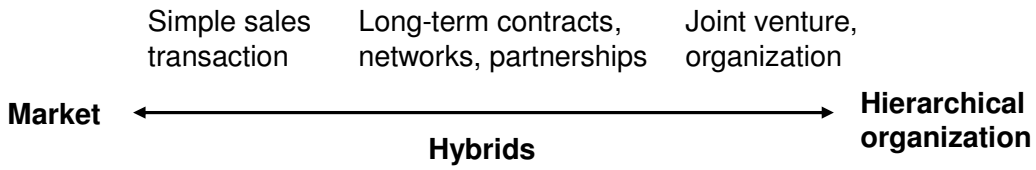

Figure 2. Different organizational forms of collaboration (Adapted from Williamson 1991)

Market means basic transactions between firms that don't need complex contracts and a lot of planning. In this kind of transaction usually the price is among the most important factors of choosing the supplier. Hierarchical organization is the tightest governance form. It means that the firms are hierarchically joined together and they are mutually owned. It naturally has the largest amount of control. Collaborative innovation that needs planning and negotiations, and usually some sort of collaboration agreement is somewhere in between market and hierarchy.

Earlier in this study it was mentioned that accessing knowledge is also one main goal of collaborative innovation. Knowledge is needed in order to gain new innovations and that is why the access to knowledge is critical for collaborative innovation. The nature of knowledge will be discussed in the next chapter.

2.1 Characteristics of knowledge

As creating new knowledge and developing the existing, knowledge is one of the most important things that firms strive for in collaborative innovation, it is important to consider some aspects related to the nature of knowledge.

Knowledge sharing is dependent on the willingness of the partners to share knowledge. Trust and the degree of protection of the knowledge affect this

willingness to share. Protection does not mean only the legal means, but the nature of knowledge can also be protective if it is uneasily imitated into partner organization (Hurmelinna et al. 2007). Knowledge issues that affect to its appropriability presented here are knowledge tacitness, collectivity, legal protectability, and the usability of the knowledge. This chapter will introduce the characteristics of knowledge.

Explicit and tacit knowledge

Knowledge can be described in many different ways. Perhaps the most cited aspect of knowledge is Polanyi's (1967) division of knowledge into explicit and tacit knowledge. Explicit and tacit knowledge are still very much used to describe the tangibility of the knowledge.

Knowledge assets can vary greatly in the degree of knowledge tacitness. The scale goes from highly explicit to highly tacit. (Norman 2002) Highly explicit knowledge is codifiable, transferable and could even be tangible. Explicit knowledge can be represented in designs and drawings. It is the easiest knowledge to transfer and seems to be more easily internalized by one's partners. (Baughn et al. 1997) Firm's ability to protect explicit knowledge depends on the firm's ability to protect the knowledge from leaking out. Firms in collaboration need to take action in order to prevent this kind of explicit knowledge from leaking out. Such codified intellectual property as patents, copyright and trademarks can be registered and thus provided with protection in the registered countries or trade unions. (Baughn et al. 1997) The legal ways of protecting explicit knowledge from expropriation will be dealt later.

Tacit knowledge on the other hand is knowledge that can't be completely articulated or codified. It can't be easily taught to others and is not visible when observed. (Zander & Kogut 1995) Experience in manufacturing, and understanding of some specific area of business are types of tacit knowledge.

They may be embedded in the social networks and the individuals within the firm. It can be formed in different interactions and projects and is greatly dependent on firm variables. The exchange of tacit knowledge requires social contact with beholders of the knowledge. (Baughn et al. 1997)

Tacit knowledge is described as know-how, since the nature of know-how is tacit, sticky, and difficult to put in prints. It is also difficult to imitate and transfer. However, because of the very nature of know-how it can be a sustainable advantage: partners that are effective in sharing know-how are superior to those who are not. (Dyer & Singh 1998) It is easier to protect tacit knowledge because it is not available in written form and it can't be stolen, but legal mechanisms do no exist in the form of patents for example, to protect the intangibles. Tacit knowledge is embedded in the individuals of an organization (Heiman & Nickerson 2004). Protective means are contracts and trade secrets. On the other hand sharing of knowledge is more difficult and costly when knowledge is of tacit kind. The generation of new knowledge is faster when it builds on explicit rather than tacit knowledge. (Adler 2001) However, tacit knowledge is more likely than explicit knowledge to build the basis of a firm's competitive advantage. Appropriation of tacit knowledge could have more severe effects on the competitive ability of a firm, which is why firms are expected to take more effective means of protecting highly tacit knowledge and capabilities. (Norman 2002)

Individual and collective knowledge

Besides tacit/codified knowledge there are several other considerations about knowledge. Liebeskind (1997) talks about individual vs. collective knowledge, legally protectable vs. non-protectable knowledge, and usable vs. non-usable knowledge. According to Liebeskind's definition knowledge can be divided in individually possessed, or a collective good. Individual knowledge is that what only one individual possesses, and what that individual is able to use alone

without other pieces of information from co-workers for example. There are two types of collective knowledge. Example of the first type is surgical operating, where all the participants in the surgery have their one specific role and every individual is needed in order to complete the task. Second, an individual's knowledge may need some complementary knowledge in order to be valuable. An example is a case of secret code, where the members of a group all possess different complementary parts of the code. Only by having all the parts of the code will the secret code be available. (Ibid.)

Legally protectable and non-protectable knowledge

Various kinds of knowledge can be legally protected. New innovations, such as products or processes can be patented. In order to be patentable these goods need to be substantially different from prior products. Thus, many valuable innovations can't be patented. Even if a product could be patented it is costly and information about the innovation has to be released. This results in firms sometimes not taking action in order to protect these legally protectable knowledge assets. Copyright also does not prevent release, but it provides a replication monopoly for a period of time. Trade secrets provide with more binding legal protection as they prohibit the employees of a firm from providing codified knowledge about the firm to any outsiders. They are not watertight, though. They are difficult to prosecute when the inventor of the secret is an employee, unless that employee has signed a contract regarding trade secrets of that firm. Also the employer firm needs to make an effort in order to keep the innovation a secret. (Liebeskind 1997) While there are ways to protect legally protectable knowledge still there is considerable amount of knowledge that remains unprotected by legal means. In order to use the protecting power of intellectual property, some strategies have to be thought of and active use of protective mechanisms is needed. Intellectual property rights will be discussed in more detail later.

Usable and non-usable knowledge

The possibilities of another firm to gain knowledge from a partner also depend on how effectively the knowledge can be used by other firms. Knowledge could therefore be usable or non-usable to a firm (Liebeskind 1997). When lacking complementary assets (Teece 2000 p. 25) or absorptive capacity (Cohen & Levinthal 1990) the firm might not be able to use the knowledge gained in collaboration. Certain types of knowledge cannot be successfully appropriated from partners (Liebeskind 1997). The more complex the knowledge is, the more difficult it is to utilize (Winter 1987). It is good to remember that complex knowledge may be far less valuable to partners and competitors than knowledge about simple processes and products (Ibid.). In practice though, simple knowledge is not so well protected because it is considered less worthy for costly protection procedures.

2.2 Critical factors in knowledge sharing

This chapter introduces some critical factors for knowledge sharing. The presented factors are uncertainty and opportunism, learning and absorptive capacity, and disclosure dilemma. Some help knowledge transfer and adaptation, while others might have a negative affect.

2.2.1 Uncertainty and opportunism

Collaborative innovation involves always uncertainty because it is about dealing with partners outside of own firm. The possibility for opportunism is usually present in collaborative innovation as mentioned before. Opportunism can be divided in two main forms of “passive and weak” and “active and

strong" (Klein Woolthuis et al. 2005). Passive form of opportunism is when a partner neglects to perform the best of one's performances (Ibid.). The active form of opportunism is concerned when a partner intentionally seeks to exploit the other by lying, stealing, and cheating (Williamson 1985). Williamson (1985) defines opportunism also as self-interest seeking strategy undertaken in order to redirect profits from a vulnerable partner. According to Williamson active opportunism can appear in many ways, including bargaining, shirking, and withholding valuable knowledge from the partner (Ibid.).

Volatility and *ambiguity* are considered aspects of uncertainty. Volatility refers to the unpredictability of change in the environment over time. Changes in the environment create uncertainty about future conditions. In volatile environments adjustments in collaborative innovation agreements are usually necessary. Ambiguity on the other hand refers to the degree of uncertainty irrespective of its change over time. Ambiguity is less about an uncertain future and more about uncertainty about present and past experience. A partner can be perceived as ambiguous when there are problems in the clarity of information for example. Both volatility and ambiguity make collaborative innovation more vulnerable for opportunism increasing its probability of occurring. Volatility engenders the need for renegotiations during the course of the collaboration relationship because of changed external environment, where opportunistically behaving partner might try non-cooperative bargaining for its own good. When perceptions of one's partner are ambiguous, some opportunism might go on unnoticed, and therefore unpunished, which will increase opportunistic behavior. (Carson et al. 2006)

Learning of new things in collaborative innovation is a lot easier when the partners dare to be open. The primary hindrance for such openness is the mutual suspicion of opportunistic behavior between the partners, which usually causes them to be less willing to share both explicit knowledge and know-how with each other. (Kale et al. 2000)

In addition there are also other risks related to outsourcing. The trend towards concentrating on one's core competencies makes firms dependent on their suppliers. Firms have to manage relations to these supplier partners well, since they will probably need them again in such a small market area as Finland. Collaborative innovation creates dependency and therefore also the problems related to contracting and opportunism among partners. One can question the whole collaborative innovation on that basis. On the other hand, would firms be able to provide everything themselves fast enough to be compatible in such a rapidly changing world?

2.2.2 Learning and absorptive capacity

This paragraph will concentrate on learning and the ways, which firms can profit from the knowledge pool of collaborative partners. Sharing knowledge and creating new knowledge can create competitive advantage for firms (Crossan & Inkpen 1995). Innovation is an outcome of organizational learning, which is possible when knowledge is shared. That explains the relationship between innovation and absorptive capacity. Absorptive capacity reportedly helps the speed, frequency, and magnitude of innovation and innovation produces knowledge that becomes part of a firm's absorptive capacity. (Lane et al. 2006)

The sharing of knowledge is often difficult and firms have to be able to learn and adapt from partners in order to create competitive advantage. The research on learning in collaborations has traditionally assumed that each organization has a certain ability to learn from others (Lane et al. 2001). For example Cohen and Levinthal, the creators of the concept absorptive capacity, argue that absorptive capacity is largely a function of firm's prior related knowledge and background (1990). These factors affect to firm's ability to learn from the partner, but they are not the only ones. There is evidence that organization's ability to learn from partners varies with the

learning context and is critically affected by the presence of trust as well (Lane et al. 2001). Absorptive capacity is needed to transfer tacit knowledge better (Inkpen & Dinur 1998). Trust is a critical part of absorptive capacity because when there is trust between partners, the “teacher” will help the “student” to understand and internalize the know-how that it is offering (Lane et al. 2001). Trust and absorptive capacity help partners create new knowledge and innovation and are therefore critical factors for succeeding of collaborative innovation.

Firms usually want to learn more in collaboration than they do (Crossan & Inkpen 1995). Reason to this is that a firm also needs to have the ability to learn. Collaboration with firms with complementary assets can bring great deal of external knowledge, but the knowledge also differs in how easily it can be internalized. Best chance of learning and using the new knowledge occurs when the partner has similar skills, resources and capabilities (Collinson 1999).

Firms try to learn and develop knowledge in collaboration in order to improve competitive advantage (Soekijad & Andriessen 2003). If a firm is efficient in learning it can advantage greatly from collaboration. On the other hand knowledge is not worth lot to a partner who doesn’t know how to use it, or doesn’t have access to it.

Conditions for learning

There are some conditions that have to be filled in order for learning to take place in collaborative innovation. The firms engaging in collaborative innovation expect to receive a certain added value from knowledge sharing (Gulati et al. 2000). The firms must be willing and able to share. One goal of collaborative innovation is to learn from or with partner. Prior related knowledge will ease the learning process (Dyer & Singh 1998). Also organizational capabilities can be seen affecting a firm’s ability to exploit

outside resources of knowledge for example, by learning effectiveness (Inkpen & Dinur 1998), transparency (Larsson et al. 1998), and absorptive capacity (Dyer & Singh 1998; Lane et al. 2001; Lane et al. 2006). Perception of shared destiny both engenders and depends on a sense of mutual trust and can create effective sharing (Adler 2001). The strength of the relationship and the trust between the partners in collaboration needs to be somewhat strong in order for them to share enough for learning to take place (Larsson et al. 1998). The more explicit the knowledge is, the easier it is to transfer and teach (Adler 2001; Soekijad & Andriessen 2003). And the more tacit the knowledge is, the more essential the presence of trust is successful knowledge sharing (Adler 2001). This doesn't mean that tacit knowledge couldn't be taught or learnt, but only that it takes closer relationships between the parties and trustworthy surroundings for tacit knowledge to be shared and learnt.

Learning by individuals

Because individuals actually possess the knowledge, the settings where most knowledge sharing is likely to take place are inter-personal groups, such as project teams, communities of practice, or networks of expertise. Communities of practice and networks of expertise are focused on learning and knowledge sharing and can be thus considered as knowledge sharing groups. In this kind of groups employees can develop new knowledge with people from different firms and learning happens through daily work. (Soekijad & Andriessen 2003) In this kind of close relationship between employees especially tacit knowledge is likely to be generated and shared (Inkpen & Dinur 1998; Adler 2001).

If knowledge tacitness is high, it is likely that it is transferred mainly via individuals (Inkpen & Dinur 1998). According to Nohria and Ghoshal (1997) interpersonal networks are vital because they serve as the glue that holds internally differentiated firms together. Interpersonal links are integrative

mechanisms, because they produce knowledge exchange. Interpersonal networks allow for organizations to coordinate and communicate with their own units and with units of the cooperative firm. If there weren't these informal networks, the members of an alliance would only have to depend on formal mechanisms, which would quickly get overloaded. Informal channels of communication have an enormous role in the efficiency of the collaboration. (Nohria & Ghoshal 1997 p. 151) If collaborative innovation partners succeed in making a combination of sharing tacit knowledge, absorbing and learning from collaboration, and protecting sensitive knowledge they will probably succeed in creating value from the collaboration.

2.2.3 Disclosure dilemma

Even if knowledge sharing is wanted with collaborative innovation negotiations, still the firm possessing knowledge – whether in codified form or not – may not wish to disclose it at the negotiation stage. This is what is meant by *disclosure dilemma* as described by Maskell and Malmberg (1999). The firm that has the knowledge cannot share it early in the negotiations although it could have a positive influence on the collaboration. If the knowledge they possess is something they could sell, license or share with collaborative innovation partner the act of sharing the knowledge in the negotiations could reveal so much that the recipient of the knowledge learns enough to terminate the negotiations and try and proceed on their own (Maskell & Malmberg 1999).

The effects of disclosure dilemma and the importance of IPRs to protect knowledge can be described by the diagrams in figure 3. The highest point in both pictures is somewhere in the middle of these spectrums. With knowledge in a form of codified data, such as recipes and prints the disclosure risk is quite as big as in a case of tacit and embedded knowledge, as can be seen from the upper spectrum of figure 3. Also the importance of intellectual

protection, which is described by the lower diagram in the figure 3, in negotiations is high in case where the knowledge is in between codified knowledge and knowledge of tacit kind. (Contractor & Ra 2002) When knowledge is highly codified its strategic importance is not very high as others easily invent it as well, and in the case of tacit knowledge it is not easy for rivals to copy even if they happened to get information of the innovation.

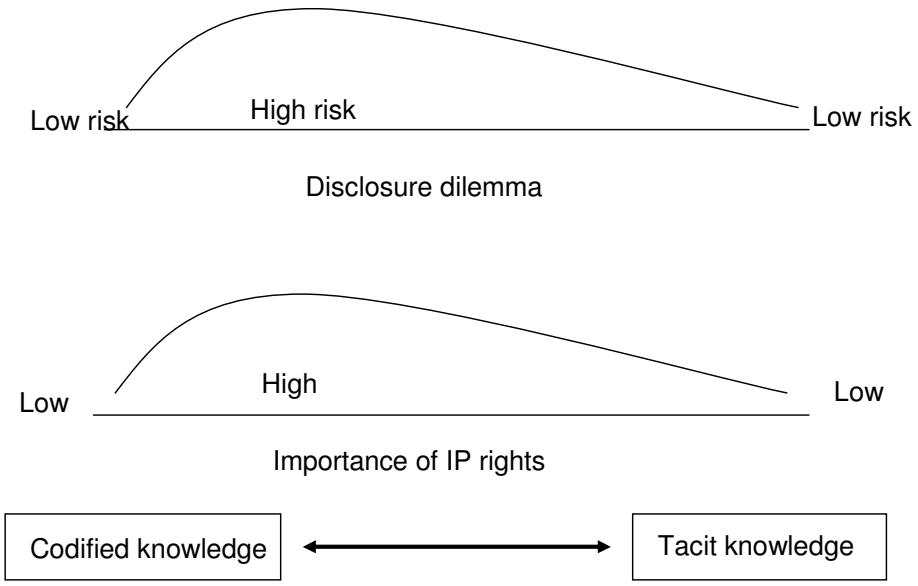

Figure 3. Disclosure dilemma and importance of IPRs in codified knowledge – embedded tacit knowledge spectrum (Adapted from Contractor & Ra 2000)

Knowledge leaks mean unintended leaks of a firm's core competence to closely cooperating partner. Firms need to be open to gain access to outside knowledge, but that openness comes with a risk of firm's sensitive knowledge being leaked to partner. (Hoecht & Trott 2006) Knowledge leaks to strategic partners need to be prevented (Baughn et al. 1997). Therefore control instruments, such as bureaucratic control, legal contracts and goodwill trust, are used when managing knowledge leakage risks of collaborative innovation (Hoect & Trott 2006). These control instruments also decrease the risk of opportunistic behavior. The more open a firm's strategy is, the less

appropriate are legal means of protection and the firm has to rely on means of social control, such as trust and reputation (Hoecht & Trott 2006).

Because these risks are present, there needs to be control over sharing and protection. When innovation and knowledge are gained through collaboration, protective means need to be weighed. Firms need to prepare themselves for risks of opportunism and uncertainty. The means of control for risks and uncertainty in collaborative innovation studied in this thesis are trust as relational control, and intellectual property rights, and formal contracts as legal control. Next chapter will introduce the concepts and how they have been perceived as control mechanisms in previous literature.

2.3 Knowledge sharing routines

Collaborative efforts for new technologies, products, and processes require an enormous amount of knowledge (Berends et al. 2006) Firms can generate rents by developing better knowledge sharing routines between firms than their competitors do.

Grant (1996) defines interfirm knowledge sharing routine as a regular interfirm interaction that helps the transfer, combination, and creation of knowledge. Heiman and Nickerson (2002, 2004) have found two attributes that knowledge sharing in collaborations can be characterized by – the degree of knowledge tacitness and the level of problem-solving complexity. These factors make knowledge transfer between individuals more difficult and costly. The cost and time used in knowledge sharing involves, among other things, verifying that the recipient accurately understands the message of the knowledge. With codified knowledge, it is easy for the recipient to verify the knowledge by inspecting its physical representation, such as formula. In contrast, when knowledge is stored in individuals, the recipient can only verify

the message by transferring it back to the sender who must provide the recipient with verification. The transmission project of the knowledge must be repeated in case the message was inaccurately interpreted first time around. This is likely to increase costs of communication, and knowledge tacitness can therefore be seen as affecting increasingly on knowledge transfer costs. (Ibid.) Problem-solving in exchange is typically difficult when the knowledge is dispersed among different actors. The more complex a problem is the more trial and error is involved in the process, which naturally increases the costs. In order to ease the knowledge transfer managers adopt knowledge management practices (Heiman & Nickerson 2004).

Bandwidth of transmission refers to the degree of intensity of communication among individuals. Communication is called high or low bandwidth, depending on the chosen information channels. Increasingly high-bandwidth communication channels and increasingly co-specialized communication codes are those practices that are used as the degree of tacitness or problem-solving complexity increases. A high-bandwidth interaction is intended to create rich context, high-affect, and high-transparency in communication between partners. High-bandwidth interactions allow easy access to knowledge by high interactivity and physical demonstrations, for example. (Heiman & Nickerson 2002)

Low-bandwidth interactions, in contrast, are low-context communication methods, such as e-mail, letters, and phone calls. Low-bandwidth interactions provide with affects such as time-lagged queries and responses, and low interactivity. Low-bandwidth interactions provide low degrees of knowledge transparency at low cost, where as high-bandwidth interactions provide high transparency with a high price. Knowledge management practices should be considered in the presence of limitations of tacit knowledge and problem-solving complexity. When neither of these characters is present, the use of costly knowledge management practices is ineffective and even harmful because of the risk of opportunism. (Heiman & Nickerson 2004)

These practices for easing knowledge transfer also make firms vulnerable for knowledge appropriation hazards arising with better transfer of tacit knowledge (Heiman & Nickerson 2002). According to Oxley (1997) the adoption of high-bandwidth knowledge transferring practices limits the ability to specify, monitor, and enforce property rights of the shared knowledge, which gives rise to knowledge appropriation hazards recognized by Heiman & Nickerson (2004) as well. The ability of alliance partners to generate rents through knowledge sharing is dependent on the incentives that encourage partners to be transparent and to share knowledge. Also, one must not free ride on the knowledge acquired from the partner in order to be able to generate rents. (Dyer & Singh 1998)

3 GOVERNANCE MECHANISMS FOR KNOWLEDGE SHARING AND PROTECTION

The dilemma of knowledge sharing in collaborative innovation is fundamental. Technological collaboration often requires sharing of tacit, uncodified knowledge in order to solve problems. That could allow the knowledge to leak out from the firm and to the hands of a possible future competitor. Even though some knowledge can be legally protected, much of knowledge still remains in unprotected form and can therefore be more easily expropriated. The dilemma is very important because the firm's future competitiveness could be at risk if collaborative innovation is not carefully managed. (Heiman & Nickerson 2004) Collaborative innovation can despite all the benefits of collaboration be a challenge when it comes to protecting knowledge and innovations from imitators.

Ways of managing this dilemma between sharing and protecting knowledge have been found in the literature. Because there is risk in the collaboration it has to be controlled. Depending on the model of collaboration the risk perceived by the firms engaged in the collaboration can vary from low to high risk (Hoecht & Trott 1999). Formal, contractual governance and informal, relational governance can control the risk. Collaborative innovation does not have to be managed by only one mode. Relational norms, such as trust, have been seen in some studies as substitute for complex, explicit contracts (Gulati 1995; Dyer & Singh 1998; Adler 2001), or that at least relational governance is stronger than the contractual one (Ferguson et al. 2005). Quite many studies have however concluded that these governance modes are not substitutes but complements (Poppo & Zenger 2002; Blomqvist et al. 2005). If a firm manages to balance the control of knowledge sharing and protecting in a trustworthy surrounding, the path to innovation that profits all of the parties is likely to succeed.

The relationship between trust and contracts in the collaborative innovation between partners is not static. In the beginning of the relationship if not familiar with the partner, a contract can make the behaviour of the partner more predictable. But a detailed contract is only one way of making behavior more predictable another one is trust. In the presence of mutual trust firms may choose not to use contracting as a ways to control collaboration. (Gulati 1995) Although there have been studies arguing trust and contracts are substitutes, this study agrees with the ones that state they are complements and usually both are needed in collaborative innovation. Formal and relational governance can be described on a line from informal relational governance to strictly formal governance as is showed in figure 4. Both ends are rare as usually the collaborating partners find the point of balance somewhere between the ends and the governance is a mixture of both formal and informal governance.

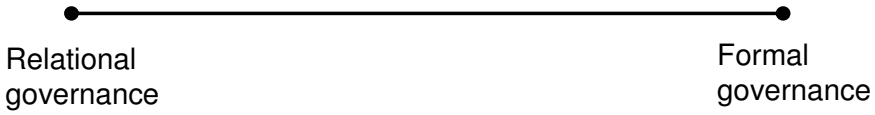

Figure 4. Continuum of governance mechanisms for collaborative innovation

The risk of knowledge leakage has to be weighed-up against not having access to cutting-edge knowledge and know-how from other firms (Hoecht & Trott 1999). Too tight and inflexible governance could result in not getting access to wanted knowledge. Figure 5 illustrates that knowledge assets are the objectives of a firm's sharing and protection strategy. Both sharing and protection are needed in order to reach the goals of collaborative innovation, and it depends on the specific collaboration where the point of balance is on that area of balance.

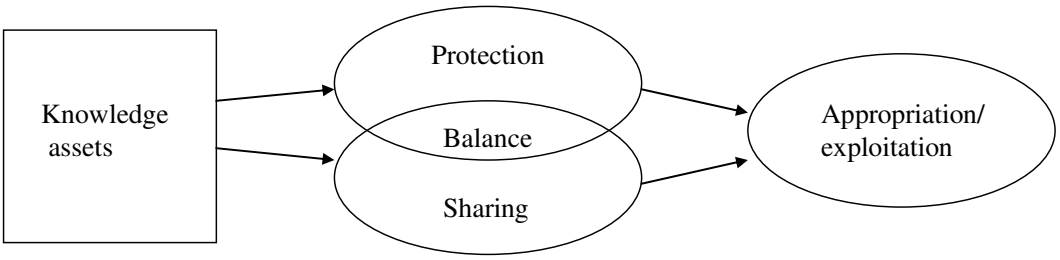

Figure 5. Sharing and protection of knowledge in collaborative innovation (Adapted from Hurmelinna-Laukkanen 2005 p. 24)

Knowledge characteristics and the strength of institutional protection determine the level of protection according to Teece. (2000) Hurmelinna and Puumalainen (2005) have presented building blocs of appropriability regime as nature of knowledge, legal protection, human resource management, technical means of protecting and lead time. In addition to IPRs the legal protection means various legal contracts, and labor legislation (Hurmelinna-Laukkanen 2005). However, the nature of knowledge, learning and legal protection via contracts, IPRs and labour legislation have the biggest influence in knowledge sharing propensity of the firms.

Appropriability is considered *strong* when the technology is both difficult to replicate and there are legal barriers of intellectual property system to imitation. When technology is easily replicated and there is no intellectual property protection, then appropriability is *weak*. In between strong and weak appropriability also intermediate conditions exist. (Teece 2000 p. 19)

3.1 Intellectual property rights as governance mechanisms

Innovators have been having problems in profiting from their innovations because it is easy for others to copy knowledge that is in codified form with a little or no cost (Teece 1986; Davis 2004; Pisano 2006). If imitation is easy, the profit could go straight to imitators and competitors instead of the actual creator of the innovation (Teece 1986). Therefore it is essential for innovators

to be able to make intellectual assets less transferable and increase the costs of copying. By generating this kind of market imperfections for their knowledge assets the firms are able to build competitive advantage. (Hurmelinna-Laukkanen et al. 2007)

3.1.1 Background of intellectual property protection mechanisms

Intellectual property is an aspect of property rights, which highlights the importance of know-how. Some intellectual properties enjoy protection against theft under the laws of individual countries. There can be seen signs of intellectual property systems strengthening since the 1980s. Intellectual property has received interest from not only new industries like biotechnology and telecommunications, but also from more mature industries such as petroleum and steel. (Teece 2000, p. 6)

The idea of exclusive rights has been a desirable reward for innovators and creators. But over the centuries the idea of what should be rewarded has changed. Before it was argued that the most important reason for rewarding would be the act of making a new innovation public. In modern intellectual property laws the most important driver for reward is the necessity to encourage innovation and new inventions through incentives. The business environment of the day has always influenced the history of intellectual property rights. There has been an ongoing discussion about whether a holder of these rights should have an exclusive right to exclude competitors or cause them additional costs for example through licensing. (Rahnasto 2003 p. 19-20) Dosi et al. (2006) doubt the ability of IPRs to create innovation. They suggest that there is evidence that IPRs are not the most important means for profiting from innovation and that they have no impact or even a negative impact on the rates of innovation. (Dosi et al. 2006) Although the IPRs have undeniable benefits in protection, they are not necessarily effective in motivating collaborative innovation.

Intellectual property and intellectual property rights have become critical assets of knowledge-based collaboration (Blomqvist et al. 2005) Discussion on ownership is likely to emerge in the course of the R&D collaboration (Ibid.). The intellectual properties of the partners are one of the issues that the collaborating firms need to control by formal on relational governance, or with a combination of them. The existence and use of intellectual property protection makes the proper use of both trust and contracts even more important to the success of the relationship. Partners of collaborative innovation can either agree on the use of their existing intellectual property and the allocation of new possibly created intellectual property or they can fight about them in the court which will be expensive and time-taking not to mention it can ruin the relations of the partners.

Intellectual capital includes intellectual property, such as patents, trademarks and copyrights. (Cloutier & Gold 2005) Depending on the point of view trade secrets are sometimes counted as intellectual property rights and sometimes as legally non-protectable knowledge assets. In this study trade secrets are viewed as being a part of firm's intellectual property protection portfolio. The common characteristic between these various forms of IP protection is an exclusive right to exclude others from certain activities (Lang 2001). Patents are considered to provide the strongest form of IP protection (Hicks & Holbein 1997). The creators of intellectual capital face the problem of managing the intellectual capital in a way that the firm can profit from it (See for example. Cloutier & Gold 2005; Teece 1986). These instruments of managing intellectual capital are legal in nature but are an important part of strategy plan for management as well as they offer the tools to control access to and profit from innovations.

The law divides the world into tangible goods and intangible goods. The dividing line between these two is do the goods have physical form. Intellectual capital consists of knowledge. According to protection view it is

something that individuals or firms want to hold back. However it is not always competitive advantage to hold back the knowledge. There is a reason why patents and other mechanisms are used to protect this knowledge. Protecting knowledge is profitable, since it is possible to sell the whole patent or a license for its use. Intellectual property rights create competitive advantage first by being able to use the protected knowledge to profit one's own business activities and later sell licenses to competitors. Knowledge is competitive advantage that is worth protecting.

To avoid confusion over *innovation* and *intellectual property* distinction between these two concepts needs to be made. The latter is a legal right, or a collection of legal rights, some procedure based and some substantive. A new technology exists after it has been developed and tested. It only becomes covered with intellectual property rights after it has been legally acknowledged as such. In the case of patents this means that particular country's patent office grants the inventor's application and issues the patent. Most certainly the difference between innovation and legal intellectual property right can be seen when the right grant expires. After the expiring the inventor does not have any right to exclude other firms from using the innovation. Innovators benefit falls but it does not mean the worth of the innovation for the society would fall. Instead it may even increase after the expiring. (Teece 2000 p. 149-150)

Partners entering a collaborative innovation project often possess valuable knowledge, part of which is usually contributed to the collaboration. The knowledge the firms own, when entering a collaborative innovation, is called *background knowledge*. This knowledge can be shared with a partner for the term of the partnership and sometimes even longer. The sharing is enabled because intellectual property rights protect the property. IPRs also offer the partners a way to manage the output of the partnership. If new innovations that need protection are created in collaborative innovation, they are called *foreground knowledge*. Background knowledge can help the collaborative

innovation reach its innovative goals if the needed knowledge is dared to share with the partner. Figure 6 describes the relationship and roles between background and foreground knowledge in collaborative innovation. IPRs are important assets that the partners need to allocate as the collaboration project comes to an end. IPRs are time and energy saving in defining the outcomes of the collaboration. (Hertzfeld 2005) IPRs create the asset that can be licensed (Merges 1995). IPRs are used to determine which outcome of the collaboration belongs to which partner and which rights do the partners have to it, if any.

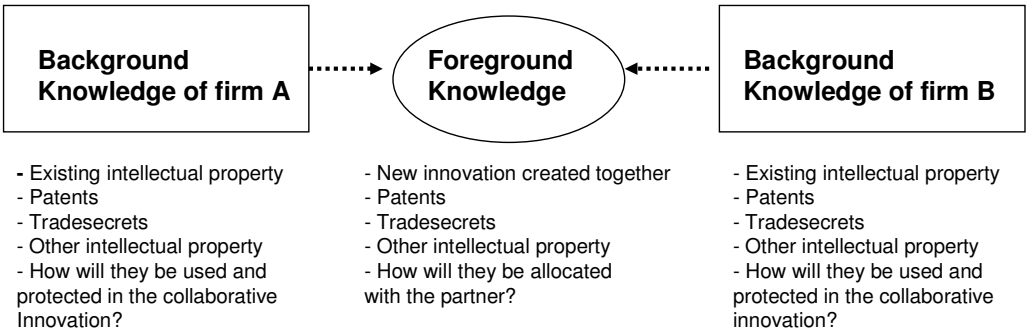

Figure 6. The roles of background and foreground knowledge in collaborative innovation

Ideally, IPRs should be global commodities. However, the protection granted for a patent for example is usually nationally limited to certain country that has acknowledged the right. (Hicks & Holbein 1997) There are also national differences regarding the question of first-to-invent and first-to-file. IP owners are therefore not able to exercise their rights of patent ownership across national boundaries. The most significant global institution to try to foster global harmonization of IP laws is the World Trade Organization, WTO. (Lang 2001) The World Intellectual Property Organization (WIPO) complements for existing activities of the WTO, but it does not have WTO's power to discipline countries that are not its members. WTO negotiated an important agreement

towards the harmonization of global IP rights called Trade Related Aspects of Intellectual Property Rights (TRIPS) that became to force in 1995. TRIPS was the first agreement requiring member nations to revise their national laws concerning various forms of IP protection. Trade agreements between countries often include IP right provisions, which allow the reciprocal treatment of IP rights across national borders. It used to be more difficult and expensive to obtain patent protection through the whole of EU than in USA or Japan for example. Since the European Commission adopted rules about community patent it has been easier to protect intellectual property in the EU area. Firms have the choice between patenting in single European countries or the whole of EU as a community patent through EPO (European Patent Office). (Lang 2001) The law has a critical role in determining what can be protected and how the rights are used. Legal rules determine what can be protected, against whom, and for how long. The protective approach depends on the matter being protected, the duration of protection, and what rights the protection offers. (Cloutier & Gold 2005)

3.1.2 Intellectual property rights

Intellectual property rights are useful in the formation process of collaborative innovation. They might help in the negotiations, and protect firm's own knowledge in collaboration. IPR negotiations have been acknowledged to be more difficult and complex between horizontal partnerships and also when universities are involved. Intellectual property rights such as patents, copyrights, trademarks and trade secrets are critically important to research partnerships. IPRs allow knowledge sharing that is needed in order to form the partnership and to gain the wanted outcome from the collaboration. In legal literature IPRs are viewed to revolve around arrangements between the collaborating parties to safeguard their own intellectual property while maximizing benefits from joint research and development. Sometimes problems arise from multinational collaboration since there is major lack of

harmonisation across national IPR systems. Because national patent systems differ, it can be a source of legal uncertainty between partners. (Hertzfeld et al. 2006)

Patents

According to Lang (2001) patenting is a vital source of competitive advantage in the knowledge economy where value is generated from protected ideas, knowledge, skills, and methods. The number of patents awarded implies of growing strategic importance of patenting. (Lang 2001) Patents are the most used intellectual property protection mechanism for protecting both a firm's existing knowledge in negotiations (background knowledge) and the technology created in collaborative innovation (foreground knowledge). Existing intellectual property rights, especially patents, are of value in negotiations. (Hertzfeld et al. 2006) Accepted patent creates a limited monopoly to encourage the production of inventions, such as processes, machines, and compositions of matter. The public is seen profiting from patents directly, as there will be more innovation, and the inventions will be disclosed to the public. Also, as the term of the patent expires, the innovation becomes part of public domain, free for anyone to use. (Merges et al. 2003 p. 24)

An invention has to be capable of industrial application and have a technical effect. It has to be replicable and industrially useful. An invention must be new, and it must have an inventive step to be patented in Finland. (PA 1967/550 1:1-2) Patents require registration through a strictly formal procedure where the applied idea will be registered by national authorities. The patent application is based on written descriptions clarified with illustrations. (Bruun 2001 p. 72) The description of the invention is central to the patent system. Its purpose is to disclose the invention to others and thus promote technological progress. (Bruun 2001 p. 74) This makes patents very

easily replicable. It is possible for competitors to observe the patents made by the firm and even imitate in order to create similar advantages. One could say the patent application process involves a risk in this sense. However once patent is accepted, the patent owner holds the exclusive right to use the patent for its own advantage or gain financial benefit from selling licenses to the patent for a limited amount of time. The protection period of a patent is relatively short, as it is 20 years with possible extensions for medicines up to 5 years, compared to other intellectual property protection mechanisms. Copyright has a protective status ever since the invention has been created until 70 years have passed from the death of the inventor, and trade secret has no limit as long as the secret is kept secret.

Patents are not equally valuable world wide. The value of a patent is dependent on factors such as the potential for licensing to other businesses, quality of the patent which means whether it is of worth in application, the importance of the market covered by the patent, which means whether it is patented where the demand lies, and the effectiveness of patent enforcement. (Lang 2001)

As said before, in addition to the use of patents in gaining limited monopoly to the patent for a limited amount of time, patents are used for other reasons as well. Firms use patents also to (1.) block rivals by preventing them to use a given process for example, (2.) signal plans of entering a new market area, (3.) facilitate cross-licensing agreement (helps in reducing the cost of acquiring the needed technology), (4.) indicate market value, or (5.) enable firms to evaluate business prospects for mergers and acquisitions. Many patents are taken out for defense, so that no one else can have them, and to secure freedom to operate. (Kingston 2001)

Several trends are emerging in international patenting. (1.) Countries that use the most resources on research activities tend to seek the broadest geographical protection as is the case with The USA, Japan and Germany.

(2.) Countries with large market potential are popular targets for patent applications since it is more worthwhile to seek protection where the demand for the invention is high. (3.) The high costs of patenting seem to hinder patenting. (4.) Firms tend to seek protection for their applied ideas especially in their home countries. (5.) Inventors tend to seek protection in geographically close countries rather than those of distant. (Lang 2001)

Although it may be the most used form of protection for technological inventions, the efficacy of patents in protecting firms existing knowledge is often questioned in recent studies (See e.g. Kingston 2001; Davis 2004; Dosi et al. 2006). It is typically seen less effective than for example lead-time or secrecy (Davis 2004). Hurmelinna (2005) reminds however that patents are only one way of generating rents from collaborative innovation, and there are alternative methods, such as other forms of IPRs, contracts, tacitness, secrecy, lead time, human resource management, and labour legislation, for example. Patenting is only worthwhile if the firm has the ability and the resources to detect patent infringements and act on them (PRH 2006).

Trade secrets

Another form of IP protection is the trade secret. The concept of trade secret is defined in the Penal Code (PC 1889/39) and its chapter 30 that was revised in 1990 in attempt to define this concept in legislation (Bruun 2001 p. 160). According to chapter 30 section 11 of the Penal Code, a trade secret is a business or professional secret concerning a certain trade or business which the trader keeps confidential and the disclosure of which could cause economic damage either to his trade or to another trader who disclosed the knowledge to him. Other laws concerning trade secrets are Unfair Trade Practices Act (UTPA 1978/1061) and Employment Contracts Act (ECA 2001/55).

Trade secrets protection, which may last for an indefinite period of time, could include among other things a firm's chemical formulae for materials, recipes such as Coca-Cola, compilations of information, business information, financial information and customer files (Lang 2001; Hannah 2005). They are also valid in protecting know-how and tacit knowledge in collaborative innovation. They are used especially in the early negotiation stages of the collaboration. (Hertzfeld et al. 2006) For a piece of information to receive a legal status as a trade secret, it must meet certain criteria (Merges et al. 2003 p. 20). The three criteria the piece of information needs to meet in order to be considered as a trade secret are first: it contains information, second: the secret is valuable to the firm who owns it, and that value is derived, in whole or in part, from the secrecy of the information, and third: the firm must make reasonable efforts to keep the secret as a secret (Hannah 2005).

There are advantages for trade secrets over patents. When a firm files for a patent it has to disclose the matter of the patent to the public in a way that it is possible for competitors to copy (Merges et al. 2003 p. 22). Where as trade secret if held effectively as a secret can prevent competitors' total access to the secret. Competitors can try to use the information of a patent disclosure to copy the patent in a way that allows them to use it in their own operations. It is possible to circumvent the legal protection of the patent owner. Also, patents lose their protective status after 20 years. Trade secrets can be held secrets for longer periods of time if the protection of the secret is effective. Trade secrets retain their legally protected status until they become public knowledge. (Hannah 2005) On the other hand the rights of the trade secret owner tend to be limited because the owner lacks the power to exclude others from specific activity apart from the prohibit of illegal acquisition of the secret by the breach of confidence, breach of contract, or industrial espionage (Hicks & Holbein 1997).

Trade secrets must be concealed if firms wish to exploit them effectively. They lose their protective status as soon as they are made public and can be used by anyone, provided that the secrets were not stolen or gotten otherwise by improper means. (Merges et al. 2003 p. 23 Hannah 2005) It is clear, that control over employees' actions concerning trade secrets is important. Employment Contracts Act includes obligations for employees to protect the trade secrets of the firm. During the term of employment the employee may not divulge trade or business secrets of an employer to third parties (ECA 3:4). If this knowledge was gained unlawfully, prohibition of disclosure will continue even after the termination of employment (Ibid.).

Firms may also employ *trade secret protection procedures* in protecting firm's trade secrets. There are two types of protective procedures: (1.) *access restriction procedures*, and (2.) *trade secret handling procedures*. Access restriction procedures restrict an employee's right of entry to certain areas, rights to use documents and copy them and so forth. Trade secret handling procedures establish rules for what employees can and cannot do with firm's trade secrets. The use of contracts that forbids divulging trade secret information to others is extremely common. These contracts are called nondisclosure agreements (NDAs) or confidentiality agreements. (Hannah 2005) NDAs will be discussed more in the chapter concerning contracting.

The use of trade secret protection procedures is on the other hand a two edged sword. Trade secret protection has a lot to do with the concept of trust. The employees react to how they feel their employers feel about them by adjusting their perceptions of their own obligations in response (Robinson et al. 1994). In employees perspective the mode of trade secret protection procedure signals to them whether they are trusted or not. The use of access restriction procedures and keeping the employees far from the trade secrets prevents these employees from taking any actions with those secrets, including using them for working for the benefit of the firm. This implies to the employees that the employers do not trust them and as a result they might

feel less obligated to protect the secrets. (Hannah 2005) The mutual lack of trust certainly affects knowledge sharing and openness on other areas of communication within the firm. Comparison between these two intellectual property protection mechanisms is provided in the following table 2 based on the previous chapters.

Table 2. Trade secrets and patents as modes of intellectual property protection (Adapted from Merges et al. 2003 p. 21-23)

	Trade secret	**Patent**
Underlying theory	Freedom of contract, protection against unfair means of competition	Limited monopoly to encourage production in exchange for immediate disclosure and enrichment to the public
Source of law (National)	Unfair Trade Practices Act 1978/1061, Employment Contracts Act 1929/228, Penal Code Chapter 30	Patents Act 1967/550 The patent regulations of the Patent Office
Purpose	Protection of valuable, sensitive knowledge against unfair means of competition	Creates a limited monopoly for inventors to encourage the production of inventions
Subject matter	Formula, pattern, method, technique, know-how	Process, machine, manufacture or composition of matter, designs excluding laws of nature, natural substances, business methods, printed matter, mental steps
Scope of protection	Protection against missappropriation – aquisition by improper means or authorized disclosure	Exlusive rights to make, use, and sell innovation with possible contractual limitations
Standard for protection	Information has commercial value due to not being generally known or available; reasonable efforts to maintain secrecy	Novelty, nonobviousness, capable of industrial application, technical character
Protection enacted when	Reasonable steps taken to maintain the secrecy of valuable information	Patent application filed and disclosed to the public: no protection if patent subsequently not approved
Period of protection	Until becomes public knowledge	20 years from filing, extensions up to 5 years possible for pharmaceuticals, medical devices
Situation when used	1. When intellectual capital cannot be patented or otherwise protected, 2. when disclosure is not wanted, 3. core competence that cannot strategically be disclosed to others 4. other protection too expensive	1. When an invention meets the requirements of a patent, 2. when others wanted excluded from using the invention,3. rents by using and selling licenses to the invention

3.1.3 The effect of IPRs on knowledge sharing

Firms need to protect their existing intellectual property in collaborative innovation. Having background knowledge can be of use in the collaboration negotiations. Like the background knowledge also the foreground knowledge created through the collaborative innovation, needs to be protected by suitable means.

When it comes to protecting firm's intellectual property too tight protection of own property could cause difficulties in getting to the wanted outcomes. If a firm is not willing to use the background knowledge – patents, know-how, and trade secrets in the course of the collaborative innovation the collaboration could end up failing. Too much protection could hinder innovativeness. If the partner feels that some knowledge is held back from the collaboration, it could cause the partner to withdraw from sharing its own knowledge assets and other intellectual property that might be useful in the collaborative innovation. Also a reason to withdraw knowledge could also be fear the partner would learn, and gain one-sided competitive advantage. Withdrawal of knowledge usually affects so that a partner is less willing to cooperate, which would alter the success of the whole collaborative innovation (Larsson et al. 1998). Collaborative innovation project with no new innovations would obviously be regarded as a failed one.

3.2 Contractual governance as a governance mechanism

The use of contracts in governing business relationships is called formal governance. Contractual governance can be seen synonymous to hard, explicit, formal, and written contracts. Contracts are legally binding, detailed agreements that specify the obligations and role of both parties. As such, contracts can be seen as substitute for other formal governance mechanisms

of integration or hierarchy. (Ferguson et al. 2005) By using contracts, firms try to prepare for future and reduce risk and uncertainty in business relationship (Lusch & Brown 1996). However, contracts cannot be complete, because future is unpredictable. It has been argued that referring to formal contract in collaboration could damage the trust between the partners.

In Finland, the primary source of law is the written law and legislative history. National custom, decisions of the Supreme Court and juridical literacy are considered sources of law as well. The Finnish contract law has developed considering these sources of law. (Nystén-Haarala 1999) Some main laws concerning contracting are the Law of Legal Acts (LLA 1929/228), Commerce Law (CL 1987/355) and Employment Contracts Act (ECA 55/2001). The development of national contract law is viewed through new cases and possible principles of law that might arise from cases (Nystén-Haarala 1999).

Firms use contractual governance in collaborative innovation to serve several important functions in managing the risk of knowledge leakage (Reuer & Ariño 2005). Firms strive to accomplish their goals and to be prepared for the future in volatile business environment increasingly using well-designed and prepared contracts. Long-term business contracts always include features such as risk and flexibility of contract. (Tieva 2006) There are several conditions, which are likely to affect the threat of opportunistic behavior and the inefficiencies related to contracting and make firms employ more or less complex contracts. (Reuer & Ariño 2005) Contracting will be dealt in the following paragraphs in the point of view of collaboration between partners first in firm level and then in individual level. Special questions concerning long-term contracts will be discussed in the form of relational contracting, dynamics of contract, and principles of law.

3.2.1 Definition of contract

Collaborative innovation as is seen in this study has no hierarchical structures to control the relationship. This means firms use contracts to reduce opportunism and incentives for opportunism (Klein Woolthuis et al. 2005). Agreement can be written or verbal, implicit or explicit. The term formal contract is used to describe a written document, which expresses agreement and is intended to be legally binding. (Lyons & Mehta 1997)

3.2.2 Long-term contracting

Contracts have been traditionally viewed as a contract of sale. In legal perspective, rules should be inflexible in the case of contract of sale. Otherwise there is a danger of contracting leading to an uncertain situation. This simple rule of inflexible contracts does not, however necessarily work in the case of long-term partnership or other complex contract. Since partnerships and long-term contracts are common in increasing profits and complementing knowledge in today's business there has become discussion about the development of long-term contract. These discussion points include complexity of contracts, relational contracting, dynamics of contract and principles of law.

In long-term contracts the contents and complexity of a contract are very different to simple one-time contract. Nystén-Haarala (1998) differs contracts by contract duration and complexity. In the following figure 7 contract types are described so that on horizontal axis there is time, and on vertical axis is the complexity of the contract. *A sale of goods* (1.) is placed in the chart in the sector of one-time transaction with low complexity. A sale of goods does not involve complex issues. It is a typical one-time transaction between supplier and buyer. *A turnkey contract* (2.), for example a sale of factory with building

the complex and training the employees is a package that is made from the wishes of the buyer. A turnkey contract is placed in one-time transaction with high complexity sector. It is not as simple a transaction as a sale of goods, because there is certain continuity in the contract. The obligations of buyer and seller need to be carefully determined in the contract. The target of the contract is more complex as are the rights and obligations related to the contract. Long-term contracts base a long-term contract relationship that usually is of cooperative type. Because of the duration of the contract and its complexity is natural that the contract requires cooperation between the parties. Trust and loyalty are seen as important factor in these long-term cooperative contract relationships. *A license contract* (3.) for example to a patent has quite determined clauses and it leads to a long-term contract with the licensee. It is therefore of interest to the licensor who the contract partner using the license is. *A collaborative innovation agreement* (4.) is a very complex contract about the partners' responsibilities and rights, the management of the collaboration and limitations to knowledge disclosures for example. Partners in research and development partnership have a common goal in sharing and creating new knowledge in the innovation, and therefore are committed to cooperation in long-term.

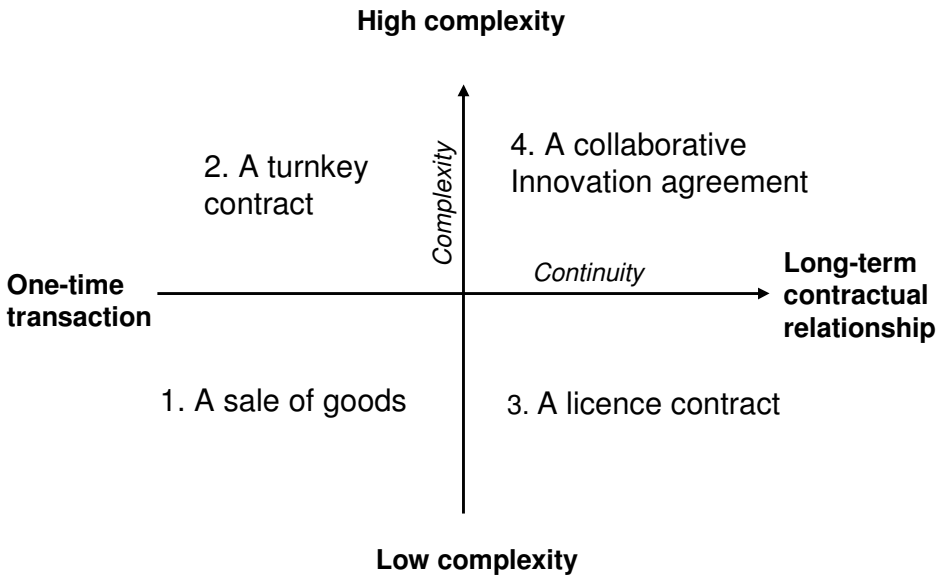

Figure 7. Contract types by their duration and contractual complexity (Adapted from Nystén-Haarala 1998 p. 20)

Long-term contracts differ from short-term contracts significantly. They are very common between business partners and they need to be carefully designed while short-term contracts such as exchange of an item usually won't take such complex planning. (Halila & Hemmo 1996 p. 9-10; Tieva 2006) Short-term and long-term contracts are easy to separate from each other. One clear difference is the ending of the contract. Ending of long-term contract could cause harm to a partner who would still like to continue the relationship. Usually there are clauses about ending the relationship in the cooperation agreement. If there were not any clauses about that, the partner wanting to stay in the collaboration could be protected, and there would have to be a reason in the legislation for dissolving, for example a contract offense. Short-term or one-time contract on the other hand expire when contract is fulfilled or annulled. Long-term contracts naturally take more active cooperation from the parties, than those of short-term, and there are thus some responsibilities for partners, as loyalty (Halila & Hemmo 1996 p. 10-11). Contract negotiations must be held with care, and that always takes time and money (Tieva 2006). Compared to short-term contracts, long-term contracts can therefore be seen as more expensive form of contracting.

3.2.3 Relational contracting and dynamics of contracts

During the last decades there has become a rise to a concept of relational contracting. Relational contracting focuses usually on long-term contracts, which are long-term complex relationships between collaborative partners. The partners' commitment to the relationship affects the activity of the partners outstandingly. (Rudanko 1998) In these relationships trust between partners and the continuum of partnership is much more important than appealing to the contract and threatening with sanctions of contract offence in case of disagreement. Solving legal disputes in the court of law would be detrimental for trust and continuum of business relationship. (Rudanko 1998)

Another concept that can be looked at from the perspective of trust concerning long-term contracting is the dynamics of contracts. The main idea of dynamics of contracts is that both parties acknowledge that the contract will change through complementing as the collaboration evolves. A complement to the contract could be made in case there would be increase in interest rate for example. Usually the contracts have conditions for changes like this. Another possible complement would be a completion of a hole in the contract after the contract has been signed. (Annola 2003 p. 33) A completion made after signing of contract takes naturally a great deal of trust between partners. When trust is present, dynamics of contracts increases flexibility of contracting extensively. When talking about long-term contracting, there are some principles of law used in legal literature and also in practice as can be seen in court decisions. Trust is seen very closely related to collaboration and contracting within collaboration, as can be seen in the next paragraph concerning the principles of law.

3.2.4 Principles of law concerning long-term contracting

Principles of law are especially important in long-term contracting (Tieva 2006). The main principles of law are freedom to make contracts and binding contracts (pacta sunt servanda). These principles of law should in general be followed but they are not absolute, though. The principles are not valid when the parties have agreed on a point that does not follow the effective legislation of a government. The binding of contracts is especially meaningful in these contracts between business partners where as in business to customer relationships, for example, they are not as strong as the customer who is considered weaker, enjoys protection. (Hemmo 2003 p. 48) In these on-going contracts between firms trust is an essential factor. Loyalty principle has been a common topic in the discussion of Finnish contract law for decades. The loyalty principle has its main idea in taking into consideration the interests of the partner as well (Hemmo 2003 p. 53), and in the

consistency of knowledge between the partners (Saarnilehto 2000 p. 88). Before the loyalty principle was understood as the demand for honorable and honest behavior. Now, it is emphasized that a contract is co-operative in its nature. Hence, both partners need to reciprocally contribute to the best interest of the partner. (Saarnilehto 2000 p. 165)

According to the loyalty principle, a partner is obliged to take into account the reasonable expectations of the other partner. Features of loyalty principle in contracting are common goal, trust, and co-operation. The longer the collaboration has continued the more justified is the expectation of loyal behavior by the partner. (Saarnilehto 2000 p. 88) Hence, there are different levels to loyalty principle. The narrow sense of loyalty principle can be seen as prohibition to use the rights gained by collaboration in the disadvantage of the partner (Halila & Hemmo 1996 p. 12). A wider sense of loyalty principle can be seen as obligation to act in a way that does not disadvantage the partner, or that the caused harm would be as little as possible (Saarnilehto 2000 p. 88).

In the principles of European contract law the claim for *good faith*, *fair dealing,* and *duty to co-operate* are acknowledged (Commission on European Contract Law 2000). The contents of these terms are almost the same as the Finnish loyalty principle. Finnish legislation does not however agree indisputably that the violation of any of these principles could cause contract offence which the counter partner could appeal to. The force of these principles would make contract law stronger if breaking them would be considered a contract offence and would cause a reason for damages claim, which is not the case in Finland at the moment. (Saarnilehto 2000 p. 143) According to Nystén-Haarala the concept of good faith or mutual loyalty known in long-term contracting principles corresponds to the concept of trust in economics. (1998 p. 33)

3.2.5 Cooperation agreements

Contracts may serve several important functions in managing exchange risks in collaboration. Parties of the collaboration use contract to set forth their mutual rights and obligations through specification of inputs to the collaboration, configuring processes by which exchanges will occur and how any disputes will be resolved. Expected outcomes of the joint collaboration process are naturally one important set of functions for a cooperation agreement. Formal contract establishes the division of labor by detailing the partners' roles and responsibilities and the scope of collaboration. The contract also determines the constraints and obligations external to the collaboration. For example, even before the collaboration has begun, firms can limit knowledge disclosures, and during the collaboration contract may specify how to interact with third parties, whether those are other divisions of the firms or alternative suppliers for example. The termination of collaboration can be specified in the contract. (Klein Woolthuis et al. 2005; Reuer & Ariño 2005)

Other important issues determined in the cooperation agreement should be those issuing the use and division intellectual property rights (e.g. ownership of knowledge, method, patents and licences), and knowledge spill-over (pledge of secrecy, sanctions of spill-over and limitations to work with other partners) (Klein Woolthuis et al. 2005). Also a complete contract would have clauses about possible limitations on firms' competitive and hiring practices through the use of non-compete and non-solicitation agreements (Reuer & Ariño 2005). Contracts are usually customized to fit the particular circumstances around the agreement relating to the partners, affected industry, markets, technology and regulatory environment (Hertzfeld et al. 2006).

It is not always possible to make a cooperation agreement in the beginning of the collaborative innovation because it is unknown if there will be results from

the collaboration or not. Because of the risk of failure, the firms can start the collaborative innovation with *preliminary agreements*, where they only agree on the costs and results of exploring the common interests. A preliminary research agreement also includes clauses about terminating the collaboration or continuing to next phase that is, in large-scale collaborative innovation projects often a *pilot contract.* A pilot contract includes clauses about testing an invention in smaller scale than actual and how results will be allocated, and terminating the collaboration or continuing to the next phase.

Non-disclosure agreement

Non-disclosure agreements can be used with employers when there is a need to protect firm's ideas or trade secrets. Employers are using more and more agreements to prevent proprietary information from floating out of the firm. These non-disclosure agreements are made to prevent employees from revealing any confidential or proprietary knowledge learnt while employed. (York 1998) NDAs are essential if a firm is practicing trade secrets for protection of intellectual assets. Hertzfeld et al. (2006) argue that the best way for a firm to protect its intellectual property is by binding its employees to strict NDAs. When a firm uses trade secrets to protect its intellectual capital it is obliged to make reasonable efforts to keep the secret a secret. The use of non-disclosure agreements is an effective way of taking care that everyone in the firm knows how to handle secrets. The use of these agreements with employees is counted as *reasonable effort* to keep trade or business secrets safe. Employee's duty to protect employer's business- and trade secrets is mentioned in the Employment Contracts Act. Employees are not aloud to use or disclose to others the trade- or business secrets of the employer during the contract of employment. If the employee has gained the knowledge illegally prohibit of disclosure will continue after expiration of the employment contract. (ECA 3:4)

However, employees are not the only ones who might need to sign a non-disclosure agreement. When starting a collaborative innovation there are usually negotiations with the possible partners. Firms might have to share important knowledge about the projects before there is an actual agreement. There is naturally a danger of the partner backing off from the collaboration and starting to do the business by itself. Reasonable NDAs with the employees help in managing that critical knowledge will not be shared by the employees in the negotiations that could cause the partner to do it alone. At the same time negotiating partners can start the negotiations by signing NDAs that will clear to partners *(1) what knowledge is confidential and what is not, (2) how the gained knowledge is aloud to be used, (3) how long the period of confidentiality is,* and *(4) what are the consequences of violating the agreement.* (Päällysaho & Kuusisto 2006)

3.2.6 Employment contracts

Employment contracts are meant to determine obligations and responsibilities of both employer and employee. They serve as internally, but they also have responsibility towards third parties when the employer firm should cooperate with another firm. Human resources are an enormous source of know-how in a firm, and that is why there needs to be protection over employees' possibilities to use the knowledge gained within the employment. Employment contracts emphasize the employee's loyalty towards the employer. On the other hand the use of these agreements should not limit the rights of an employer to earn a living by working too much.

Employment Contracts Act (ECA 55/2001) is the primary source of law concerning employment contracts in Finland. It covers all the main aspects of working life concerning both employer and employee. ECA includes several sections of legislation about protecting the knowledge assets of an employer, which is referred to as the firm where the employees work. Clauses can be

made binding towards partner firm's employees by special non-disclosure agreements. Next chapters will shortly introduce the contents of the law concerning knowledge protection and loyalty towards employer.

Competing activity

An employer should not work for another party that could cause harm to the employer contrary to fair employment practices (ECA 3:3). This section forbids any competing activity or preparing of that, that can't be approved of based on the law, during the term of employment. The purpose of this clause is to prevent employees from working for a rival firm the same time as working for the employer, but also to prevent them from taking the knowledge they have gained in the firm and going to work for another one and use the knowledge they have gained during the term of employment.

Agreement of non-competition

Agreement of non-competition could come into question for particularly weighty reasons related to the operations of an employer. Agreement of non-competition could be made in the beginning, or during the employment relationship to limit the employer's right to work for a competing firm, or to his/her own account after the course of employment has ceased. If the employment relationship has ended due to actions of the employer, the agreement of non-competition is not valid. This kind of agreement shall be made and enforceable depending on the need to protect business or trade secrets on the employees account. Agreement of non-competition protects also trade secrets for a period of time from six months up to a year. (ECA 3:5) Table 3 summarizes the different types of contracts discussed in this chapter.

Table 3. Summary of different types of contracts used in collaborative innovation

Contract type	Participants of contract	Contents	Main goal
Collaboration agreement	Partners	Division of labor, responsibilities and outcomes	Start long-term collaboration
Preliminary research agreement	Partners	Division of labor, responsibilities and outcomes	Start preliminary research that will possibly lead to pilot agreement
Pilot agreement	Partners	Division of labor, responsibilities and outcomes	Start pilot agreement that will possibly lead to collaboration agreement
Non-disclosure agreement	Employees and partners	Definition of knowledge concerning the agreement, consequences of disclosure	Strives to prevent knowledge leaks
Competing activity	Employees	Valid based on employment contract, no additional contract	Prevent an employee from working to his/her own account or for employer's competitor during the course of the employment agreement -> protects trade secrets from leaking out with an employee
Agreement of non-competition	Employees	Comes to question for especially weighty reasons by the employer after the employment contract has ceased	Protect employer's trade secrets from leaking out with an employee after he/she leaves the firm

3.2.7 The effect of contracts on knowledge sharing

Contracts can have different functions, which can also be social in nature. (Klein Woolthuis et al. 2005) Contracts have a strong tendency to constrain also opportunism. (Carson et al. 2006) They can help in creating trust and hence contribute to more open knowledge sharing within the collaborative innovation. In trusting atmosphere where partners do not fear opportunism, a contract can be used to specify the partners' goals and plans of how to reach

them. That is how contracts can be seen as directing the collaborative innovation into fruitful and efficient way.

Contracts also act as safeguard for contingencies. When partners start a long-term collaborative innovation they usually plan a contract that will help them to build a framework of how to react in case unforeseeable contingencies occur. The contingencies are not necessarily opportunism, but external contingencies such as technical developments, a take-over of one of the partners or an accident. In sum, they help in preparing for the future. As contracts have this tendency to reduce uncertainty and opportunism in the collaborative innovation, they serve as path to partners being more willing to share knowledge, since having a contract reduces the risks from partner's side. Contracts can even be thought of being a sign of commitment. A written agreement can be used as a tangible expression of trust in each other. (Klein Woolthuis et al. 2005) In this point of view contract expresses the loyal intentions of partners that should include openness in needed knowledge sharing.

Non disclosure agreements (NDAs) are used to prevent knowledge sharing of firm's strategic trade secrets and other important knowledge that is usually part of firm's core competence. In sum they are used for hindering knowledge sharing. Tight NDAs might involve penalty clauses that could frighten the employees from disclosing any knowledge. There is still a lot of ambiguity and uncertainty around their use. The use of NDAs is not necessarily always a good thing if it prevents people from telling also the knowledge that would be needed in order to succeed in the collaborative innovation.

3.3 Trust as a relational governance mechanism

Over time the relationship between partners evolve as the partners interact (Inkpen & Currall 2004). The role of trust is said to increase as the collaborations continues and partners get good experiences about the relationship. Since it is necessary for firms to interact and exchange knowledge in order to stay competitive, trust is an important dimension in these relationships. Trust economizes the negotiations between partners and also allows greater flexibility (Nooteboom 1996). The development of mutual trust fades opportunism, thus there may be a reduction in formal control and monitoring costs, which increases the efficiency of the collaboration (Inkpen & Currall 2004; Lyons & Mehta 1997). Trust enables rapid and flexible responses to unexpected events. The transformations in the relations and in the environment are seen to explain why firms choose to use loose contractual forms on mere verbal promises rather than tight, legally binding formal contracts. (Lyons & Mehta 1997) Though there are good sides to trust it also carries a risk of betrayal, and it has to be built up. However trust reduces probability of knowledge leak and enables partners move forward even though risk and uncertainty remain in the collaborative innovation (Nooteboom et al. 1997). Trust is always culturally bound. The meaning of trust can vary a lot from country to another, which is why knowledge of the other firm's national culture is important when engaging in international collaborative innovation.

3.3.1 Definition of trust

Trust can be defined in wide or narrow sense. It has many implications because of its importance and use in several branches of academic studies. The wide definition of trust involves anything that restraints the partner from opportunistic behaviour (Nooteboom et al. 1997). Trust is an essential

prerequisite for stable relationships, it is vital for the maintenance of cooperation, it is fundamental for any type of exchange, and necessary in all the every day routines. (Misztal 1998 p. 12) The environment where firms operate has factors like multiple partners and insecurities, which make trust even more important among partners. Trust is central in both internal and external collaboration development because of its ability to make future somewhat more predictable. The lack of trust in partners could make partners withhold knowledge. (Ruuskanen 2003 p. 91)

In prior researches some invariants of trust can be found. Trust toward a partner can be described by e.g. calculation, knowledge, and identification. And the dimensions of the concept itself are e.g. credibility, reliability and benevolence. Trust can be defined as a state comprising the perceived credibility, dependability and benevolence of a trustee across the relationship. (Bories 2005)

3.3.2 Personalized fast trust and incremental trust

Trust is traditionally viewed developing from common history between firms and the investments and time used in the relationship (Nahapiet & Ghoshal 2000) However, sometimes there is not enough time for *incremental trust* development because of sudden changes and uncertainty in some technology sectors (Blomqvist 2002 p. 184). Also, firms may have only a limited amount of time available for the development of an invention before it has to be patented and therefore they do not have the time needed to build up sustaining relationships with their partners.

Blomqvist (2002 p. 185) has used the term *fast trust* to describe the development of asymmetric technology partnerships where sudden changes are possible and goals may change during the collaborative innovation. Stereotyping partner negotiators to clear roles like engineer, lawyer, or

technological expert, enables faster inferences than by getting to know the partner employees profoundly (Meyerson et al. 1996). When people act through these specific roles and not by their whole personality they are easier to evaluate through stereotypical thinking. Also, there is less risk than there would be if they act through their personality. (Ibid.)

“Incremental trust is based on deeper cognitive knowledge and behavioral experience of the other (Blomqvist 2002 p. 187).” Incremental trust is based on institutional and personalized trust. Incremental trust has time to evaluate the partner’s goodwill, which the fast trust eliminates. Brief interaction between parties is not enough for evaluation of goodwill elements. (Ibid.) Fast trust uses categorization to clear roles as a way of building relationships. For example the engineers that meet for the first time share a common technical language and are able to understand each other easily. Fast trust does not need as much commitment, nor does it involve great amounts of risk. (Blomqvist 2002 p.184-187) Thus, the people are able to trust each other fast. The existence of personalized fast trust enables the relationships to start developing. It creates the interest towards partner and enables initial investments into the relationship. On the other hand it usually is very thin and fragile and can brake easily. Incremental trust could be gained if there was more time for the relationship development, existing collaborative innovation history or prior contacts to the partner firm that enable cognitive learning about the partner’s intentions and capabilities. Existence of incremental trust enables more risk-taking and it is a stronger form of trust. Figure 8 lists the different roles and characteristics of fast trust and incremental trust.

Fast trust	**Incremental trust**
-Enables and initiates a relationship -Creates interest and enables initial investments -Thin and fragile, conditional	-Makes the relationship more durable -Enables risk and adaptation -Thicker and more resilient, even unconditional

Figure 8. Roles and characteristics of fast trust and incremental trust (Adapted from Blomqvist 2002 p. 187)

3.3.3 Consequences of trust

Beccera and Gupta (1999) studied intra-organizational trust within a multinational organization and found evidence of trust between people increasing the amount of knowledge shared and risks taken in the course of the relationship. Relationships with low form of trust have to be monitored. With regard to theory of transaction cost economics, the absence of trust is seen as increase to the time and energy spent in relationships with no, or low form of trust. In contrast, it has been found important to have fluent information across the organization. In trusting relationships open communication, where people are not afraid to share knowledge and believe in what has been told to them, is possible. Where higher forms of trust appear, managers are more willing to take bigger risks in sharing knowledge within the relationship that is perceived as trustworthy. (Beccera & Gupta 1999) According to Luhmann (1979) trust decreases uncertainty and diffuses complexity, but it also produces risk. A person who decides to trust another on limited information about the future is always vulnerable and can get betrayed. (Luhman 1979 p. 26)

3.3.4 Forms of trust

Trust is the mutual confidence that one's vulnerabilities will not be exploited. Different types of trust exist in different situations. The types of trust can be divided into three categories of weak, semi-strong, and strong form of trust s defined by Barney and Hansen. (1994) These forms express the reasons why partners can trust each other in collaboration.

Reason to why partners can have confidence in their vulnerabilities not be taken advantage of, is that they have no significant vulnerabilities as far as that certain collaborative effort is concerned. In a situation like this the

trustworthiness of a partner is high, because of low risk of vulnerability. This type of trust can be called the weak form of trust because there are no contractual mechanisms to increase trustworthy behavior. Rather it is present only because of limited possibilities for opportunism. Parties are able to trust each other without costly governance. The other side of weak trust is that it is easily lost, if vulnerabilities should arise. Because of its connection to not being vulnerable, weak form of trust is usually not presented in complex collaborative relations. And because it is not present when firms are vulnerable, it can't usually be a source of competitive advantage. (Barney & Hansen 1994)

Semi-strong form of trust is the type of trust that can emerge when significant vulnerabilities are present. When appropriate governance mechanisms for avoiding opportunistic behavior are present, the cost of opportunistic act would be greater than its benefit, which makes partners behave in a trustworthy way. Partners can have confidence that they will not be used in opportunistic way since it would be irrational to do so because of contractual sanctions for example. Partners must manage the collaboration with appropriate governance mechanisms in order to create sanctions to prevent opportunistic behavior and semi-strong trust. (Barney & Hansen 1994)

Strong form of trust emerges in the presence of significant vulnerabilities. It is irrelevant for strong form of trust whether governance mechanisms are used or not, because partners would not want to violate against values, principles, and standards of behavior that are shared between the partners. (Barney & Hansen 1994) This kind of trust is seldom present, because even the trustworthiest partners tend to take advantage of a good opportunity, even if it is against the best interest of the partner. In order for strong form trust to be a competitive advantage, both of the partners need to be strong form trustworthy. Otherwise one might again use the other in an opportunistic way.

Whereas Barney and Hansen talk about weak, semi-strong and strong forms of trust as levels of commitment, Nooteboom has presented goodwill trust and competence trust to describe the different depths of trust. According to Nooteboom trust may concern a partner's ability to perform according to the agreements made. This kind of trust he defines as *competence trust* (Nooteboom 1996). Trust may also concern the partner's intentions to perform according to the agreements, which he defines goodwill trust. Goodwill trust is about one's good intentions and integrity. (Ibid.)

Trust might usually be used as complementing governance mechanism, but there are also studies to confirm that a great deal of partnering is happening through totally informal agreements (See for example Hagedoorn et al. 2000), and that informal agreements are even more used and important than formal ones (Bönte & Keilbach 2005).

3.3.5 Risks related to trust

Characteristics of knowledge, absorptive capacity, resource overlap and the use of knowledge management practices could affect how easily partners appropriate certain knowledge. Fact is however, that some amount of firm's knowledge can be appropriated. Partners can have incentives to appropriate knowledge whether they operate in complementary or supplementary fields. Firms are obliged to use appropriate institutional mechanisms to protect their knowledge (Liebeskind 1997). Luhmann (1979) agrees that legal norms are one of the most effective ways of getting prepared for the risk involved with trust. The use of legal norms and sanctions also gives good clues to a potential partner looking for a partner to trust that the firm is taking trust issues seriously and is therefore more trustworthy than the ones that do not use these legal norms. Legal regulation and a threat of sanctions can reduce the risk of betrayal. However sanctions should not have to be used, they should merely serve as a preventing factor of offences against partner that

the both parties would remember before even thinking about betrayal. (Luhman 1979 p. 36-37)

3.3.6 The effect of trust on knowledge sharing

Mutual trust between partners reduces the fear of opportunistic behaviour (Gulati 1995). Trust-based relationship in collaborative innovation can contribute to freer sharing of knowledge. The people involved in the collaboration do not feel they have to protect knowledge from the partner as they have trust that the partner does not behave in an opportunistic way. (Kale et al. 2000)

The existence of trust can help the employees of both firms to create informal discussions between them that can be called knowledge sharing units. The informal knowledge transfer between employees of both companies keeps the partners posted on what is going on in the collaboration. Trust, and therefore also knowledge sharing between people can even increase in an informal group of people like this.

3.4 The relationships between contracts, IPRs and trust

There are a lot of good sides of firms putting their forces together in a form of a knowledge pool to profit both partners. One major thing is that due to collaborative innovation the firms have more resources in their use than they would have alone. Collaborative innovation creates access to partner's knowledge. A partner can have, for example, existing markets to the created innovations. Knowledge assets are vital for firm's competitiveness. In collaborative innovation these knowledge assets are shared with the partner in order to reach a common goal. Depending on the nature of the knowledge

itself, the knowledge can be easily appropriated by partner, or the knowledge can be totally useless for the partner without collaboration. Depending on the ease of appropriation different combinations of protective mechanisms need to be used to prevent unwanted appropriation and to ensure the succeeding of a collaborative innovation. At the same time as knowledge is being protected, the firms need to share knowledge to each other in order to reach new ideas and innovations. Contracts, IPRs and trust can be concluded to work together supporting each other in the task of helping firms to balance between their knowledge sharing and protection. The relationship between contracts, IPRs and trust can be illustrated as seen following figure 9.

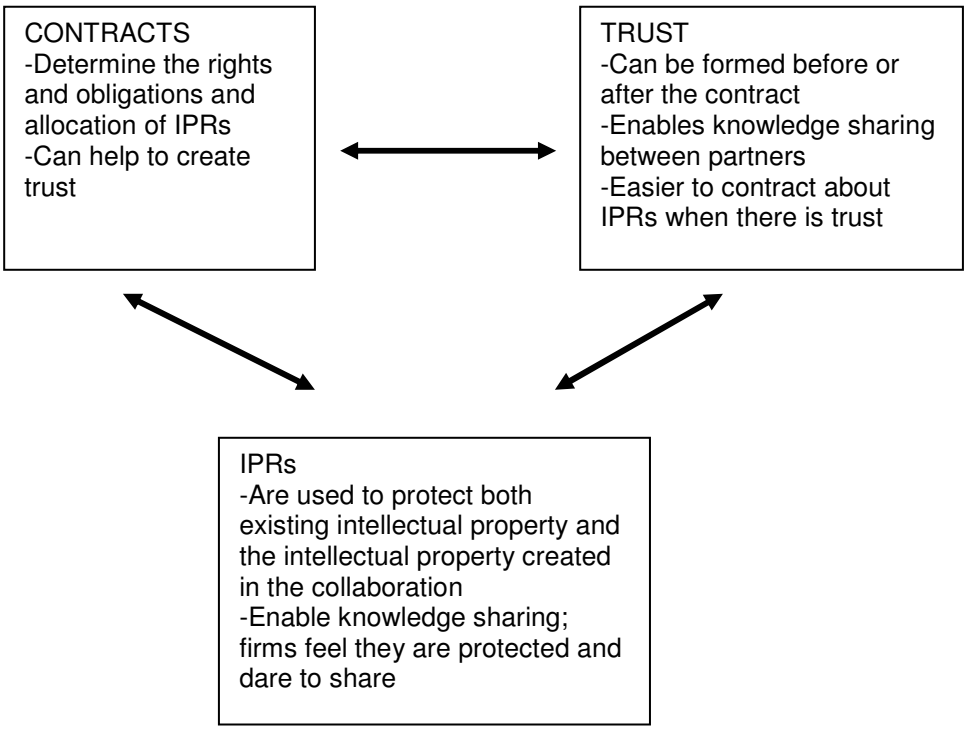

Figure 9. The relationship between contracts, IPRs and trust

Trust enables a better flow of knowledge between partnering firms. Having trust eases the negotiations about contract and the allocation of IPRs. Contracts are there to protect the environment where the knowledge exchanges take part. IPRs are both the wanted outcome of the cooperation and also a ways to protect the existing knowledge from leaking out. Innovations that arise from knowledge sharing and creating can be turned into intellectual property and partners or one of them will become holder of these intellectual property rights.

Contracts are used to determine the mutual rights and responsibilities of the partners in collaboration. They can be seen as incentive for trust building in relationship. It is a sign to a partner that everything has been taken care of and that one is dealing with a trustworthy company (Luhmann 1979 p. 36). Some studies say that the use of legal norms and contracts is detrimental to a collaboration, but that should only be the case of contracts were used by both sides forcing one-sided advantages upon the other and threatening to take the case to court (Bachmann 2001). Contracts are also used to determine partners' rights to background and foreground knowledge. Clauses about intellectual property ownership are important to be made in the early phase of collaborative innovation since it can get harder as time goes by. Still, if there is trust between partners, the agreement about these rights can be made later on. However, it should be carefully deliberated if the partner is really worth of such goodwill trust and whether it might use an opportunity like that for its own good or not. However, too much protection could hinder innovativeness. If a partner feels that they are not being trusted, and that knowledge is withdrawn from them, they might change their own behavior as well not share as much knowledge as needed by the collaboration. That could hinder or even cause a failure of the collaboration.

Although trust maybe a sought-after goal in collaborative innovation, it needs to be remembered that some amount of distrust only keeps one sharp. It means that one shouldn't blindly have faith on one's partner but be also

prepared for possible changes in the relationship and knowledge sharing within. When trusting blindly, changes for the worse from partner's side might not be noticed early enough. Some amount of distrust can be good, if it helps in remembering there is always certain amount of uncertainty in every business relationship whether there is a contract or not.

4 IPRS, TRUST, AND CONTRACTS – A MULTIPLE CASE STUDY

This chapter will introduce the methods and data of the empirical part of this thesis. IPR's, trust, and contracts will be studied in the light of a one globally functioning forest industry firm called Pinewood (name of the firm has been changed for confidentiality), and four of its strategically important suppliers from different industries. Each case is thoroughly examined as a partnership between two firms Pinewood being the other partner in all the cases.

General introduction of the Finnish forest industry

Finnish industry has traditionally been centered around forest and the paper industry. Pulp, paper, and a variety of sawn goods are made for export in larger amount than for domestic markets. (Bruun 2001 p. 15) Surrounding this main industry branch there is a complex network of collaboration partners that are needed by the Finnish forestry firms. This network includes material suppliers, technical engineering and machine manufacturers, chemical industry, vendors, and universities and different research institutes. Machine manufacturers need close collaboration with paper firms in order to make the best possible machinery for those firms. Firms in pulp industry need partners for example from chemical industry and wood producers. Paper firms are a good example in a sense that due to the competitive situation in the markets they need to network with other firms extensively to survive. Formerly the paper firms managed to do a lot themselves, but during last decades there has come a trend of outsourcing and concentrating on one's core competencies in the competitive market. Forest industry firms cannot survive by themselves anymore. As the costs of energy and labor are relatively high in the Nordic countries, it is difficult for paper companies to yield profit in a situation where the whole paper industry suffers from over supply of goods.

Partnerships in the forest industry between for example paper companies and companies of mechanical engineering or chemical industry are very common as the paper companies try to gain value. Value creation is however quite difficult in a situation where costs are high and outside resources are needed for almost all strategic research and development. These problems were also apparent in the cases examined.

4.1 Research methods

This chapter will introduce the methodology that will be used to study the subject empirically. The empirical part of this study is qualitative and uses multiple case-studies as method to explore the reality behind the theoretical implications. Research method, data collection, and the validity and reliability of the data will be discussed.

4.1.1 Case study

Case studies are a typical way to do qualitative inquiry. As a form of doing empirical research, case study is defined by its interest in individual case, not by the methods of inquiry used. Case study gains credibility by thoroughly approaching the descriptions and interpretations, not just in a single step but continuously throughout the period of study. Case study concentrates on experiential knowledge of the case. (Denzin & Lincoln 2005 p. 454) A case study usually examines from one to a few chosen cases to serve a particular purpose (Koskinen et al. 2005 p. 154). The object on a case study is usually firm's certain process, function, department, or history for example. Levels of a case study can be industry level, organization level, project level like in this study, or individual level. Methods for data collection can be various and they are chosen concerning the specific case study. The most typical qualitative

research materials are interviews and written materials. (Koskinen et al. 2005 p. 157) In this study also, the cases presented were chosen so that the supplier partners would represent different industries and that there would be somewhat different results from the collaboration, some cases succeeded as some were not as successful as hoped when starting the collaborative innovation.

A typical case study used for research purposes is very specific, for the data collection is dependent on research questions and the theory. Much time is used in the data collection and interpreting. Issues concerning the research problems are dealt in detail but other data is mainly for background information. (Koskinen et al. 2005 p. 156) A case can be simple or complex (Denzin & Lincoln 2005 p. 444). Documenting takes a lot of time for planning, gaining access, data gathering, analysis and writing. There are not always clear stages to these, but development of the theory continues until the end of the study, and writing of the empirical case study starts from preliminary observations. (Denzin & Lincoln 2005 p. 453)

When there are several case studies like in this study, the method is called multiple case study research (Koskinen et al. 2005 p. 162). There are pros and cons for multiple case studies (Denzin & Lincoln 2005 p. 445-446). The advantage to multiple case study method is that it has greater evidence about the research problem in question. When making of multiple case study every case should have a function. (Koskinen et al. 2005 p. 162) Each case should be studied as individual and following replication thinking and should not be considered only as statistical extract. If all cases give the same results, the theory can be considered to have verification. Every one of the single cases is part of a series and the validity of the theory will be evaluated based on all of the cases, and not only one. (Yin 2003 p. 48-53)

4.1.2 Data collection and analysis

The data was collected through theme interviews in the case company called Pinewood. The four cases were chosen since they provide with both successful and unsuccessful collaboration projects. They give a good picture of the most typical knowledge sharing problems and advantages in this certain industry. One interview per case was conducted and additionally one pre-interview with person in charge of contracting was made before the actual interviews to discuss the validity of the cases and for the researcher to get an overall view of the empirical data. The same person was also later on interviewed about all the cases since that person was well aware of all of them. All other interviewees were, also, long-time employees of Pinewood. They all had technical backgrounds and had taken part in collaborative innovation projects with several years experience. The interviewees can be said to all have good understanding of research and development, and collaborative innovation projects with different suppliers. Since all the projects were quite small when it comes to number of employees taking part in the collaborative innovation, all of the interviewees had an important role in the case they were interviewed about.

The interview questions (see Appendix 1) were planned as advised in empirical research method literature. They were also planned according to the theory and so that research questions could be answered. The questions were reviewed and commented by supervisors of the study before the interviews took place. The interviews were taped and transcribed to ease the processing of the data. As the interviews were in written form they were uploaded to a qualitative data handling software ATLAS.ti. The software could then be used for coding the data in order to ease the processing and the analyzing of it. The interviews were made in February 2007.

4.1.3 Quality of the data

Cases to be examined in this study were chosen so that they would represent different industries that Pinewood has as partners. They involved different people from Pinewood and they went on at different times. The interviewees were chosen on the basis of their important role in the collaborative innovation project in question, and perspective from history of research and development for the company. The cases represent the phenomena studied in this study well.

4.2 Case presentations

Case 1

Some time ago Pinewood had an idea of a technological improvement in one of their processes. They had to decide whom to do collaborative innovation with. Negotiations started with a familiar Supplier firm A and they agreed they could together accomplish new innovation to profit both parties.

Since Pinewood had already past experiences about this supplier it was a natural choice for partner. Past experiences and trust between the firms and the people within aloud free knowledge sharing that benefit the project. An important thing was also the belief that the partner was going to make their best effort to gain results. There were not any doubts about the partner choice in the minds of the Pinewood employees when the project started.

> *“They’ve done projects like this before. We know they are able to do it and we have a history of collaboration. We don’t need to think about it that much.”*

Pinewood's interest for the collaborative innovation was to develop one of their business areas. They wanted to learn about the process and not so much learn about the partner's business.

> *"We were not so much interested in how they did it, but in what would be delivered and if it worked as we wanted it to work."*

Pinewood felt strong in the negotiation phase, since they had history with the partner and the partner was a big supplier for them in other ways as well. They thought this position as a big customer gave them advantage against the partner. The supplier would not dare to be opportunistic because of how much it had to lose if this collaborative innovation was to fail. After first negotiations about the possible collaborative innovation, both firms came to the conclusion that they are able to help each other to achieve something new and useful. Non-disclosure agreements and a collaboration agreement were made between the companies and the employees and the project was started. The collaboration agreement was made mainly to protect Pinewood's own knowledge, and to insure they would gain competitive advantage if the collaborative innovation was to succeed. They could be possess the IPRs or lead in launching new products, for example.

At the end of the collaborative innovation project the people at Pinewood, who observed patents of competitors and suppliers noticed the supplier had started proceedings to file for a patent that Pinewood had not been informed about. When asked about the issue, the supplier pleaded to the contract that they were just patenting what they thought belonged to them. However, the contract clearly said that, if they were to create a patentable innovation together, both parties would file for the patent together unless one or the other wanted to withdraw from the filing. After both firms' lawyers had negotiated, also Pinewood got their name in the application and both of them got the patent in the end.

> *"The most difficult thing for us was that we were not told about this matter they planned although according to the contract the innovation was on that gray area where they should have taken us along in the negotiations in the first place."*

The patent application of the supplier came as a bit of a shock to Pinewood, because they had trusted the supplier would not use them or the knowledge gained in the collaborative innovation opportunistically. Trust towards this supplier-partner shuttered and Pinewood was not sure, if they would do this kind of collaborative innovation together with this partner in the future.

The collaborative innovation was a success in that sense concidering Pinewood got the product they wished to get from the collaboration, but in the end they were not happy about the way things were handled. The loss of trust towards the partner affected in a way that collaboration was not continued to the next phase with this particular partner, although there would have been other preconditions to that. In the future Pinewood will be very careful entering into new collaborative innovation with this supplier.

Case 2

Another time Pinewood had an idea of a technical development in another process. The idea appeared to work in small scale, and if it would work in a larger scale it could yield better profits for the firm. It was not able to do the development itself, and therefore needed a technical partner. Supplier B was selected as partner because it was the only firm capable to supply Pinewood with this product and some of Pinewood's employees had some personal contacts to this firm. Mutual trust between the firms was gained already in the first meetings, where the engineers of both firms talked about the technical side of the collaboration.

> *"Engineers are straight-forward and like to keep things simple. Engineers feel they can trust each other when they are talking about technology. As soon as we get to commercial issues, the problems start."*

At that time it was quite usual for collaborative innovation to start without formal agreements, and so was the case in this project as well. It was the technical engineers of both firms that took part in starting of the collaborative innovation. Negotiations were held around a table and the communication was mostly verbal with some illustrations on transparencies. Knowledge sharing was open and trust was present in this collaborative innovation project. The collaboration was managed at first quite informally. That was the way of the country several years ago. All the knowledge needed was provided in the meetings. The informal management was considered leading to more openness in the knowledge sharing and discussion. Everything was going well until both the firms realized they had found something important and valuable, and they did not know which partner the rights to this invention belonged to.

The contract negotiations were not easy as one can imagine in a case where results are already near and there is no contract yet. Partners came to a consensus and collaboration agreement was written where allocation and exploitation, and the licensing of the rights were determined.

> *"The most difficult things about the agreement were related to determining which share belongs to whom, how it is exploited and how both you and your partner can benefit your businesses with this common property."*

Pinewood felt that their partner tried to use the position that no contract was made earlier in order to profit more from the collaboration. Pinewood's trust towards the supplier dropped from its high level when the negotiations about

the collaboration agreement went on. The reason for this was that suggestions they got from the partner were one-sided. Propositions concerning the agreement did not feel equitable to them.

> *"Our trust was based on the assumption that the rights will be owned and exploited together since we invented them together."*

> *"The partner tried to take advantage of the situation that there was no contract before the end of the collaborative innovation."*

There were no problems in the collaborative innovation with supplier B before the contract negotiations. The situation got better after the contract was signed but still there remained the uncertainty and disappointment that was caused by the partner's behavior. After all the collaborative innovation was considered a successful one since Pinewood gained new knowledge and technological competitive advantage in a form of a mutually owned patent. Today Pinewood thinks it is still possible to collaborate with this supplier if the contracts are well designed and agreed on in much earlier phase of the collaboration.

Case 3

In the case 3 Pinewood again had an idea where they would need a partner's help. The idea concerned the use of a material that was otherwise going to waste. The partner (supplier C) was chosen on the basis that they would be able to do this kind of planning and delivery that the idea demanded. Also, the size of the chosen partner was convenient. Pinewood felt they could get a lead better with a partner that was relatively small than when it comes to using bigger partners in size. Bigger partners could have sold the innovation faster to competitors of Pinewood. In the case of supplier C it was an easy

decision to have them as a partner since they had some common history from projects like this before and even other on-going projects at the same time.

Knowledge sharing between the firms was open, for it was in the best interest of both partners to achieve results as soon as possible. Knowledge was shared in negotiations of the planning phase and also people from the supplier firm could come and see the process at Pinewood's location. The risk of possible knowledge leak was considered relevant, although small in this case. The risks in this collaborative innovation were greater in the technical side of the collaboration. If the innovation would not work, or major changes would have to be made to make it work, the costs would have probably been for Pinewood to pay. Other risks related to the partner's behavior perceived by Pinewood's side in this collaborative innovation were relatively small. They felt they were in a stronger position compared to their partner which was a big supplier for Pinewood in other areas of business as well. The risk of knowledge being leaked outside the firm and the collaborative innovation did not affect knowledge sharing in large amount.

> *"Of course knowledge is always transferred into the common knowledge package, and through that to the partner in collaborative innovation, but we are conscious that unless knowledge is shared, no new knowledge will be created together."*

In the beginning of the collaboration the partner's did not have a collaboration agreement. There was only an agreement on Pinewood buying a product from supplier C that would help their process. The first six months went to planning and negotiating. Soon after the plans were ready, a well-designed agreement that included clauses about the allocation of intellectual property rights was signed. The contract was considered fair and equitable to both partners, and having the contract it was easy to file for the patents they wanted in order to profit from the innovation. The deal was that both of the partners would get their names in the patent filing and the supplier continued

to supply Pinewood with the product and technical back up related to the product. They did not get the patents they filed for since the technology used in the innovation was evidently not new enough to gain the patent protection. However, the partners negotiated an agreement that the supplier would only sell the product to them which of course brought Pinewood's competitive advantage compared to their partners that could not use exactly the same technology since the supplier would not sell it to them. Even the supplier was happy, since the collaborative innovation had gone well. They got to supply the customer with more of the same products and even continue on the process of making the new innovation even better. New agreements on continuing collaboration were made.

More protection is sought after since the actual invention is not new enough to be patented. However, there are alternative ways to try and patent the invention, which may help the partners in keeping competitors from copying the same technology for a longer period of time. Also both partners gained large amount of knowledge about the process, the product, and maintenance, for they shared a lot of knowledge in this trusting relationship. The relations between the partners are still fine and other projects are possible, only the contracts will be made more carefully at an earlier phase with the partner in the future. The informal relations are still there and people feel they can trust each other in informal issues as in business. To avoid difficult situation of not being able to patent the invention, there has to be good contract early on, to ensure the partners will come up together a ways to still profit from the innovation. Although everything went well with this particular partner as they noticed they would not get the innovation patented, Pinewood recognized that with some other partners that might not have been the case, and therefore learned a lesson about making the contract earlier.

Case 4

Pinewood had found in their own research that they could improve their product and get more revenue, if a change was made in one phase of the process. They sat in the negotiation table with a familiar partner (supplier D) with history of previous projects and good informal relations to employees.

The collaborative innovation was started since both parties thought they could come up with new innovation. The idea was to first do some testing together and then see if something worth of making a contract comes up. Both partners knew they only had an informal testing contract. Another contract, concerning the whole collaboration, would need to be made in case they wanted to continue the development on a bigger scale than a laboratory.

> *"We did not really know if anything would be actually invented… It was not worth the contracting process. We thought we would first do some tests and then a contract if both wanted to continue."*

> *"It is not difficult to make a deal about testing. It is two times as difficult as testing, to make a deal about piloting. When making a written contract of collaboration in actual scale it is ten times more difficult. It might be worth 500 000 euros."*

Without contracting process the collaborative innovation started quickly and employees, engineers of both sides were enthusiastic about the project. Information was exchanged quite freely, Pinewood needed to provide the supplier with all the knowledge they had about the idea, because the supplier was not familiar with the technique and process beforehand. The partners had regular negotiations around a table where they exchanged knowledge about the results and thought about changes and improvements to the process. Pinewood needed to share this information with its partner. However, Pinewood noticed that the supplier did some changes at their own

location but did not inform Pinewood about these changes in detail. When results came from tests, they were analyzed, and changes were made again. This went on for a few years, but the invention never reached commercial exploitation in large scale.

The problems arose when it was time to take the innovation to large scale factory environment. Since the partners didn't have a written contract, they had to try and make one at this point. However, no consensus was gained. Demands of both partners were high and the investments would have been enormous. There was also need to have faith in the invention and each other. The supplier never showed any detailed drawings or gave information about the technical side of their responsibilities. Project employees from Pinewood were not aloud to go to supplier's location to have a look at what they were doing. The supplier D protected this information as their business secret even if it contained information from Pinewood. Of course Pinewood's project organization got a lot new knowledge about a technique like this, since they got the results of their own testing and the results from the partner.

Pinewood considered the demands of the supplier unfair since they demanded refund of something that was Pinewood's property for Pinewood to be able to use the invention. They couldn't make a contract that was not in their best interest. As the supplier wouldn't bend in the matter either, agreement on how to continue the collaboration in actual scale couldn't be reached.

As it seemed that no results would be gained through negotiations with this supplier, Pinewood decided to go to another supplier that they knew was a supplier to their partner D asking them to carry out the task. The supplier thought about taking the deal, but they had to refuse, since they had such a strict contract with Pinewoods supplier D that they would get into trouble if they started to supply for Pinewood. Pinewood met a blind alley. Negotiations were jammed for a long time and no result could be found since either of the

partners wanted to bend. Pinewood planned about finding alternative technique to carry out the plan.

4.3 Intellectual property rights

Intellectual property rights are among the actual innovation the best gain from a collaborative innovation. Possession of IPRs guarantees a firm that they can develop and use the innovation themselves without fear of losing it. It is therefore not easy to settle these issues with a partner. A natural wish to all firms seems to be having everything to them, and leaving nothing to the partner. However, a collaborative innovation does not work that way. Sometimes the division of intellectual property is so difficult that no agreement can be made. In all the above cases the contract was made at late phase of the collaboration due to the problems of not being able to make a contract that was fair to all the parties in the beginning. The contracting delay was admitted to be caused by difficulties found in agreeing about the allocation of results.

In the cases 1, 2, and 3 the final conclusion about IPRs was that both firms would mutually own the parts of the inventions that were invented together with mutual efforts and the party that had developed something alone would have exclusive right to their own part of the invention. This is not the best possible situation if the best part of the invention is the one that was mutually developed. Of course both firms wish they would have exclusive right to that and not have to share that right with a partner. The only way of being able to gain this kind of mutually developed asset, would be having a contract. The contract would guarantee the client’s rights for the invention ordered from the partner. This leaves a question open, what is the partner's gain besides the agreed reward of contract supply. Learning from the process and gaining trust from the client could be seen as indirect gains as well. Eventually they could

lead to another project with this partner that would bring them some kind of agreed upon financial benefit.

In all of the cases the employees of Pinewood shared all the knowledge needed in order to develop innovations. All the interviewees acknowledged the great importance of knowledge sharing on innovation. On the other hand, it was not very clear to them which issues they were not aloud to talk about with the partner. The knowledge sharing was so open, that no real limitations to knowledge sharing were considered. On the other hand the suppliers tried to withhold at least some knowledge related to their process that could be considered as their trade secrets.

4.4 Trust

In all the cases presented earlier, Pinewood had existing relationships with the suppliers. This tells about the industry and its limited choices for partners, but also that it is a lot easier to choose a familiar partner with whom there has been time for incremental trust building. It can be said trust existed in each of the case-projects between the partners before the collaboration started. The trust was based on the previous experiences of the partner. Pinewood knew the partner would have the competence needed from the collaboration partner.

It was found that it is easier for Pinewood to trust other Finnish firms as partners, since they have the same language and culture. Contracting was also considered a lot easier with a partner with similar cultural background. Risks of getting to an argument would be greater since a possible court handling would be abroad in a foreign court held in English.

The collaborative innovation was found easier between partners somewhat the same size. Especially if Pinewood would have to collaborate with small firms there would have been more trouble than with bigger ones, in general. Small firms are not able to participate as much to the costs as the bigger firm. Therefore all the economical risks are on the larger firm. The situation was considered a risk, since the functioning of a small firm was found more difficult to predict than those of larger size. On the other hand, in case 3 it was found that Pinewood wanted to collaborate with partner that was noticeably smaller in size than Pinewood, since they felt they were more in control of the relationship and had vantage of that.

In cases 1 and 2 the trust towards the partner was shuttered somewhat due to the partners' opportunistic behaviour in the contracting phase. In case 1 the supplier A tried to file alone for a patent that was mutually developed. Even though Pinewood worked the problem out with the partner and they both got a mutually owned patent, Pinewood still thought the partner had tried to steal something from them. The loss of trust occurred and Pinewood froze further collaboration plans with this partner. In case 2 the loss of trust in the contracting phase created some amount of distrust, but as some kind of agreement could be reached, it was not perceived as serious as in the case 1. Still the disappointment towards the partner created some amount of distrust and uncertainty between them.

It is remarkable that all the interviewees thought that it takes a lot of time, possibly years, and energy to build up goodwill trust between partners. At the same time trust can be lost very fast. When trust is gone, it is really difficult to continue a business relationship. However, interviewees from Pinewood were not willing to totally give up on collaborative projects with these partners in the future. If the loss of trust was not too serious and could be somehow corrected, there might still be hope of future collaboration. The interviewees had a consensus that they might work again even with the partners that had once betrayed their trust. However, in the future contracts should be well

planned and signed beforehand. That way the employees of Pinewood could have trust in the partner again as a business partner. Even though business relations might have been hurt, that did not seem to affect the informal relations between employees of Pinewood and one of the suppliers, as happened in case 4.

4.5 Contracts

In all of the cases collaborative innovation project was entered open-mindedly with sharing attitudes and enthusiasm. Instead of contracts, the partners had technical issues on the top of their minds. It was not until results started to occur that the partners noticed the knowledge gained could be something that anyone could use unless it was protected. The problem was that since the results were already visible, no-one wanted to give them up to their partner. In the interviews it was acknowledged that the collaboration proceeded in reverse order starting from the negotiations, moving to knowledge sharing and innovating leading towards the contracting problem.

As the contracts were made, there were clauses about the division of IPRs and the interplay between the partners as well as the starting and termination of the collaboration. There were also clauses about confidentiality where it was needed. Actually, the only thing wrong with the agreements was that they were not made on time. The late contracting led to not being able to make as good contracts as possible in order to gain real competitive advantage. A lot of the troubles that existed in these collaborative innovation projects were caused by opportunistic behavior of a partner, some of which could have been prevented if there had been a signed collaboration agreement from the beginning.

4.6 The interplay between IPRs, trust, and contracts in the empirical data

The findings of the cases are drawn together in the table 4. In the table, the objective of the collaboration can be seen being the same for all of the projects. Also knowledge sharing was found to have been open in all the cases. In two cases there was a collaboration agreement before results were to be seen, but still in the other case the partner violated the contract. In the other case everything went well while there was a contract. Patenting was not possible in that case for other reasons. In the two cases where there was an agreement, the other one could not be finished since the partner would not make a fair deal with Pinewood and in the other case an agreement could be reached and the invention could be patented, but still Pinewood's trust was shaken because of opportunistic behaviour in the delayed contracting process. In three out of the four cases there was a critical point in the collaboration that was related to contract. In two cases the problem was caused because the contract was not made on time, and in one case the partner violated the contract by applying for a patent alone. In two of the cases Pinewood got a mutually owned patent with the partner. A great deal on new knowledge was also created in the projects. In one of the cases patenting was not possible, but Pinewood could still benefit from the innovation because of continued agreement between the partners. In one case the partners could not come to an agreement at all and the collaboration had to be terminated with the partner.

Table 4. Empirical findings on knowledge sharing and protection and their influence on the overall success of the collaboration.

	Case 1	**Case 2**	**Case 3**	**Case 4**
Objective of the collaboration	Develop an improvement that would increase profit	Develop an improvement that would increase profit	Develop an improvement that would increase profit	Develop an improvement that would increase profit
Openness of knowledge sharing	Open sharing of knowledge	Very open and trusting, informal relationship	Very open and trusting knowledge sharing from Pinewood	Open knowledge sharing from Pinewood, not as open sharing from partner to Pinewood
Agreement about division of IPRs made on time	Yes, but was violated by partner A	No contract was made until results were obvious	Yes	No. Collaboration started informally, and as results were obvious it was impossible to contract fairly
Critical point in collaboration	The violation of collaboration contract by partner's side (unagreed patent application)	The contracting phase at a late point. The partner tried to take advantage of the situation	When noticed that patenting was not possible. Luckily the partner was loyal and they could come to an agreement about continuing to work together	The collaboration agreement negotiations, as the supplier's demands were unfair and opportunistic
Parties' gain from the collaboration	Useful patent together with the partner	New knowledge and a mutually owned patent with the partner	Although the patent applications failed, a further contract was made with the partner concerning the exclusive supply of the material they had invented together	Pinewood found out their idea would probably work in large scale. The plan couldn't be finished up, however
Overall success of the collaboration	Success in a sense that patent was gained, but trust towards this partner was shuttered	Success as there became a patent, but relationship with partner was somewhat hurt by partner's opportunistic behaviour	Successful project even though no patents were gained. Trade secrets and agreement between the partners form the competitive advantage at the moment	Pinewood has not been able to profit from the innovation as they haven't yet found another partner that was fair. Trust related to business activities with the partner was shuttered. Next time contracts will be made earlier with them

5 CONCLUSIONS ABOUT THE ROLES AND DYNAMICS OF IPR, TRUST, AND CONTRACTS IN COLLABORATIVE INNOVATION

This study has provided a theoretical framework for studying the roles and dynamics of contracts, IPRs, and trust in balancing knowledge sharing and protection. It has presented examples of collaborative innovation projects, some successful some not so successful. This chapter will conclude by presenting the limitations, the contributions, both theoretical and managerial, and final conclusions.

5.1 Limitations and suggestions for further research

There are certain limitations to this study due to only having Pinewood's opinion of the collaborative innovation with different partners. Having interviewed only Pinewood's employees, a perception of Pinewood's point of view has been gained. But the perception of their partners' about how much and openly Pinewood, and the partner communicated between them could be totally different than that of Pinewood's. The unit of analysis is however, Pinewood and due to the sensitivity of the subject, only Pinewood was interviewed in this study.

Because the cases are all from one certain industry and its supplier industries, the generalization to different industries is problematic. Since there are four cases that do represent these issues in the industry in question it is possible to generalize some of the results at least to this industry. Multiple case study as a method offers possibility to learn about particular cases. Generalizations across different industries need to be made carefully. The results can be seen giving a thorough picture of particular cases of interest.

For a broader perception of the dynamics of trust, contracts and IPRs in collaborative innovation it would be interesting to study both of the partners and partnerships with multiple partners, which would be a more complex case. Also, in order to be able to draw conclusions about these issues as a whole, it would be needed to study totally different industries and different kinds of levels of collaboration between the organizations. For example, there is a lot of informal collaboration between companies that might not officially have a collaboration agreement. The idea of sharing knowledge in order to build one's own knowledge base comes quite near the idea of open innovation. The more you share, the more you will receive in return. The issue of balancing between sharing and protection of knowledge is still not thoroughly investigated when it comes to balancing for example within a firm. It could be interesting to study how a firm should balance between knowledge sharing and the management of trade secrets internally.

5.2 Theoretical contribution

The study provides a framework for studying the roles of trust, IPRs and contracts together in collaborative innovation. This study binds together these three concepts for the first time in a research of collaborative innovation projects. The research has been interesting since collaboration projects are dynamic and relatively short term when compared to the life span of a company. However, if everything goes well, partners are likely to collaborate again. The downside is that in case something goes wrong in the collaboration, it could have very far-reaching consequences.

This study has provided literature review of the past related researches and assessed the knowledge gained from it in the empirical part. In the empirical part issues and ideas that rose from the literature have been tested in practice. Cases and the interviewees were carefully selected to know their

projects and therefore an interesting and thorough view of one firm's side of the issues could be reached.

5.3 Managerial contribution

By reading this study firms can learn about trusting enough to share. The lesson about this study is that every collaborative project has its challenges. However, one can create better circumstances by trusting and letting the partner know that, and act based on that trust. Another important lesson is in alternative modes of protection. Patent protection is not always the one and only mode of protection and it can be time- and money taking. As the amount of patents owned by a firm increases, the costs increase at the same pace. There needs to be personnel to manage the patents or outside help is needed, which increases costs considerably. Also, patents do not solve every issue about knowledge protection. They hardly protect the tacit knowledge of the company. Other protective modes besides patents need to be considered as part of the protection strategy. There are ways to educate the personnel and other protective modes based on secrecy for example. It is usually difficult to take these new modes into use, and sometimes it even goes overboard. New ideas should be applied enthusiastically but with forbearance.

5.4 Conclusions

The objective of this study was to find out, how the role and dynamics of contracts, intellectual property rights and trust affect knowledge sharing in collaborative innovation. This study has showed that there is a connection between these three factors that affect knowledge sharing. These factors

form a circle where one factor leads to another backing each other up as seen in figure 10.

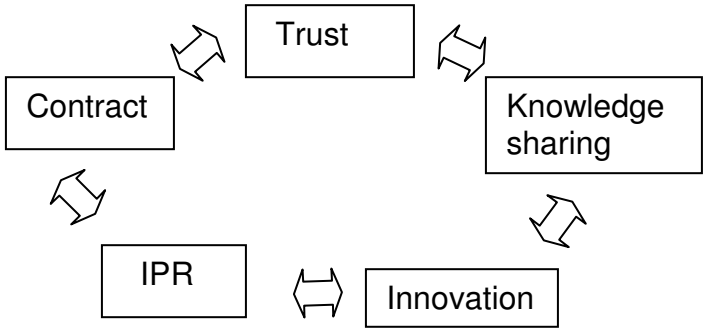

Figure 10. Circle of collaborative innovation interactions

Some amount of trust usually exists before there is chance for a collaborative innovation to take part. Also, if contract would be made at an early phase that could improve the partners' possibilities for open knowledge sharing by increasing trust. On the other hand, according to the research results, there does not have to be a contract for partners to have open knowledge sharing. In the data it was found that informal relationship without a written agreement can be a very fruitful ground for a collaborative innovation. However, it is much easier to get betrayed by one's partner if there is no contract. And once the trust is lost, the relationship will hardly recover to its previous condition. The partners having trust and a fair attitude towards each other makes contracting and agreeing about intellectual property rights agreeable. Trust towards partner enables using of existing intellectual property and knowledge in the collaboration. That, on the other hand, helps in creating new knowledge and new intellectual property. As a conclusion it can be said that balancing between knowledge sharing and protection is crucial for finding competitive advantage from a collaborative project. Although they are not the only things that affect the success of a collaborative innovation, all three contracts, IPRs and trust are needed in order to make collaborative innovation a success. This way firms can gain sustainable competitive advantage instead of falling into a non-win situation caused by poor planning of the collaboration project.

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APPENDIX: INTERVIEW QUESTIONS

Interview Questions

Questions about the interviewee:

- Position?
- How long has he/she been in the firm?
- Role in the particular collaboration project?

General questions about collaboration projects:

- What are you collaboration projects like, in general?
- Describe the case in question?

Collaborative Innovation:

- What was the goal of the collaboration?
- What were the roles of the partners?
- What were your motives to go into collaboration?
- What role did knowledge transfer / knowledge sharing have in this project?
- What kind of new knowledge was sought after and how?
- Which factors (if any) hindered knowledge sharing between you and your partner?
- How was knowledge exhanged in practice?
- Which mechanisms did you use in order to ease the knowledge transfer?
- Did you anyhow observe the knowledge exchanges between you and your partner?
- Who exhanged knowledge and in which situations?
- What was the formation of the group from your firm and the partner's?
- In which ways were your employees in contact with the partener's employees?

- Was the knowledge that was exhanged in this project of tacit of explicit kind, or both?
- Absorptive capacity:
- Did you want to learn from the partner?
- What was your ability to learn from the partner?
- Did you try to enhance the learning from partner in any way?
- What was your partner's ability to learn from you?
- What riks do you see in this kind of collaboration, in general?
- What kind of risks do you see related to knowledge creation and protection?

Management of collaboration:

- How were risks being prepared to?
- How was the collaboration managed? Was it managed formally, informally, hierarchically?
- What kind of contracts did you have with your partner concerning the collaboration?
- Why were these contract used?
- What was the main risk you used contract to be preapared to?
- Did you have any other agreements besides employment contract, with your personnel?
- What was the collaboration agreement like?
- Was the agreement tight or flexible?
- Did you need to make changes in the agreement during the collaboration?
- What was the importance of the contract in the collaboration?
- Was the contract as significant all the time, or was it more important in some specific part of the collaboration?
- What was the role of trust in making the contract?
- What kind of related immaterial property rights (background knowledge) did you have when entering the collaboration?
- Were you able to protect all knowledge?

- How did you prepare for knowledge leaks?
- How did you try to protect your trade secrets?
- Did you need to your immaterial property rights in order to get to the results?
- How willing were you to let your partner use your immaterial property rights in the collaboration?
- Did your partner have any immaterial property rights when entering the collaboration? How much did they affect on your decision to collaborate with them?
- How willing was your partner to let your firm use their immaterial property rights in the collaboration?
- Did using existing immaterial property rights affect the trust between you and your partner anyhow?
- Was there any intellectual property created in the collaboration (foreground knowledge)?
- What kind of immaterial property was created?
- How were the immaterial property rights allocated?
- What was good in the management of the collaboration project?
- What were the biggest challenges or places for development in the collaboration?
- What was especially difficult in contracting?
- What was especially difficult with immaterial property rights?

Trust in collaboration:

- What was the role of trust in this collaboration project?
- And what is the role of trust in collaboration projects, in general in your opinion?
- Could collaboration like this be possible without trust?
- In which factors was your trust based on in this collaboration project?

- How was the trust created? What were the critical factors for the creation of trust?
- How did you try to create trust? Do you tend to do that conciously?
- Which factors diminished trust?
- What was the affect of contract on trust?
- What was the affect of the use of immaterial property rights on trust?
- Did the existence of patents and trade secrets affect trust in somehow?
- Were there changes in the level of trust during the cource of the project?
- Was the partner trustworthy the whole time?
- Was the role of contract more important at some point of the collaboration than otherwise?
- Was the role of trust unchangeable the whole time?

The outcome of the collaboration:

- What were the critical factors for the success of the project, in your opinion?
- How is a successful collaboration project like, in your opinion?
- Did you reach the goals you wanted from this project?
- Does the outcome of the collaboration affect your willingness to collaborate with this partner again?
- Do you see some challenges in the future of collaborative innovation projects?