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Frontiers of Open Innovation

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Foreword

The idea of open innovation (OI) was initially presented by Henry Chesbrough in 2003. It has increased a great attention among academics and practitioners ever since. The main idea of OI emphasizes, among other things, that agents can benefit from acquiring valuable knowledge from external sources external and/or selling internally generated technologies, which have low value within the agent's current business model, to other agents. The OI concept is clear, but the question is how the notions of open innovation are received or implemented in different economic environments and corporate ecosystems. Are original settings sustainable, and for how long?

This research report is edited from presentations of the Open Innovation Research seminar held in August 23, 2010 in Kouvola. The seminar had both theoretical and practical oriented presentations from academia, business and government sectors, including national and international aspects. The research report includes papers written for the seminar.

A great variety of aspects of OI was presented at the seminar: cross-border environment, customer perspective, emerging-markets, intellectual properties, services, collaboration, culture, knowledge management, and public sector. As we may conclude, OI can be analyzed and thus benefitted from several perspectives. We haven't seen all yet.

in Kouvola Finland, August 2010

Marko Torkkeli

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Open innovation in cross borders - advantages or disadvantages?

Strategic options analysis

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ABSTRACT

The great opportunities created by open innovation have been praised for companies, but the disadvantages have been a topic far less discussed. In a cross border setting, where two foreign companies should confront, the realm is often something else than the theory of open innovation (OI) suggests. The bias in the literature has not been addressed properly and this study suggests that the use of the strategic (real) options approach (SOA) in analysis can help in explaining the phenomenon.

It has been addressed that research should study situations in which open innovation can damage firm's fortune and analyze them in terms of real options (Vanhaverbeke et al., 2008). This study utilizes the options approach to analyze the advantages and disadvantages of OI in the cross-border environment (CBE). Study aims to answer the question: How well does open innovation work in the cross border settings from the strategic options point of view?

Research design consists of several steps of analysis. The open innovation model applicability in the CBE is analyzed by the means of SOA attributes. The utilized research data consists of interview results from previous explorative small and medium size enterprise (SME) study (Volchek et al., 2010). Finnish and Russian SMEs were interviewed at both sides of the border. The study provided propositions of facilitating and hampering factors for innovation in the CBE. These results are utilized in the analysis part of this study.

This study results metapropositions that present the factors for and against OI in the CBE. Study shows from the options perspective how applicable the open innovation could be for SMEs interested in cross border operations. The results help to understand in which conditions firms could utilize open innovation and when not.

Keywords: strategic options, real options, open innovation, cross border environment

1. INTRODUCTION

Since the famous Open innovation book (Chesbrough, 2003a), a great number of articles and books have followed the claims presented in it. The great opportunities opened by open innovation (OI) for companies have been praised, but the disadvantages have been a topic far less discussed. The bias in the literature has not been addressed properly and this study suggests that systematic analysis could better explain the phenomenon. For instance, in a cross border setting, where two foreign companies confront, the realm is often something else than the theory of open innovation suggests. Sometimes companies cannot even operate cross the border because of legislative, normative and cognitive constraints.

The strategic (real) options approach can be used as an analysis tool to explain how companies perceive OI in the cross border environment (CBE). In the options analysis it is utilized value attributes that can be used in option valuation. They are uncertainty, required investments, possible outcomes and opportunities, and time to realization.

This paper is a continuum of an earlier explorative SME study that concentrated on analysis of the factors that hinder and facilitate innovation in the CBE (Volchek et al., 2010, forthcoming). The study provides 17 propositions which are utilized in this paper to analyze advantages and disadvantages of OI in the CBE. The sample consist of interviews of Finnish and Russian small and medium enterprises (SMEs) operating in Finland and North-West and Central Russia (Russian Federation) respectively. The research poses a question: **How well does open innovation work in the cross border settings from the strategic options point of view?**

The analysis shows that open innovation in the CBE is not necessarily possible in all cases. This study helps to understand how open innovation can affect to the SMEs' future success in cross border settings in terms of strategic options. By broadening our understanding how open innovation can or cannot be utilized, the paper contributes knowledge that will be of use to SMEs, researchers and consultants in the area. Paper helps firms to understand in which conditions open innovation should be utilized and when not when entering the CBE.

2. THEORETICAL BACKGROUND

2.1. The creation of competitive advantage and rent in the knowledge-based economy

Nowadays, the competitive advantage is not so much a consequence of the optimal positioning in the markets than earlier. Whilst the sources of the profits have increasingly moved from capital-intensive industries to knowledge-intensive industries, the information technology has had a strong influence on this. It has made the knowledge transferring and processing faster and easier. It has enabled the firms to change their management and business processes and practices creating new opportunities but also threats. Technologies have enabled the fast management and transferring of information inside the firm, between firms and over global communication and data networks, and across borders.

The focal points of strategic management literature have at least to some extent moved away from the Porterian competitive forces (Porter, 1985) to the theories based on the resource-based view (Wernerfelt, 1984) and the theories that emphasize firms' unique and inimitable knowledge-based resources, competences and capabilities as internal sources of competitive advantage (Grant, 1991; Kogut & Zander, 1993). Dynamic capabilities (Teece & Pisano, 1994; Teece et al., 1997; Helfat et al., 2007), intellectual capital and intangibles exploitation expand the firm's set of strategic management in the knowledge-based economy and makes strategists to concentrate on ways through which firms can best sense new strategic opportunities, seize them and take advantage of their knowledge-based assets. Open innovation continues this stream. Business models have become more transparent and also for competitors easier to replicate. On the other hand, firms utilize the new, more competitive environment more efficiently and take advantage of open and collaborative networks that can offer them new ideas for business and resources to further develop prominent opportunities.

The world trade has increasingly been deregulated since the mid 1990s. The free trade contracts have cut down trade tariffs and other trade barriers between countries aiming for economic growth and gain. The strengthening of the knowledge-based component in products and adoption of information and communication technologies has catalyzed the fast imitation of businesses. When earlier the firms aimed at internalizing most of the supply chain, in the new state of the world they are encouraged to seek new sources of opportunities, for instance, from networked collaboration such as open innovation. This all has opened more possibilities for firms to operate over country borders in a much more open environment than before.

2.2. Open innovation

Chesbrough (2003a; 2003b; 2006a; 2006b) introduced a paradigm shift from a closed innovation model to an open innovation model in the knowledge-based economy. Chesbrough claims that the belief in the firm's own R&D operations dominated in many leading industrial corporations for most of the 20th century and R&D was fully an in-house operation. The presented arguments have been sometimes even mighty and far from academic thoroughness and objectivity:

> *"...the knowledge monopolies built by the centralized R&D organizations of the twentieth century have ended"* (Chesbrough, 2003a, p. 45), and
>
> *"the new imperative for creating and profiting from technology"* (Chesbrough, 2003a, Book title).

The open model is claimed to be more responsive to the internal and external flows of knowledge (and resources) than a closed model which concentrates on discovering, developing and shipping R&D only within the limits of one firm. OI results from the discovery that firms have faced a difficulty of commercialization of their research results and spillovers. In the OI model, the research outcomes such as technology would be licensed to others instead of 'sitting on a shelf' waiting either for internal development or out dating without finding them a new owner. Rather, in the case of open model the research proposals would leave the firm and be developed in a start-up firm or utilized in another way. In a closed innovation model, a firm generates, develops and commercializes its internal ideas (Chesbrough, 2003a; 2003b; Chesbrough & Crowther, 2006; Chesbrough et al., 2006a).

> *"Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology."* (Chesbrough et al., 2006b, p. 1)

In the OI model a firm aims to commercialize both its own ideas as well as innovations from other firms. It seeks ways to bring its own ideas to market by creating pathways outside its current businesses. The boundary between the firm and its surrounding environment is permeable, enabling innovations to move easier between the two. The OI model aims to an effective import and export of valuable knowledge: ideas, technologies and innovations in any phase of the innovation chain. Within this view the firms aim to utilize both their own and other firms' discoveries. The importance of both internal and external paths to market is considered to be equal. The inflows and outflows of knowledge are seen as a way to accelerate internal innovation, and expand the markets for external use of innovation. In order to succeed firms cannot use just their own internal ideas and paths

to market, they also need the external ones. (Chesbrough, 2003a; Chesbrough, 2003b; Chesbrough et al., 2006b)

When closed innovation mainly takes place through internal cooperation or sometimes even through opportunistic use of external resources, open innovation in contrast uses the bi-directional exchange mechanisms of ideas, innovations, technologies and knowledge between the external and internal interfaces. The external interfaces are the customers, suppliers, partners, research institutes and competitors; and the internal interfaces are the business units, processes and structures. The differences between the closed and open innovation model are compared in Table 1.

Table 1. The comparison of closed and open innovation (Adapted from Chesbrough, 2003a, p. xxvi)

	CLOSED INNOVATION	OPEN INNOVATION
Knowledge input: The best source of knowledge for innovation	The best knowledge is in-house based.	The best knowledge is found either inside or outside the firm.
Generating innovation	Firm discovers, develops and ships R&D by itself.	It is seen that external R&D can create significant value and internal R&D is needed to claim some portion of that value.
The importance of proprietary and origin of innovation	The proprietary and origination of discoveries are seen as a way to become the first-mover.	The origination of innovation is secondary compared to the question who is able to commercial an innovation first.
The source of value	The value of first-mover advantage is emphasized.	The value of good business models is emphasized over the first-mover advantage.
Competition	The number and quality of ideas are emphasized in competition	The best use of internal and external ideas is emphasized in competition.
Intellectual Property	Intellectual property is controlled so that competitors cannot profit from it in any case.	IP is seen as a source of profit and others are allowed to license it or buy it. Also the firm is willing to buy others' IP if it looks lucrative.

2.2.1. Criticism of open innovation

The idea of open innovation goes nicely along with the concept of closed innovation and is complementary to that. However, some issues have not been in the favor of OI. First, it is a bestseller story. The praise of the concept has risen from claims presented more with

passion than clean observation and reporting (e.g., Chesbrough, 2003a). OI was presented by a scientist in a way that reminds of an evangelist with a missing scientific objectivity. (Our interpretation might be understood to be close to the syndrome of ‘not-invented-here’ and contrary to that our perspective on the issue is purely academic). From the unit of analysis’ viewpoint the OI studies have often structured to support the idea of OI, not to have an analytic view on it (see, e.g., West & Gallagher, 2006; Jusko, 2009; Gassmann et al., 2010). With this we mean that people tend to see what they think they see which fits very poorly to any academic reporting. That is called also as a halo effect that is "a way of mind to create and maintain a coherent and consistent picture, to reduce cognitive dissonance" (Rosenzweig, 2007, p. 50).

Second, OI has existed much longer and claims of its radicalism are not true. The ideas of involving external knowledge and technology were presented by scholars much earlier that Chesbrough did it. Trott and Hartmann (2009) provide an explicit analysis showing that the theory lying in the basis of the “new” open innovations model is a perfectly marketed combination of network model of innovation (Rothwell & Zegveld, 1985, cited by Trott and Hartmann, 2009), external information and external knowledge involvement theories (Hoecht & Trott, 1999), research on the innovation collaboration related issues such as trust (Hoecht & Trott, 1999), and culture (Herbig & Dunphy, 1998). Empirical evidence of “open innovation” model application are found in the US industrial R&D history which provides examples of numerous spinoffs in biotechnology, microelectronics and computer industry from the late 1940s (Mowery, 2009) and packaging industry in the late 1970s (Jusko, 2009).

Third, R&D is still a strategic asset of the firm. There are many examples of products that are output of companies’ internal R&D and succeed very well (e.g., Apple iPod and Microsoft XBox) (Pontiskoski & Asakawa, 2009; Almirall & Casadesus-Masanell, 2010). That leads us to a conclusion that OI could not be considered as a “cure-for-all” model and suitable for all cases.

2.3. Strategic options and open innovation

The real options and open innovation has been discussed in Vanhaverbeke et al. (2008). They address that research should study situations when open innovation can damage firm’s fortune and be analyzed in terms of real options. The need for that is clear and

welcomed. We will go further and extend the discussion to strategic (real) options. However, first the concept of real options is presented.

The traditional real options analysis is basically analysis of the investment decision making. In a narrow sense, real options can be regarded as extensions of the financial options theory to options on real (non-financial) assets (Amram & Kulatilaka, 1999). Primarily "[a] real option is the investment in physical and human assets that provides the opportunity to respond to future contingent events" (Kogut & Kulatilaka, 2001, p. 745). Real options are opportunities to undertake different courses of action in the real asset market with sequential investments.

A real option is exercised by making a real investment where the cost of the investment is the strike price of the option. Hence, the value of an option can be defined by standard techniques taken from financial economics. For investment decision making it has been suggested that the standard NPV can be added up with the real option value (Trigeorgis, 1993). This strategic net present value (SNPV) derives from two factors: static (passive) NPV of expected cash flows and value of options from active management (Ov). Thus, SNPV = NPV + Ov.

Above the real options are strategic options which are the unilateral contracts of strategic tangible and intangible assets which give the holder or buyer the right but not the obligation to exercise the strategic opportunity before its expiry. With the strategic options view we expand the view of traditional real options approach that does not work well in all situations. The real options valuation can be used with no trouble following the logic of financial options if the assets market works well and the perceived uncertainty is parametric in nature. This means that the volatility of future cash flows is known as well as the beliefs of the probabilities as a result of the consequences of possible actions in each state of the world. Unfortunately, this premise fits poorly in most decision situations characterized by strategic options. The antecedents of real options simply do not hold in the valuation of genuinely strategic opportunities. For SME's entry to the CBE is that type of.

2.4. The cross-border environment

Based on the macro-level view of CBE, “two (or more) countries share country border, each of them having the sovereignty with an own economic, legislative, socio-cultural properties and the power of execution” (Volchek et al., 2010). The CBE is considered to offer open innovation opportunities for several reasons. First, different economical, technological, institutional, social, political and cultural background creates a heterogeneous environment (Lundquist & Trippl, 2009) supporting new business development. Second, due to the access to the other markets as well as suppliers and customers at the other side of the border, new collaboration possibilities for innovation needs become visible and new external partners (companies and users from the bordering area) could be involved. Third, the scale and variety of knowledge inflows and outflows increases in the CBE.

The CBE gives access to new capabilities, information, innovation related ideas and knowledge, but also sets barriers, formed by the country-specific regulatory, normative and cognitive constraints of the operational environment. Market opportunities are shaped by institutional political, socio-cultural and economic factors (Mudambi et al., 2002). These factors provide either facilitating or hindering effect on company’s opportunities to innovate in the CBE and are important to recognize.

A regulatory foundation describes governmental legislation, regulations, industrial agreements and standards in particular country; a normative foundation includes existing values and norms; a cognitive foundation provides cultural and language context. The regulatory constraints present company’s conformity to the legislation and regulations existing at the country level. The normative and cognitive constraints have identical structure at the country and company level. Among the cognitive constraints knowledge and organizational capabilities, and motivation are considered to be critical. The cross-border operations are described as different types of exchange flows such as product/service, information, financial and social exchange flows (Håkansson, 1982) and give companies motives and means to innovate in the CBE.

3. STRATEGIC OPTIONS ANALYSIS

The strategic options analysis model consists of the following main attributes: A) uncertainty, B) required investments, C) opportunities, and D) time to realization. The analysis is presented in the form of advantages (pros) and disadvantages (cons) OI offers in terms of strategic real options. It has been done from two directions. First, the concept of OI is compared to the SOA attribute and second to the propositions from the CBE case research (see Appendix 1). The advantages and disadvantages are summarized and metapropositions[1] are presented finally.

The presumption here is that is that companies can make investments that create them options for future business.

Perceived uncertainty (A)

Uncertainty is probably the most important factor affecting on the real option value. The strategic management literature often refers to uncertainty types such as technical uncertainty (Dixit & Pindyck, 1994) or market uncertainty (Ansoff, 1965; Ansoff & McDonnell, 1988), and in some occasions also as profit flow uncertainty (Dixit & Pindyck, 1994), and environmental uncertainty (Bowman & Hurry, 1993). All uncertainty relates to the incomplete information of a decision maker. The basic rule has been that the higher uncertainty is, the higher is the option value of waiting.

The following propositions were identified to fit into this theme:

(P1 O) A local partner is important against regulatory constraints hindering market entry of an innovation.

(P2 C) Customs regulation and formalities prevent the easy flow of products.

(P3 C) Russian bank system hinders firms' possibilities to operate in Russia due to regulatory constraints.

(P4 C) Differences in industry standards hinder innovation.

[1]A metaproposition is a "statement in behalf of all propositions" and "a proposition that transcends a variety of propositions and that occurs in all of them". (Neusner, 1995)

(P9 C) The SMEs' perception of political instability beyond the border hampers innovation.

(P13 C) Prejudices constrain technological exploitation over borders.

(P16 O) Technological problem solving with knowledge from the foreign domain provides access to new solutions.

The propositions from the case data are analyzed and the following advantages and disadvantages arise:

Pros:

- Open innovation can greatly lower the innovation based uncertainties. In the closed system, the firm takes in its responsibility all risk to bear (i.e., uncertainty and realization costs). Contrary to that, in an open innovation system companies can share costs and from this point of view OI is a risk management system. An example would be co-investments in two technologies. The results of R&D and also the risk of investing in a wrong technology are shared. Thus, OI greatly helps in sharing the risk of technological failure. The company can create technology based options that it would not be financially possible done in a closed system. (P16)

- Related to the market uncertainty, the company can suffer regulative constraints without sufficient knowledge of the market environment. The bigger institutional distance between closed and open environment is, the harder it is to

Cons:

- The described risk management can have many disadvantages. Opening the technology portfolio to other companies brings in threats of losing technological transcendence. Also, the leak of central information pieces of technology and market strategy can decrease competitive advantage over competitors. As Hoecht & Trott (1999, p. 258) state: "Openness and free exchange of information [...] make companies more vulnerable to risks of information leakage". (P4, P16)

- The dependence on others can put the company in a situation where it closes its future opportunities because of too much trust to outsiders. If the market uncertainty is greatly decreased with customer channels that lean on openness, the lack of in-house market capability can become severe. The company can turn to become an empty shell. (P13, P15)

- Operational environment is shaped by the

overcome the existing barriers without local market environment knowledge. The open innovation model provides opportunity to obtain that knowledge to reduce market uncertainty. (P1, P9).

regulatory constraints, including the governmental legislation of the country, regulations, industrial agreements and standards (Scott, 2007). Complexity of that environment can create an institutional system unable to support an easy flow of products/services, knowledge, finances, technologies and information between partners. Those are constraints which hamper a possibility of open innovation related activities. (P2, P3)

It seems that the propositions present many barriers to operate in the open innovation regime. The hindering factors are mostly legislative (i.e., political and standards) and cognitive (i.e., attitudes against partners and overconfidence in one's own capabilities).

Thus, we can present Metaproposition 1:

Legislative & cognitive barriers in the CBE create a high level of uncertainty to enter OI.

Required investments | Scale and Irreversibility (B)

The irreversibility of an investment increases the investor's risks of the sunk costs and fixed costs (Dimpfel & Algesheimer, 2002). It decreases the management's flexibility and the greater it is, the higher the value of the option to defer investment is (McDonald & Siegel, 1986) and the lower the value of the option to abandon (Myers & Majd, 1990). The ability to delay and wait for further information before making an irreversible decision has value (Herath & Park, 2001). If the investment could in any likelihood result in a loss, the opportunity to delay the decision of keeping the real option alive also has value (Dixit & Pindyck, 1995).

The following propositions were identified to fit into this theme. Propositions from the case data are analyzed in the OI SOA framework:

(P6 O) Lack of funds facilitates collaboration with foreign companies as a norm.

(P8 C) Overestimation of companies' own capabilities hampers entry into foreign market.

(P15 C) Patriotism of Russian entrepreneurs affects negatively on seizing innovation opportunities from abroad.

The propositions from the case data are analyzed and the following advantages and disadvantages arise:

Pros:

- The required investments of an innovation can be far beyond the SME's limits. OI makes possible for firms to utilize the resources of others and extend the resource base and decrease the sunk costs. (P6)

Cons:

- Company that avoids investing in capabilities required in the future will lose the capability options and create negative options for it. For instance, if the company is part of a cooperative R&D project where the intellectual property rights and know-how around technology remain outside the house, and the co-operation relationship is broken for some reason, the SME will lose all investments and the access to the technology in question. The patriotism can be a hindering factor of releasing information to a foreign company. (P15)

- The company can perceive OI as a non-option because of a delusion of one's own transcendence. (P8)

From the investor's point of view OI seems to make possible to make less investments than operating alone. The sunk costs in resources that might become invaluable can be retrieved

from the open market, and thus, decrease the risk of investing in wrong capabilities and technologies. The options that make possible to maintain access to essential pieces of knowledge and know-how are valuable.

Thus, we can present Metaproposition 2:

Knowledge and know-how based options are valuable in OI cooperation in the CBE.

Opportunities | Market value & Options | Flexibility (C)

Investments in R&D can create valuable follow-on contingent investment opportunities. They can be collections of embedded options, and an exercise of one option can create new options (Slater et al., 1998). Investments in a new technology can open access to future cash-flows, growth opportunities, and strategic flexibilities (Kasanen, 1986; Brabazon, 1999). The possibility to stage the investment offers flexibility in decision making. Thus, when companies identify business opportunities and/or get innovation ideas they will analyze the potential market value, growth and staging opportunities, and flexibilities available.

The future cash flows define the possible market value of an innovation. It is a result of the future demand and market size which, however, are very difficult to estimate beforehand. The more time it takes from idea to innovation the less precise information there is available.

The following propositions were identified to fit into this theme:

(P5 O) The promotion of SMEs' technological solutions by government facilitates innovation.

(P10 O) Success in international contests facilitates the access to a foreign market.

(P12 C) Insufficient knowledge of foreign market-needs hinders adaptation of innovation.

(P16 O) Technological problem solving with knowledge from the foreign domain provides access to new solutions.

(P17 O) Ability to recognize a niche market facilitates innovation.

The propositions from the case data are analyzed and the following advantages and disadvantages arise:

Pros:

- Open innovation can help to achieve more accurate information about the market requirements and demand. (P12)

- Open innovation gives access to more technology based growth opportunities than a closed system. (P16)

- Open innovation can help the firm to stage its R&D based investments (i.e., offering flexibility to decision making) with the help of open information and resource sources. (P5, P10)

Cons:

- The amount of OI information can become huge and inconsistent. The risk that partner will influence negatively the decision making increases because of good convincing skills. (P6)

- Open innovation negatively affects the birth of radical innovation. The consensus between partners might influence the end result so that innovation created in a closed system would represent something unexpected. (P17)

- The company can severely lose flexibility because it is not possessing all decision making power because of becoming more dependent on outsiders. (P12, P16)

- The commitment to the future development can be low because company has no need to make investments in internal R&D. (P17)

- The value of the opportunities can become more difficult to analyze. (P17)

We can identify the option creation ability of investments in open innovation environment. The information available in OI environment can be more extensive than one company could produce. OI offers growth opportunities but can on the other hand reduce managerial flexibility because of the lost independence and narrower capabilities.

Thus, we can present Metaproposition 3:

OI opens new growth opportunities but decreases managerial and strategic flexibility.

Time to realization (D)

An important factor is the expected time for realization of an innovation idea. If a start-up company is required to invest in an innovation idea for decades, this idea is basically worthless for it. Opposite to this, a firm can realize that it might take much less time than one would expect at first glance. The option based investment decision making is not basing on now-or-never decisions. The decisions can therefore be postponed as long as the option to be deferred is alive. The perceived uncertainty decreases usually over time and the option to wait and see is valuable.

The following propositions were identified to fit into this theme:

(P4 C) Differences in industry standards hinder innovation.

(P11 C) Lack of communication hinders technological development.

(P14 O) Shared language is a necessity for overcoming normative and cognitive constraints.

(P16 O) Technological problem solving with knowledge from the foreign domain provides access to new solutions.

The propositions from the case data are analyzed and the following advantages and disadvantages arise:

Pros:

- Open innovation makes company more time resistant. Companies can easily watch and wait how the technologies and markets develop. (P16)

Cons:

- The domain of open innovation can make a company passive for opening opportunities because high technological uncertainty makes waiting option valuable and thus hinders OI. (P4, P16)

- Collaboration that is highly dependent on

the other partner increases the time related uncertainty.

The frequency and quality of communication either speeds or slows down the innovation process and strongly influence the success of collaboration. (P11, P14)

OI in the CBE provides reasons to utilize waiting options to reduce, e.g., technological uncertainty and complexity. By deferring the commitment to technological development leads companies to a passive role in OI setting. Second, the openness of innovation process emphasizes the role of communication in the CBE. Communication efficiency is a result of overcoming cognitive and normative constraints of partners. The bigger differences are between them, the higher is the time related uncertainty, i.e., to lose recognized opportunities because of inertia.

Thus, we can present Metaproposition 4 divided into two parts:

a) OI in the CBE can encourage companies to wait passively for needed technologies and capabilities.

b) OI in the CBE can be slowed down by communication difficulties creating time related uncertainty.

4. CONCLUSIONS

This paper aims to show that OI can be and should be analyzed in different contexts and with different methods. Previous OI studies have approached the phenomenon from network, institutional and organizational theories perspectives. This study aims to present possible advantages and disadvantages of OI in the CBE setting. The strategic (real) options method is utilized to explain how the companies can operate in the CBE and how it affects OI. Our analysis shows that OI can have disadvantages compared with a closed system.

The proposition data from an earlier CBE study was used as the unit of analysis and the theoretical basis of strategic options in analysis. The results of this study can be summarized as the following metapropositions:

MP1: Legislative & cognitive barriers in the CBE create a high level of uncertainty to enter OI.
MP2: Knowledge and know-how based options are valuable in OI cooperation in the CBE.
MP3: OI opens new growth opportunities but decreases managerial and strategic flexibility.
MP4a: OI in the CBE can encourage companies to wait passively for needed technologies and capabilities.
MP4b: OI in the CBE can be slowed down because of communication difficulties creating time related uncertainty.

The metapropositions show that complexity of CBE can hinder implementation of OI model. This is in line with the discovery that "open innovation generally is superior to closed innovation when complexity is not high" (Almirall & Casadesus-Masanell, 2010, p. 28). The complexity refers to pervasive uncertainty which companies cannot affect by their own means. That discourages companies to start operations in CBE even though they could benefit from it. To avoid the defined negative effects the firm should be familiar with regulatory, normative and cognitive constraints and maximize communication.

The analysis of open innovation in terms of options theories is not that straight forward one could expect beforehand. One major reason for this is that the concept of OI is not as clearly opened in the literature as it would be necessary for carefully constructed studies. The elements of OI are required to be defined more specifically and analyzed with high profoundness. The value components used in strategic options analyses are also needed to put under close examination and modeling.

Our paper shows that the analysis of OI is possible, and explanandum and explanans for further studies can be gained. What we expect from the future studies is that OI research would step down from the "hype" and take this research area as seriously as any other. The development of critical analysis stream of OI is welcomed.

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NOTES

This paper was written with the help of open collaboration system Google Docs and open-source software Mendeley which both are demonstrations of the pros and cons of OI industry. We used Microsoft Word and Reference Manager to finalize the paper.

APPENDIX 1.

Table presents 17 propositions concerning hindering and facilitating factors of innovation for SMEs in Russian-Finnish CBE (Volchek, Edelmann, Henttonen 2010, forthcoming). The primary driver is output concerning this analysis.

OPENNESS	**Primary Driver**	**CLOSED**	**Primary Driver**
1. A local partner is important against regulatory constraints hindering market entry of an innovation.	MARKET UNCERTAINTY	2. Customs regulation and formalities prevent easy flow of products.	ENVIRONMENTAL UNCERTAINTY
5. The promotion of SMEs' technological solutions by government facilitates innovation.	MARKET UNCERTAINTY / POLITICAL UNCERTAINTY	3. Russian bank system hinders firms' possibilities to operate in Russia due to regulatory constraints.	ENVIRONMENTAL (POLITICAL) UNCERTAINTY
6. Lack of funds facilitates collaboration with foreign companies as a norm.	RESOURCE UNCERTAINTY	4. Differences in industry standards hinder innovation.	TECHNOLOGICAL UNCERTAINTY
10. Success in international contests facilitates the access to foreign market.	GROWTH OPTION	7. Competition in price and quality facilitates innovation	MARKET UNCERTAINTY
14. Shared language is a necessity for overcoming normative and cognitive constraints.	COMMUNICATION UNCERTAINTY	8. Overestimation of companies' own capabilities hampers entry into foreign market.	TECHNOLOGICAL UNCERTAINTY
16. Technological problem solving with knowledge from the foreign domain provides access to new solutions.	LEARNING/GROWTH OPTION TECHNOLOGICAL UNCERTAINTY	9. The SMEs' perception of political instability beyond the border hampers innovation.	ENVIRONMENTAL (POLITICAL) UNCERTAINTY
17. Ability to recognize a niche market facilitates innovation.	GROWTH OPTION BUSINESS IMPACT	11. Lack of communication hinders technological development.	TECHNOLOGICAL UNCERTAINTY
		12. Insufficient knowledge of foreign market-needs hinders adaptation of innovation.	MARKET UNCERTAINTY
		13. Prejudices constrain technological exploitation over borders.	TECHNOLOGICAL UNCERTAINTY
		15. Patriotism of Russian entrepreneurs affects negatively on seizing innovation opportunities from abroad.	PARTNER UNCERTAINTY

Motivation and Intellectual Property in the Context of Open Innovation

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ABSTRACT

The paper studies how the type and magnitude of compensation and the degree of profit sharing influence a technology developer's motivation to use its best possible knowledge and resources in the collaboration between the developer and the owner of the results (intellectual property) of the development work in the context of open innovation. The problem of motivation has been studied theoretically in the principal-agent literature where a contract is made between the principal and the agent about work to be done by the agent on behalf of the principal, but in that context approaches focusing on open innovation have not received much attention. The research question of the paper is, what kind of reward mechanisms of collaboration and ownership structures of intellectual property support co-creation and innovation in open environment? A mathematical model, based on a qualitative multiple case study on intellectual property management in open innovation, was constructed to analyse the technology developer's willingness to either reveal and use its specialised resources or, alternatively, to retain the best specialised knowledge in-house and use only standard knowledge in the development work. With this approach, prerequisites for collaborative settings, in which mutually beneficial incentives are possible, were analysed. It was found that the structure of the rewarding mechanisms has a strong influence on the motivation of the partners. If the intellectual property owner (acting as a principal) is too short-sighted or cost-oriented with technology developers (agents), the development work may lead to suboptimal results for all parties. The results give guidelines for constructing profit sharing rules in open innovation encouraging all parties to direct their best effort in the collaboration, and, by this way, to increase their returns on investments on the development of new technology.

Keywords: collaboration, open innovation, motivation, profit sharing, intellectual property management.

1. INTRODUCTION

Technology-related knowledge and ownership are becoming increasingly dispersed between companies. Companies are outsourcing parts of their development work and using more and more technologies and know-how that is developed outside the company. The development and commercialisation of technology-based innovations often requires a high degree of specialisation. The economic success is thus increasingly dependent on innovations based on acquisition and application of both internal and external knowledge and related intellectual property rights (Teece, 1986, 2000; Arora et al., 2001).

In parallel with this specialisation and disintegration of knowledge, the forms of collaboration and competition between companies are also evolving. Companies collaborate on different kind of networks with varying levels of openness between the network parties (Jarillo, 1993; Dyer, 2000; Chesbrough, 2003; Valkokari, 2009). Similarly the competition in many industries that involve complex technologies has transformed from direct rivalry between single companies to competition between different business networks utilising different business models. In many cases where critical parts of the total offering of companies need to be developed outside own organisation due to the specificity and availability of expertise, the companies subcontracting the development work need to take into consideration that developer companies can also have competing interests that may be in conflict with the subcontractor's objectives.

Additionally, in many cases where such outside knowledge work is used in the collaboration, the subcontracting company cannot strictly supervise or control that the company doing the subcontracted knowledge work is using its best possible know-how, due to asymmetry of information. Often the key people and other resources that are needed in collaborative efforts are costly for the companies and companies' internal interests rarely exactly coincide with those of the whole innovation network. For instance, a technology subcontractor and developer might be ready to perform standard development work for another company and give away the intellectual property related to the results but at the same time saving their best specialised knowledge for other cases where it would yield the best payback. In order to manage outside development of complex technologies and to balance the companies' internal interests with the network objectives, companies that are integrating the knowledge work of other companies thus need, in addition to control mechanisms, to provide such innovation incentives that it is profitable for the developers to be innovative and give their best effort in the collaboration (Jarimo, 2008).

In this paper, we study how the type and magnitude of compensation and the degree of profit sharing influence a technology developer's motivation to use its best possible knowledge in the collaboration between the developer and the owner of the results of the development work. It is assumed that the use of best developer's specialised resources cannot be directly controlled from outside. Rather, the developer company is assumed to make decisions based on its internal interests, which can be influenced with suitable innovation incentives. Based on qualitative research and a multiple case study, we

construct a generic model to analyse the technology developer's willingness to either, reveal and use its specialised resources, or alternatively, to retain the best specialised knowledge in-house and use only standard knowledge in the development work. With this approach, we analyse prerequisites for collaborative settings in which mutually beneficial incentives are possible.

The remainder of this paper is structured as follows. Section 2 reviews the current understanding of motivation and incentive aspects of subcontracting knowledge work. Section 3 represents the approach and research methodology of the paper. The basic model is introduced in section 4 and section 5 illustrates the approach with a numerical example. Section 6 concludes.

2. CURRENT UNDERSTANDING

The problem of motivation of parties with different interests is studied extensively on a theoretical level in the *principal-agent* literature (e.g. Eisenhardt, 1989). In principal-agent setting, a contract is made between the principal and the agent about work to be done by the agent on behalf of the principal. The principal's inability to completely monitor or control the work of the agent produces an information asymmetry between the parties. This might be further exacerbated by the fact that the agent might be the best expert on the technology area of the work, if complex technologies are involved. Since both parties are mainly concerned with their self-interest, it might not be in the best interests of the agent to perform as the principal intended. One alternative to diminish these unwanted effects from the principal's point of view and to align the incentives of the principal and subcontractor is to contract for the outcomes (the desired result of the contracted work) rather than agent behaviour (the work itself). This, however, transfers more risk to the subcontractor agent from the principal as the outcome of agent's work is not only a function of the quality of the work but is also dependent on uncertain factors outside agent's control. Thus, if the subcontractor is risk averse, this diminishes its incentive for such a contract, ceteris paribus. Another factor diminishing agency problems in dyadic interaction is repeated collaboration (Lambert, 1983; Axelrod, 1984). In longer-term relationships, past performance and company reputation decrease the potential for agency problems. Information systems would also potentially decrease the information asymmetry and thus the agency problem (Eisenhardt, 1989).

A related issue of asymmetric information is the *market for lemons* phenomenon (Akerlof, 1970). This issue arises when there is a market of items which vary in quality and for which it is difficult for the buyer to assess or the seller to signal the quality of the item before purchase. This results in sellers of good quality items not receiving adequate compensation for their items, which may result in diminished supply of good quality items and overrepresentation of low-quality items. This may further discourage marketing of better-quality items, leading to market failure. The phenomenon is analogous to that of sourcing for know-how and knowledge.

In the context of *networked innovation* (see Valkokari, 2009; Paasi et al, 2010), the intellectual property ownership structures can also be seen as a way to align the incentives of the two companies (see e.g. Teece, 2000; Arora et al, 2001). If the developer is not the final intellectual property rights holder and all of the rights to the results of the development work are transferred to the buyer of the knowledge work, further development might be problematic as the developer does not have the rights and the buyer does not have the necessary competences. On the other hand, when part of the intellectual property that belongs to the developed innovation is retained by the subcontractor, further future collaboration is easier.

With deeper levels of co-creation, the contractual relationships between the buyer and the suppliers can be more complex and multilateral. To avoid suboptimal performance of the network arising from the potentially opportunistic behaviour of single companies or company coalitions in the network and the associated free-riding problem, jointly-agreed innovation incentive mechanisms need to be designed so that each company is encouraged to utilise their best knowledge in the collaboration rather than keeping that information private (Jarimo, 2008). These kinds of incentive mechanisms and profit sharing rules have been analysed with game theory (e.g. Gibbons, 1992). In cooperative game theory, where the companies can together choose how the profits resulting from the joint work are divided, rules, such as the Shapley value and the nucleolus, have been proposed (see e.g. Moulin, 1988).

3. RESEARCH QUESTION AND METHODOLOGY

The importance of incentives as a method to foster development of innovation in a network is contingent on the degree of openness and the level of collaboration. One way to classify

open innovation networks is as either transaction networks or co-creation networks (Grant and Baden-Fuller, 2004; Valkokari et al., 2009). In transaction networks, the degree of collaboration is limited and the object of transaction is usually sufficiently clear. Consequently, the knowledge that is transferred can be agreed upon with contracts and there is less need for incentives. However, in co-creation networks characterised by interdependence, close collaboration, and high uncertainty with respect to outcomes, motivation and incentives play a higher role.

The ability to identify the motivations of different partners in the collaboration and the issue of how to motivate partners to give their best effort are thus important especially for innovations that are result of joint efforts, have a large component of tacit knowledge, and in which the legal protection is less clear. Additionally, the deeper the level of collaboration, the more important it becomes to align the business objectives of the collaborating companies. Therefore, the research question for the study is:

What kind of reward mechanisms of collaboration and ownership structures of intellectual property support co-creation and innovation in open environment?

In the study, we used operations research methodology. Basic understanding of essential facets of the problem was obtained through a qualitative multiple case study involving in six case companies in Finland ranging from small software companies to large technology corporations (see Paasi et al, 2010). The problem was studied in thematic interviews and discussions on issues related to intellectual property management, open innovation, and open business models.

According to the interviews and discussions, the decisions about developing new technologies collaboratively are normal business decision and as such, financial decisions. While non-profit organisations can sometimes be motivated mainly by factors such as publicity or academic merits, in normal for-profit companies the decisions about committing resources into certain project are usually made with large emphasis on financial factors.

Furthermore, an important matter according to the case companies when making decisions about collaboration on knowledge work was the ability to distinguish between those

intellectual assets that can be more readily shared and assets that are close to the competitive advantage of the company and should be carefully managed (see also Luoma et al, 2009). Consequently, the issue of identifying the core intellectual assets and the situations in which they are to be used seems to be of high importance.

Based on these initial results from the interviews and discussions, we constructed a mathematical model to analyse the situation between two companies, i.e. a technology developer and an intellectual property rights owner for the results of the development work. This allows for game-theoretic analysis of the different possible actions for the two companies; the chosen level of commitment in terms of quality of resources for the developer company and the chosen level of profit sharing for the IP owner company.

In order to keep the resulting analysis simple, we focused on the identified key factors that drive the decision making in the companies with respect to collaboration and joint development. Costs of the effort put into joint work and the corresponding estimated payoffs as well as the level of profit sharing were identified as these factors. Additionally, the above-mentioned important distinction between core knowledge and resources and non-core resources was incorporated into the model as a decision variable.

4. MODELLING MOTIVATION IN COLLABORATION

In many kinds of joint development projects, short-term monetary gains and the final payback from the project are often contradictory objectives. In joint development project involving complex technologies, tacit and specialised knowledge, or end results that are partly indefinable in advance, it is difficult to assess just how much effort has been put into getting the obtained results and whether the results could have been significantly improved with marginal additional contributions. This emphasises the importance of agreeing about such win-win incentives and rewards in the collaboration that best possible end results are in every partner's interests.

An example for illustrating different roles and compensations in collaboration with three companies is depicted in Figure 1. In Figure 1, agreements are made with respect to ownership of the resulting intellectual property rights (dark grey arrows), use rights or licences to the resulting IPR (light grey arrows) and direct or indirect (from future profits) monetary compensation (black arrows). In the example, company 2 acts as a research

subcontractor to company 1, giving the resulting IPR to company 1 in exchange of monetary compensation. Company 3, who does not take part in the R&D work, gets a use right to the results from the final owner of the work. If the potential profits to partners and the risks related to those can be estimated with a reasonable accuracy, then e.g. system dynamic approach (see e.g. Sterman, 2000) or game theory can be used to analyse that commitment to collaboration is in all partners interests.

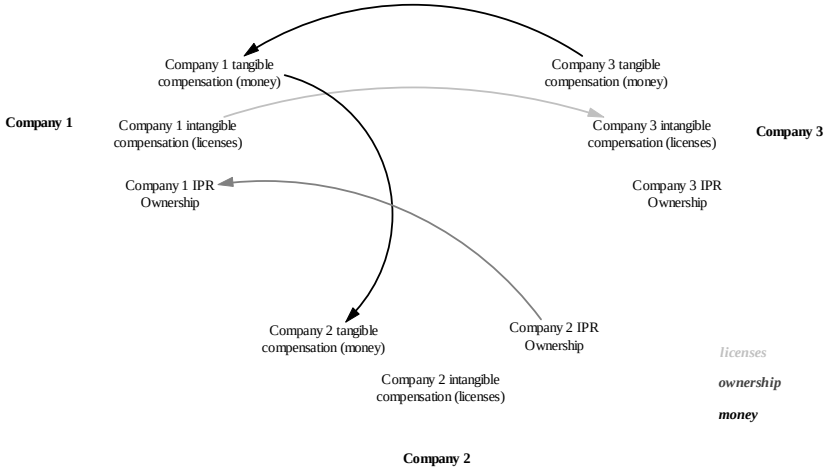

Figure 1. An example illustrating different roles and compensations in joint development.

In the continuation, we analyse the collaborative setting such as that between Company 1 and Company 2 in Figure 1. In the setting, Company 1 (called the IP *Owner*) subcontracts a predefined development work to Company 2 (called the *Developer*) so that the IP and the results of the work are owned by Company 1. We assume that the compensation of the development work for Developer is given as a *percentage* of the future profits resulting from the developed IP and know-how, where the percentage is proposed by the Owner.

Moreover, we assume that the Developer can choose the quality of resources it commits to the development work. The Developer can either perform a standard development work, using its standard resources, or alternatively utilise its best possible resources and specialised knowledge that are close to its core competences in the project to significantly improve the results and the estimated future profits. The downside for the Developer in utilising the expert knowledge is the additional cost of using the best specialists and the potential opportunity cost of utilising that expert knowledge elsewhere. Due to the complexity of the development work, it is assumed that the Owner cannot observe whether the best possible resources and knowledge of the Developer has been used in the work and thus control the development work.

Naturally, if the Developer estimates that its share of the estimated future profits would not cover the expenses from the actual development work, it would decline the whole offer. Furthermore, if the Developer would project that utilising its special knowledge would not yield enough extra benefits to offset the additional costs it would complete the project with using its standard knowledge only. The described situation and the decisions of the companies are depicted below in Figure 2.

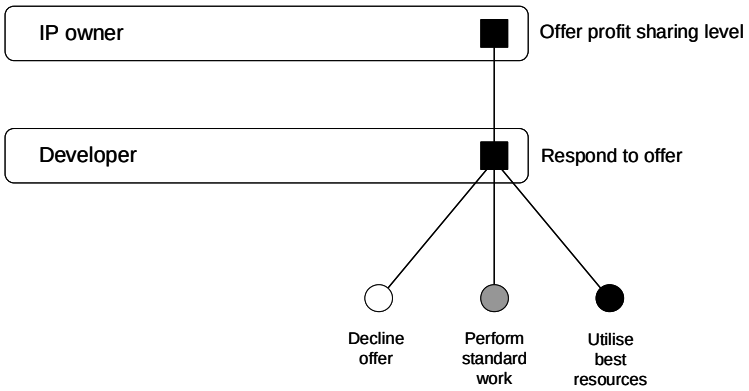

Figure 2. Decisions of the IP Owner and Developer companies.

More formally, let r denote the estimated total future revenues that follow from the results of the project, if the Developer decides to use its standard resources and $r + \Delta r$ the corresponding revenue if best expert resources are used. Furthermore, let c and $c + \Delta c$ denote the corresponding cost for the Developer for carrying out the project with standard and expert resources, respectively. Finally, we denote the profit sharing level, i.e. the percentage of the total revenue that is promised to the Developer as an incentive, with α. The profits resulting to the two companies from the Developer's decisions after the profit sharing level has been given are listed in Table 1.

Table 1. The profits of Developer and IP Owner with different actions.

Actions	Developer profit p_{dev}	IP Owner profit p_{own}
0: Decline offer	0	0
1: Perform standard	$\alpha r - c$	$(1-\alpha)r$
2: Use best resources	$\alpha(r+\Delta r)-(c+\Delta c)$	$(1-\alpha)(r+\Delta r)$

The Developer is assumed to choose its action by simply maximising its profit. For the project to be profitable to the Developer, the profit sharing level α thus needs to be such that $\alpha r \geq c$. Furthermore, the Developer uses is best specialised resources if the return

from that exceeds the return from performing standard word, i.e. $\alpha(r+\Delta r)-(c+\Delta c)\geq \alpha r - c$, which is equivalent to $\alpha\Delta r \geq \Delta c$.

For the IP Owner, the profit can reach its maximum either when the Developer is indifferent between choosing between decline and standard work, or when the Developer is indifferent between choosing to standard work and using expert resources. In the first case, the optimal profit sharing level is $\alpha = c/r$. Substituting this into Owner's profit for standard work yields

$p_{own} = r - c$.

In the second case, the optimal profit sharing level is $\alpha = \Delta c/\Delta r$ and the resulting profit level for the IP Owner for Developer's expert work is

$$p_{own} = r + \Delta r - \Delta c - \frac{r\Delta c}{\Delta r}.$$

It might be natural to assume that $c/r < \Delta c/\Delta r$, i.e. that the marginal benefit from the additional expert resources is smaller than from the standard work. If this is the case, then the required minimum profit sharing level for the developer to use its specialised resources is higher than the minimum profit sharing level for standard work.

Even if the profit sharing level required to incentivise the Developer to commit its expert resources might be higher, it is still profitable for the IP Owner to provide the higher incentive if its profits are higher from that action, or more formally,

$$c + \Delta r - \Delta c\left(1+\frac{r}{\Delta r}\right)\geq 0.$$

Thus, if the inequality above holds, the Owner is better off if it increases the profit sharing level enough so that the Developer is motivated to commit its best specialised resources to the collaboration. In other words, the increase in value that the Developer produces makes up for the cost of acquiring that value.

In the inequality above, it can be seen that the higher the Developer's cost for standard work or additional revenue from using specialised resources, the more beneficial it is for

the Owner to provide incentives for deeper collaboration. On the other hand, the cost for Developer to tie additional resources to the project as well as the revenue from the standard work both decrease the benefit of deeper collaboration with specialised resources, as seems natural.

5. NUMERICAL EXAMPLE

In the following profit calculations, we assume that the cost of the development project for the Developer, i.e. c, is 10 €, resulting in expected total revenue r of 100 €. The additional cost of utilising the proprietary knowledge by the Developer, Δc, is 10 €, which would increase the total profit by, Δr, or 40 €. As described in the previous section, a percentage α of the total profit would be divided to the Developer and thus (100 - α) would be retained by the Owner. The resulting profits for Owner and Developer with the two different Developer strategies and with different possible levels of α are illustrated in Figure 3.

Assuming optimal behaviour by the Developer, it would decline the collaboration offer with α values less than 10 %, which would yield a net loss. With α values between 10 % and 25%, the Developer would accept the collaboration offer, but only utilise its standard knowledge. With α values of greater than 25 %, it would be optimal for the Developer to utilise its best, specialised resources in exchange of greater future profits. Thus, the optimal behaviour of the Developer yields the net profit curves for the Owner and the Developer, depicted in Figure 4.

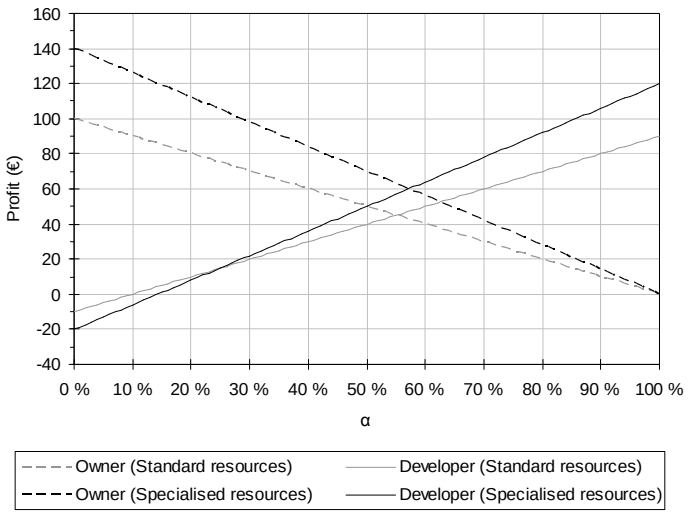

Figure 3. Profit levels resulting from the example collaboration project for the IP Owner (dashed lines) and the Developer (solid lines) as a function of profit sharing level.

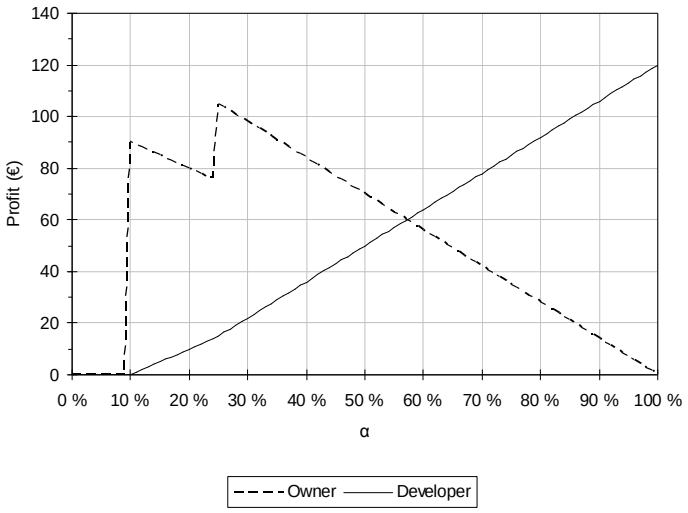

Figure 4. The resulting net profits for IP owner and IP developer as a function of profit sharing level with optimal actions taken into consideration.

The somewhat counterintuitive result here is that the Owner is actually able to increase its profits by sharing a greater fraction of them with the Developer. By focusing only on the direct cost of development, the Owner could perhaps get the Developer to accept the development work against 10 % of the future profits, in which case the Developer would perform its standard work, resulting in future profit of 100 €, of which 90 € would be retained by the Owner. However, should the Owner give 25 % of the future profits back to the Developer, the future profits would rise to 140 €, 105 € of which would be kept by the Owner. Thus, being aggressive and highly cost-oriented in the negotiations with partner candidates might lead to suboptimal results for all the partners.

Using the parameters of the hypothetical case example and the last inequality of the previous section, we can also further identify the situations in which the specialised knowledge of the Developer actually benefits both parties in terms of increased profits. If we keep the values of c and r fixed, we can find for each value of Δc a corresponding threshold value for Δr which makes it profitable for the Owner to increase the profit sharing level to attract the Developer to commit its specialised resources to the collaboration. In other words, true win-win situations exist above the threshold level. On the other hand, below the threshold level of Δr, increasing the profit sharing level α above the minimum acceptable level for the Developer is not beneficial for the Owner. Note that it may still become profitable for the Developer to utilise its specialised resources also in this kind of setting if α is increased. However, the additional revenue from the use

of specialised resources of the Developer does not offset the extra costs that the Owner has to carry in order to motivate the Developer.

The threshold curve for the joint benefits in the case example is presented in Figure 5. In the case example, Δc was 10 €, while Δr was 40 €, which is well above the threshold line.

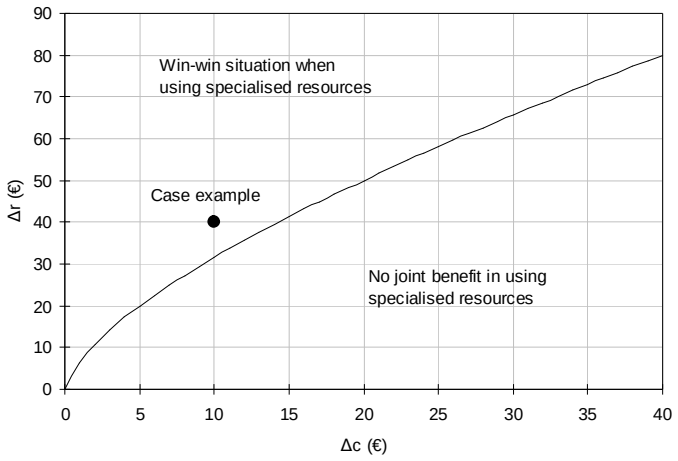

Figure 5. Threshold curve for Δr as a function of Δc above which it is beneficial for the Owner to incentivise the Developer to use specialised resources in the numerical example.

6. DISCUSSION AND CONCLUSIONS

The results give guidelines for constructing profit sharing levels for collaboration in the context of open innovation that result in all parties having an incentive to innovate and direct their best effort in the collaboration. Based on qualitative research and multiple case study, a generic mathematical model was constructed by using the methodology of operational research to analyse technology developer's willingness to either reveal and use its specialised resources or, alternatively, retain the best specialised knowledge in-house and use only standard knowledge in the development work. The study shows that by analysing the collaborative situation and developing suitable profit sharing mechanisms, companies are able to improve the results of collaboration and increase their returns on investments on development of new technologies.

It was found that the structure of the rewarding mechanisms has a strong influence on the motivation of the partners. If the intellectual property owner (acting as a principal) is too short-sighted or cost-oriented with technology developers (agents), the development work may lead to suboptimal results for all parties. Similarly, if the intellectual property

ownership structures do not reflect the interests of the parties involved, the future development of the technologies may suffer.

As a conclusion, in addition to the roles and responsibilities, the motivation and the incentives of the partners should be understood and made sufficiently clear. However, it should be noted that if too much emphasis is placed on the drafting of the rigorous agreement for the sharing of the highly speculative future payoffs between the companies before starting any concrete collaboration, the actual realisation of those payoffs may suffer. If all the parties are too risk-averse, they tend to avert the extra profits as well.

Like most mathematical models, the constructed generic model is a simplified truth of complex reality. The model does not take into account all aspects influencing decision making in real development cases in the context of open innovation, such as strategic aspects related to changes in the competition environment of the developer through the development work. Also the absolute figures that the model produces should not be taken too accurately, because the parameters of the model may easily be inaccurately defined in practice. Despite of its limitations, the model would help companies in designing reward mechanisms and ownership structures of intellectual property that support co-creation and open innovation.

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Stigmergic model for navigating a web of public services

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ABSTRACT

Private citizens and companies face routinely the difficult challenge of navigating a web of numerous available services ranging from health to business counseling. From society's perspective there is the problem of inefficient resource allocation e.g. in the form of overlap. At the private service sector "the invisible hand" of variety and selection tends to adjust service variety and weed inefficiency. At the public sector this problem has been partly solved through a process of service coordination i.e. individual customers are aided by a dedicated case manager. However, traditional process of service coordination is seen as somewhat inefficient. By borrowing from the world of social insects a conceptual model for open coordination and development of services is introduced that is based on the phenomenon of stigmergy i.e. distributed coordination of activity through a shared and adapting memory. An open stigmergic representation of available services would allow a customer to define the best possible service pathway i.e. combination of services that would allow her to reach a specific goal e.g. getting counseling prior starting a company. At the same time on the service provider side this open stigmergic representation provides valuable information for adjusting resource allocation between various services in its service portfolio. Finally, preliminary results of applying this method to the problem of selecting, which public business counseling agency or agencies to visit before and after starting a company are introduced.

Keywords: public services, stigmergy, open innovation, business counseling, service coordination

1. INTRODUCTION

Motivation for writing this article originates from the author's personal practical experience in dealing with the regionally recognized problem of low number of university graduates engaged in entrepreneurial activities (Puhakka & Tuominen, 2006). As it is, the problem is also widely recognized nationally in Finland and public sector actors provide numerous services with the goal of supporting and advising the aspiring and new entrepreneurs. For the purposes of this study alone some, 30 different types of services and other points of support were recognized regionally. This high number of services however, poses a question that can it possibly be so that this high number of at least partly over-lapping services is actually adding to the stress of a young entrepreneur? It is a fair assumption that a couple of bad steps can make the agent to abandon his path altogether and dedicate his time to other goals.

The problem of complicated webs of services has recently been recognized at the Finland's national innovation system level by the Evaluation of the Finnish National Innovation System report (Ministry of Education & Ministry of Employment and the Economy, 2009). The report states that "There are significant overlaps in the services offered by public organizations – an urgent streamlining is called for" and speaking especially in the context of services offered to high growth entrepreneurial firms "no material efforts have been directed to make the innovation and support systems more streamlined, more cost-efficient or more accessible…".

The problem of service coordination has fortunately been traditionally implemented in areas of social and health services (Hänninen, 2007) to some extent. Service coordination is a term used to describe the assisting work done by a public officer i.e. *case manager* to help user/customer to navigate a web of given services (Hänninen, 2007). By the end of 2007 ten so called best practice cases were recognized by the report of Hänninen (2007), such as aiding a released prisoner and giving support to immigrants.

The purpose of this article is to offer a new model of service coordination that doesn't only depend on the knowledge and experience of a case manager, but which takes advantage of a phenomenon that could be called collective intelligence (as in Heylighen 2010). Techniques fitting under the collective intelligence category are widely used these days in fields such as the PageRank algorithm in web searches (Page et al., 1998) , product recommendation systems (Linden, Smith & York, 2003) and idea evaluation inside an organization (Salminen, 2009). One special type of collective intelligence called the stigmergy is the focus area of this article. Stigmergy originates from the field of social insect studies (Heylighen, 2007). For example, stigmergy explains how ants collectively discover optimal pathways to food sources. Thus, stigmergy seems to be a good method to develop the act of service coordination.

In the next section we will define our conceptual framework. After it, we will use this framework to sketch our stigmergic model of service navigation and further develop it in the following section. In section five we will describe preliminary results of partial application of this model to the problem of guiding students along the service pathway to establish their own company. Finally, some limitations of the model are discussed and ways to verify some of the assumption are suggested.

2. CONCEPTUAL FRAMEWORK

Description of our conceptual framework starts with definition of individual service user and then moves through concepts of affordance, service pathway, step value and finally ends with the definition stigmergy.

2.1. Service user

We start with a problem of how to define a user of public services in simple and in such general terms that is applicable to as many as possible types of service users. What kind of shared principles there are then governing the behavior of different users regardless of their background, age, sex, education etc.? A useful general model for our framework is presented by Heylighen (2009). Following Heylighen's framework, which is based on 'principles of evolution, cybernetics and complex adaptive systems' (Heylighen, 2009), we define the service user as an autonomous *agent* with a specific *goal* it is trying to attain e.g. a university student with a goal of finding out if her business idea is good enough to registert a company and what procedures are involved in the registration process etc. Another example of agent and goal is a businessman who has a goal of increasing the profitability of his business.

In order to reach her goal our service user engages in a sequence of *actions*. Heylighen (2009) uses a very intuitive example of travelling a physical landscape in where the actions done by the agent equals the movement of a person in the physical space. In our case the "movement" is a bit more complicated. University student might engage in activities such as financial planning, composing a business plan, asking opinion of an expert or a possible future customers, she might be looking for business partners, requesting for a bank loan, analyzing completion, testing a service or prototyping a product etc.

From the space of all possible actions available for the agent, he chooses those that he sees as most effectively satisfying his goals (Heylighen, 2009) i.e. he engages in actions he sees as most beneficial or *useful* for him at that time. For example, requesting a bank loan is seen less useful at a stage where financial calculations have not been made, thus doing the financial calculations would be deemed more beneficial and a better candidate as the next action by the agent.

2.2. Services as affordances

Next, we have to define what part do services play in helping the business owner with her goal of increasing profitability of her business or the university student with his goal of deciding whether to establish a company or not? Again, borrowing from Heylighen (2009) we define services as *affordances* i.e. 'a phenomenon that makes possible, or affords, a particular action'. For example a student might not be knowledgeable in financial planning and thus sees the services of a public business advisor as a method for getting her financial calculations done. It is self-evident, though important to notice that only those services the service user is aware of are seen as an affordance by her. Thus educating service users about the available services increases the number of affordances in their 'field of vision'.

2.3. Service pathway

We define *Pathway* as a sequence of actions by the agent. This sequence of actions is seen in our context as moving in discrete steps from point to point in a network of possible affordances i.e. services. For example in new business planning a following pathway could be followed: 1. original business idea, 2. talking about the idea with a professor, 3. visiting a new enterprise agency for advice, 4. sketching a business plan, 5. visiting a pre-incubator counselor for advice, 6. formulating a business plan, 7. visiting a bank, 8. registration of a business.

2.4. Step value

Above we defined service pathway as consisting of discrete steps from one action or affordance to another. As we mentioned earlier, the reason why an agent chooses a specific action over other options is that it predicts this one action being most useful for her at that stage. However, the agent may have a change in mind about the true usefulness of the action after executing it e.g. after talking with her professor about a business idea our student visited a new enterprise agency and afterwards she felt that that wasn't a helpful visit. Thus we define *step value* as the relative quality or usefulness of a specific step from and affordance X_{i-1} to another X_i compared to other steps along the pathway. We assume that this information regarding agent's path and value of every step is retained in its memory, at least to some extent.

2.5. Stigmergy

As mentioned in the introduction phase, the concept of stigmergy originates from the world of social insects. Stigmergy can be defined (Heylighen, 2007) as a process of a collective shared memory of individual agents partly coordinating the behavior of individual agents. Key feature of stigmergy is its adaptive and self-correcting nature. A typical example of stigmergy is the food foraging behavior of ants. Every ant wanders more or less randomly in search of food. When it encounters some food it starts heading back to the nest laying a pheromone trail behind it. If other ants happen to cross the pheromone trail they have a tendency to follow it, thus finding the same food source. They in turn head back to the nest and lay their own pheromone trail. Because the pheromone will slowly evaporate, trails that lead to exhausted food sources will disappear and thus ants will no longer visit the location with the exception of unguided random exploration. We can say that the whole trail network functions as a collective shared memory of the whole ant colony and it automatically adapts to changes in the environment in a decentralized way. In the world of humans Wikipedia is an example of stigmergic behavior (Heylighen, 2007). Entries in the web dictionary draw new editors to correct errors and to add new information. Also, new concepts are added and linked to already existing ones. In the next section we will learn how phenomenon of stigmergy could be utilized for the process of service coordination.

3. STIGMERGIC MODEL

In the world of ants all individual ants have more or less identical features and a goal state. An ant can trust that all other ants value the same kind of food, thus all pheromone trails are relevant to it. For our stigmergic model of service navigation developed in here we need to assume that also in the diverse world of humans *we can recognize sub-groups of people or organizations that have similar goals and basis for reaching those goals.* In other words we assume that other people can learn and benefit from the experiences of others.

Our next assumption is not so self-evident. We assume that *as individuals move along their individual pathways towards their goal, these individuals are likely to value transitions from one affordance to another in similar way* i.e. give a similar step values to these transition. This means that if person A gave high value to step from affordance X_1 to affordance X_2 and person B at a similar stage moved from stage X_1 to X_3 and valued it

poorly, then a third person C should likely follow the step of person A. For example students with detailed business plans wouldn't probably benefit as much from a visit to an early stage general business advisor as from a visit to a specialist of that specific area of business.

Before moving forward at this stage one might ask that what does it matter if a person has a couple of unbeneficial steps before finding the right path. Indeed, it is a legitimate claim that trial-and-error is a powerful way to learn. To counter this objection we can look at two separate points of view. First, we assume that our agent has several other goals partly competing for his time and energy. We assume that a couple of bad steps can make the agent to abandon his path and dedicate his time to other goals. Second, from the public service provider perspective it is not efficient use of resources to serve customers that don't benefit from their service. Thus, a way to guarantee a better service user satisfaction is valuable.

Our goal now is to formulate a model, which would allow people to benefit from the experiences of others and could navigate a web of services with increased satisfaction.

3.1. Conceptual model

Our stigmergic model for navigating a network of public services can be seen as a process with the following steps: 1. the pathway of an individual agent together with assigned step values are recorded, 2. another agent accesses this recorded pathway information, 3. This agent then factors this information and decides his own course of actions, 4. Experiences of this agent are then added to information from the first agent with the exception that the strength of the older information is somewhat decreased , 5. Move again to step number 2.

Next, let's compare these steps to the stigmergic behavior of ants. Step one corresponds the situation where an ant is searching for food, finds some and lays down a pheromone trail when heading to the nest. Step two is the same as another ant crossing the pheromone trail of the previous ant. Step three corresponds the decision by an ant to follow the pheromone trail or continue its own random course. In step four the new ant eventually lays its own pheromone trail and at the same time all other pheromone trails continue to lose their strength due evaporation.

3.2. Emergence of new pathways

As mentioned in the introduction section of this article, stigmergy can be said to be a form of collective intelligence. The following two figures illustrate how new better valued pathways can emerge and old poorly valued pathways disappear. In figure 1 there is initially one poorly valued link (thin gray arrow) between two services (two circles). Then, because agents don't always follow the already existing paths, some agents discover a new intermittent service "between" the two original services. By going through this new service new more highly valued 2-step pathway emerges. If there would be a time-component involved to simulate evaporation, we could expect the old pathway to disappear after a while. Example of this type of activity could be for example getting advice on how to make realistic financial plan prior visiting a bank, instead of heading to bank without those plans.

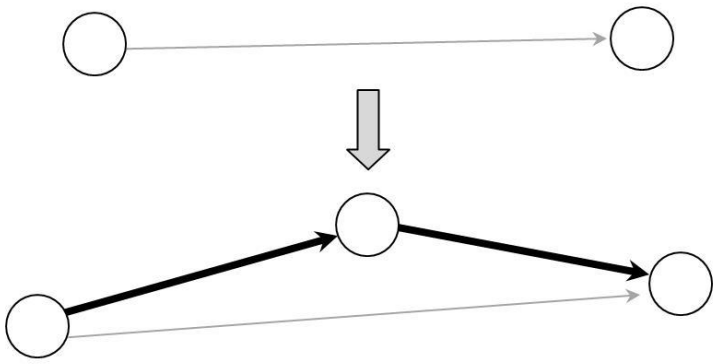

Figure 1. Emergence of a new better valued 2-step pathway to replace an existing 1-step pathway. Circles represent different services and points of support. Arrows indicate the order in which services were used. Arrow thickness and darkness indicate the average step value of a link (thicker and darker = higher value). Thick block-arrow indicates the emergence of new pathway.

In figure 2 we have the situation reversed. In this case we have a poorly valued 2-step pathway between two services. Again, because agents don't always follow the already existing paths, some agents go straight from service at the left to the service on the right without going through the intermittent service. As it is shown in figure 2, the resulting 1-step pathway is more highly valued. Again, we can expect the old 2-step pathway to disappear. Example of this kind of case would be visiting a bank at too early stage of new business development resulting only in confusion and lack of motivation.

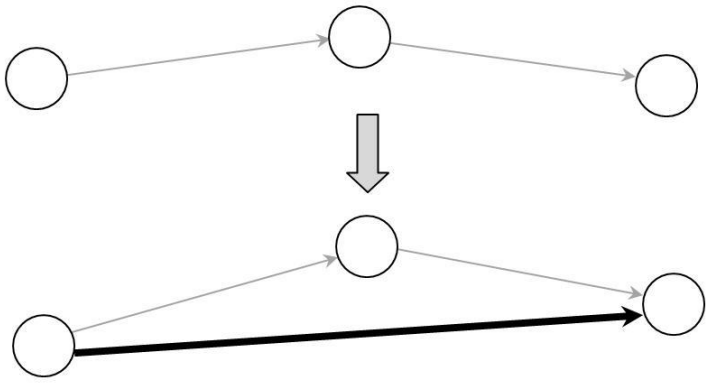

Figure 2. Emergence of a new better valued 1-step pathway to replace an existing 2-step pathway. Circles represent different services and points of support. Arrows indicate the order in which services were used. Arrow thickness and darkness indicate the average step value of a link (thicker and darker = higher value). Thick block-arrow indicates the emergence of new pathway.

Now, that we have a general draft of our model let's look at some practical issues and ways to fine tune it.

4. DETAILED MODEL

4.1. Network data

The conceptual model introduced in the previous section needs to be operationalized. To do this we use techniques from the field of social network analysis (de Nooy, Mrvar & Batagelj, 2005). A social network is defined as vertices and links of different strengths between the vertices. For our purposes we assign different services as vertices in a network and step values in the form of numerical values as directed links between them. When we encode our data in this manner we can manipulate it with social network analysis software and draw illustrations i.e. graphs. Data visualization can be assumed to be an important factor determining the usefulness of the stigmergic pathway information.

4.2. Adaptation

The key feature of ant stigmergy is the eventual evaporation of pheromone trails, which makes it possible for the colony to stop visiting location with exhausted food sources. To simulate this in our service navigation model we need to emphasize new information at the expense of older data. This can be done by linking it with actual passing of time as in the ant world. However, to counteract possible irregularities in the data collection we combine this evaporation as function of time to another approach.). In our model we decrease the strength of older data of a specific step value also after new data is collected. A simple way would be to take the average of the N latest values and assign it to a link. Thus, when a

new piece of data is acquired the oldest one would be dropped out. By controlling the number N the sensitivity of the model to changes could be adjusted.

In the next section we will look at how first step of the model was put in practice.

5. EXPERIENCES FROM EARLY APPLICATION

5.1. Collecting the data

The first step of our conceptual model (i.e. the initial network data acquisition) was tested in practice by gathering pathway and step value data in the form of a questionnaire from a small number (n = 8) of university students and graduates who had established their own company. The method of choosing these subjects was heavily biased in the sense that they belonged to author's personal social network of acquaintances.

All the subjects received an electronic questionnaire form which included a pre-chosen list of public and private services and other forms of support available for the subjects. The list included items such as new enterprise agency, business incubation services, university innovation officer, professor, experienced entrepreneur, bank, local business association, regional business idea competition etc. Altogether, there were some 30 different items on the list. In addition subjects were allowed to add items that didn't exist on the list but which they felt should be included. This last point is made possible due the robust and adaptive nature of the stigmergic approach i.e. new services can be included as they are discovered.

Subjects were asked to assign a number to each service they had had experience with based on the chronological order i.e. first service would be assigned number 1., second service number 2. etc. The length of the pathways (i.e. the number of different services) subjects had used varied between 3 and 14. Some of the services were used before official registration of a company and some afterwards. Next, subjects were asked to give a numerical value between 1 and 5 to all the services they had stated using. This numerical value was explained to symbolize the subjective benefit they perceived receiving from the service. It was stated that number 1 represented the case of no benefits and 5 the case of very large benefits.

5.2. Network data and network illustrations

In the next phase, the data from each subject was transformed in to a network format as explained in sub-section 4.1. In total 27 different linkages with at least one assigned value were recognized before company registration and 19 different linkages after the company registration. This high amount of different linkages compared to low number of subjects (n=8) was a surprise. Next, for every link, averages of values were calculated. This data was then uploaded to social network analysis software (Pajek) and several different graphs were drawn to experiment with different visualization tactics. Figure 3 illustrates combined network of all the paths of all subjects ending to business registration.

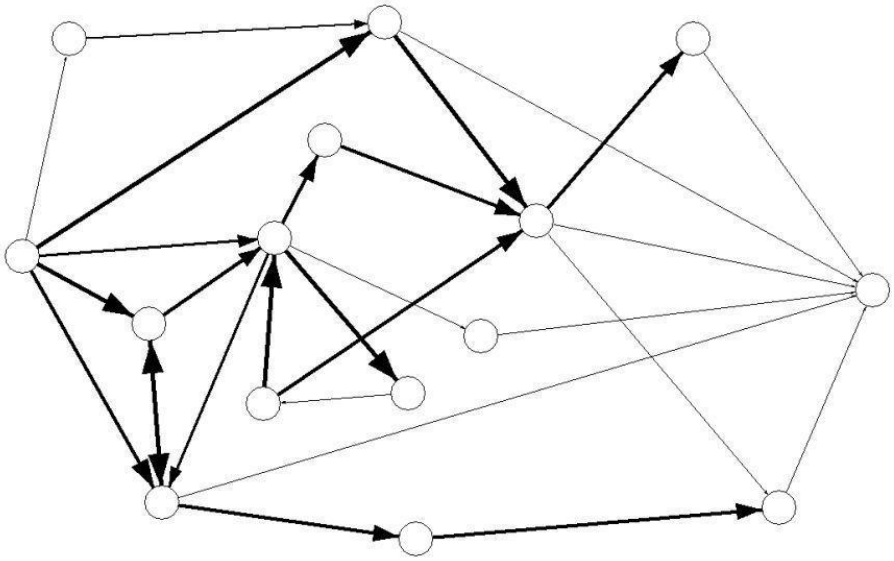

Figure 3. Combined network of all the paths of all subjects with a beginning in the middle far left and ending to business registration in middle far right of the graph. Other circles represent different services and points of support. Arrows indicate the order in which services were used. Arrow thickness and darkness indicate the average step value of a link (thicker and darker = higher value).

An important detail to understanding visualization in figure 3 is that all links ending to business registration (far right, middle) are without a set value. This is because subjects were not asked to value the act of business registration. These links are illustrated with a narrow arrow. From figure 3 it can be seen that there are quite substantial differences in values between different steps from service to service. However, due to minimal number of subjects no conclusions can be drawn regarding step values with large number of subjects.

Figure 4 visualizes service paths after company registration. In this case there is no shared end point, instead paths can trail on to different directions. In the right side of the figure there is a separated chain of four services. The reason they seem separate from the rest is

that for links connecting to them from the bulk of services no step values were for some reason given even though they were included in the service path.

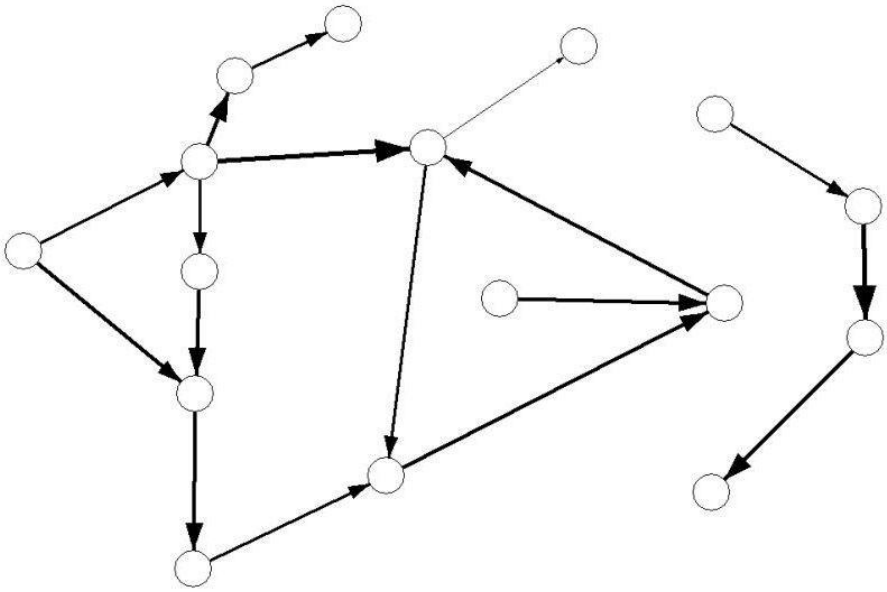

Figure 4. Combined network of all the paths of all subjects starting from business registration in the middle far left. Other circles represent different services and points of support. Arrows indicate the order in which services were used. Arrow thickness and darkness indicate the average step value of a link (thicker and darker = higher value).

In the next section we will look at examples of how these pathway illustrations could be used to aid in the process of service coordination, discuss about limitations of this study and finally give out ideas how some of the limitations could be overcome and assumptions verified.

6. DISCUSSION

6.1. Examples of possible practical uses

In what different ways these collective service pathway maps could be used than in the form of whole network illustrations? In figure 5 there is a very simple graph illustrating current state (one circle, left side) and possible future services (four circles, right side). Illustration like this could be used to aid service user to decide her next step. Through this illustration she would see what step was valued most by other service users that came before her. The service provider side could benefit from this information by for example researching the reasons for differences in the possible next steps. Step with low value could signal for example a heavy over-lap between services, which would then result in experiences of repetition at the customer side.

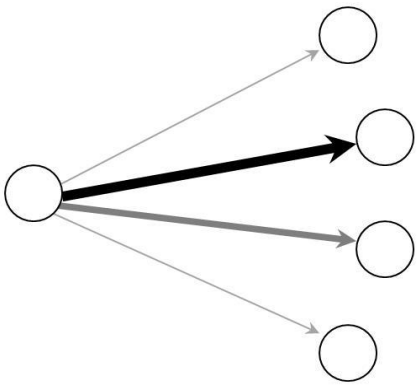

Figure 5. Current state/service-used (one circle, left side) and possible future services (four circles, right side). Arrow thickness and darkness indicate the average step value of a link (thicker and darker = higher value).

Figure 6 has the situation reversed. Service user might prepare herself for a visit to a certain specific service (right-side in the figure), which she deems for some reason important to her. In a situation like this she could benefit from the type of illustration in figure 6, because she could see what prior service would lead to biggest satisfaction when using her target service at the right. In other words the illustration suggest how service user could prepare herself for a specific service. From the service provider perspective illustration of the type in figure 6 provide information about how customers coming from different direction value their service. They could then research the reason for example why customer coming a certain direction value their service poorly. They could then change something in their offering, or they could just guide these customers to services more suitable for them.

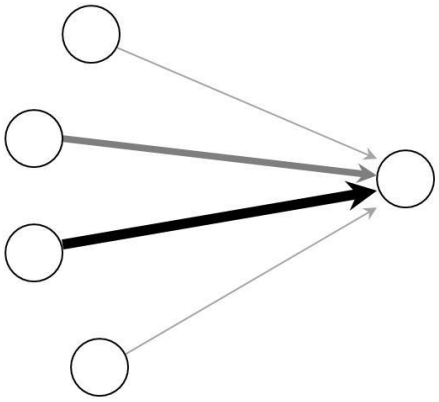

Figure 6. Future state/service (one circle, right side) and possible prior services (four circles, left side). Arrow thickness and darkness indicate the average step value of a link (thicker and darker = higher value).

The whole stigmergic process and scenarios presented in figures 5 and 6 and also earlier in figures 3 and 4 require that collective pathway data is easily accessible in different forms

i.e. it is open. A shared website with a possibility of graph manipulation would be a good candidate for this type of access. Better yet, there could be a method for representing the up-to-date data at different websites, such as those of the service providers themselves.

6.2. Limiting factors and verification of the assumptions

Next obvious step to further develop and test the model presented here is to study how service users and service providers would react to this type of collective pathway information. Would they see it as useful and more importantly would it have a coordinating effect regarding their actions. There are also some limiting factors and assumptions that should be simultaneously verified.

As mentioned earlier, human-beings have much larger variation in their needs and goals compared to ants. Thus the trustworthiness of a step value can be guaranteed statistically only after relatively large amounts of data. Further, the whole assumption that people with a same general goal would value a step from one service to another, needs verification. Luckily, this can be done with relative ease. To do this we would need to collaborate with one service provider, which is already collecting feedback from their customers. Only one simple additional question would be needed: “what service or other form of support did you use just before using our service?” A list of possible services could also be provided. Then, with a simple statistical procedure correlation between prior service and current service evaluation could be calculated. Statistically meaningful correlation would verify our assumption in the extent that people coming from different directions would evaluate a usefulness of a service to them differently. However, this could not still tell us much about the reasons behind these differences. Is the reason the order of services or that certain types of customers tend to use certain types of paths?

To further advance our model, statistical methods could be used to group different types of customers. This means that our model could offer a filtered version of the collective pathway network that takes in to account the whole or sub-part of the step values the customer had already given. Even more accurate suggestions could be given by looking out correlation between different step combinations i.e. pathways, not just earlier step values regardless of their order. Of course, both of these would require ever larger amounts of data to make these suggestions statistically meaningful.

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Mending the Rift between Social and Intellectual Capital in Open Innovation

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ABSTRACT

As Open Innovation (OI) is often seen to have great potential for increasing efficiency and reducing costs of a firm's R&D activities, it has attracted a great deal of managerial interest as well as produced a distinctive stream of academic literature. Since OI research is strongly connected to earlier studies on the 'hard' innovation management disciplines, it has adopted mainly managerial, economic and Intellectual Property -centric viewpoints. Sometimes, OI is even seen as a simple rebranding of pre-existing network, alliance and technology transfer literature.

Since the theory surfaced, it has suffered from an unchanging set of five distinct academic shortcomings which lead to several managerial challenges. We claim that this has to do with a lack of understanding of the socio-cultural issues related to OI and posit that for example the classic Not Invented Here syndrome and Not Sold Here virus both would gain from adopting a 'softer' perspective rooted in the social sciences and the socio-cultural strands of management and alliance literature (e.g. the value of social capital or development of the trust mechanisms).

Starting from the argument that no single perspective on OI is adequate, a multi-theoretical perspective is presented and connected to the central academic and managerial challenges of OI. The objective is thus to benefit the practically and managerially oriented OI research by leveraging the theoretically more advanced social fields of study and the lessons therein. A literature review is provided of the various theoretical frameworks that have been used to explain the behavior of the firms with respect to inbound and outbound OI, as well as alliance activity (including TCE, KBV/RBV, and theories on social exchange, social capital and trust). The fruitful opportunities that arise from the application of these theories to the fundamental shortcomings of OI research are highlighted.

Keywords: Open Innovation, collaboration, social capital, trust

1. INTRODUCTION

As Open Innovation (OI) is often seen to have great potential for increasing efficiency and reducing costs of a firm's R&D activities, it is not surprising that it has attracted a great deal of managerial interest as well as produced a distinctive stream of academic literature. However, as the OI research is strongly connected to earlier studies on the innovation processes, utilization of external complementary knowledge, joint development of technologies, and commercialization of technologies, it has adopted mainly managerial, economic and Intellectual Property -centric viewpoints. Sometimes, OI is even seen as a simple rebranding of pre-existing network, alliance and technology transfer literature (Trott and Hartmann, 2009).

There still remain many unsolved managerial challenges related to socio-cultural issues of OI; the classic Not Invented Here syndrome and Not Sold Here virus both require further research efforts. Many significant internal barriers to OI, e.g. the difficulty in finding the right partner(s), should be examined also from socio-cultural perspectives, since the theory of OI has little regard for the developments on the more socio-cultural strands of management and alliance literature (e.g. the value of social capital or development of the trust mechanisms).

Starting from the argument that no single perspective on OI is adequate, a multi-theoretical perspective is needed to provide a fresh viewpoint and progress towards an academic explanation and a managerial solution to some of the central OI challenges. The objective of this paper is to benefit the practically and managerially oriented OI research by leveraging the theoretically more advanced social fields of study and the lessons therein. A literature review is provided of the various theoretical frameworks that have been used to explain the behavior of the firms with respect to inbound and outbound OI, as well as alliance activity (including TCE, KBV/RBV, and theories on social exchange, social capital and trust). The fruitful opportunities that arise from introducing the socially focused management theories to the contemporary R&D cooperation and network research are discussed via the identification of five fundamental shortcomings in extant OI research.

2. THEORETICAL PERSPECTIVES

The importance of knowledge flows between companies is often stressed in the literature on open innovation. The open innovation paradigm suggests that companies can increase the efficiency of their R&D processes by acquiring new ideas and technologies outside of the firm, as well as through cooperation with suppliers and competitors. Similarly, companies are also encouraged to out-license or sell technologies that do not fit their business model to generate additional revenue from R&D outputs (Chesbrough, 2003).

Given the crucial role of these knowledge flows and transactions, the research on open innovation has drawn heavily from earlier work on e.g. absorptive capacity, industrial evolution and the impact of spillovers on industrial R&D (West, Vanhaverbeke and Chesbrough, 2006). For example, it has been argued that in order to benefit from valuable external knowledge, a firm needs to have a sufficient level of absorptive capacity, which is associated with the level of prior, related knowledge of the firm and which can be

increased by investing in internal R&D (Cohen and Levinthal, 1990). It is important to note, however, that although absorptive capacity is usually considered as a firm-level construct, it can be examined also at interorganizational level. For instance, it has been argued that in alliances the partners may develop an ability to absorb knowledge from a particular partner (Lane and Lubatkin, 1998).

When considering interorganizational knowledge flows (both voluntary and involuntary) from a more strategic perspective, it is evident that firms try to maximize the incoming spillovers from research partners and other parties, while at the same time minimizing spillovers to competitors. This has important implications on firms' R&D investments and cooperative R&D in particular. The relationship between R&D co-operation and knowledge spillovers has been discussed extensively e.g. in the literature on industrial organization (which concentrates on the effects of industrial conditions and market structure on the strategic behavior of firms; see e.g. Tirole, 1988) and the theoretical work in general seems to suggest that increases in spillovers will lead to higher cooperative R&D investments (while non-cooperative R&D levels will decrease; Veugelers, 1998). Another important factor affecting the incentive to engage in R&D cooperation is the level of appropriability of technologies: while imperfect appropriability will discourage especially internal, non-cooperative R&D, it also has negative effects on cooperative R&D. The positive effect of incoming knowledge spillovers and the negative effect of imperfect appropriability (leading to outgoing spillovers), however, have been found to depend on the type of R&D cooperation (horizontal, vertical and institutional, e.g. Belderbos et al., 2004 and Cassiman and Veugelers, 2002).

The level of appropriability is also crucial determinant of the distribution of profits from an innovation. According to Teece (1986), there are in fact three factors (and their interactions) that determine the extent to which an innovating firm is able to capture the profits generated by an innovation: the appropriability regime (which depends on the strength of intellectual property protection and the nature of the technology), complementary assets (i.e., capabilities and assets that a company needs in addition to core technological know-how in order to successfully commercialize an innovation), and the dominant design paradigm (whether a dominant design has emerged). In Teece's framework, the appropriate control structure is determined by these three factors as well. In

particular, the framework determines whether complementary assets should be developed in-house or accessed through contractual agreements (such as licensing and alliances).

Teece's framework can be seen to combine insights from transaction cost and resource-based theories. First, transaction cost economics focuses on the costs associated with different governance structures as determinants of organizational boundaries. While transaction costs are usually assumed to arise from market transactions (such as the cost of discovering relevant prices, and the cost of negotiating and creating contracts) directly, Williamson (1975, 1985) has suggested that also bounded rationality and opportunism of economic agents impose severe limitations on the effectiveness of market transactions (and therefore add to the costs of transactions). Some authors have further argued that transaction costs arise from all kinds of contracts (i.e., also within a vertically integrated firm; e.g. Cheung, 1992). Hence, the decision whether to internalize an operation or to purchase it in the market depends on production costs (associated with e.g. manufacturing or product development), market transaction costs and internal transaction costs (such as management and coordination costs).

The resource-based theories, in turn, were developed to explain how a firm can achieve competitive advantage by efficiently utilizing (valuable, rare, and not easily imitable or substitutable) resources it possesses (Barney, 1991; Dierickx and Cool, 1989; Wernerfelt, 1984). Since the resource-based view (RBV) emphasizes that these resources need to be heterogeneous between firms and not perfectly mobile (in order to form the basis for competitive advantage), this view has relevance also to the alliance research. For example, if resources are non-tradable or must be traded in bundles (due to co-specialization) they may in some cases be accessed through alliances. Among the more important findings, however, are that alliances provide a means for the partners to integrate similar or exchange complementary resources, and that the formation and structure of alliances to a large extent depend on the types of firms' resources and capabilities (e.g. Das and Teng, 2000; Yasuda, 2005). The RBV has also been extended in the context of alliances: Eisenhardt and Schoonhoven (1996), for example, suggest that the formation of alliances and partner selection are determined by both the firms' strategic and social positions (i.e., whether they are in need of resources or have the resources necessary to attract partners, respectively). In addition, several studies on alliance formation have drawn upon other

theories of organizational studies, such as resource dependence theory (Pfeffer and Salancik, 1978).

The theoretical foundations of alliances range from economic explanations to behavioral ones (Barringer and Harrison, 2000; Lowensberg, 2010). Transaction cost economics and resource dependency represent the economic explanation end of the continuum. The basic argument of the resource dependence theory (Pfeffer and Salancik, 1987) is that organizations must engage in boundary-spanning activities with their environment to obtain resources. Thus the resource dependence theory (RDT) explains the rationale behind interorganizational relationships via resources, similarly as the resource-based view explains the competitive advantage of a firm via resources. However, the research related to resources as a rational behind alliances has not always used the terminology and differentiated RBV and RDT appropriately. It should be highlighted that the focus of the RBV is internal and, whereas, as Barringer and Harrison (2000, p. 372) note, "resource dependence theory focuses exclusively on resources that *must* be obtained from external sources for an organization to survive or prosper" (emphasis on original).

According to RDT interorganizational relationships are formed either so that organizations can exert power or control over other possessing scarce resources or in an effort to fill a perceived resources need (Pfeffer and Salancik, 1978). The theory also helps to explain asset complementarity as a reason for firms to enter interorganizational relationships (Barringer and Harrison, 2000). Especially the lack of valuable resources is a valid motive in alliance and open innovation studies. Das, Sen and Sengupta (1998) studied upstream technology alliances and downstream marketing alliances and concluded that upstream alliances are more critical in relation to resource dependence and asymmetry inherent in the interdependence, due to the limited number of potential partners. These findings can be applied to open innovation as well by viewing inbound open innovation as being analogical to upstream technology alliances. Following such an analogy the 'Not Invented Here syndrome' (Chesbrough, 2003) of external technology acquisition reflects asymmetric interdependence and resource dependence between partners, as in both cases it's difficult to "trust it" or "benefit from it if it did not come from us" and find suitable partners.

As one step away from economic explanations on alliances, resource dependence theory focuses on the need for critical resources and the necessity for social exchanges and it emphasizes the environment or the social context thus extending the ideas of open systems theory (Katz and Kahn, 1978; Pfeffer and Salancink, 1978) leading to a different viewpoint than TCE. Granovetter (1985) criticized the atomistic approach provided by TCE and other neoclassical theories and introduced the concept of embeddedness. Embeddedness denotes that organizations are embedded in networks of interdependencies and social relationships. Thus he brought social theory to the economic discourse, bridging sociology and neoclassical accounts by turning the make-or-buy question to make, buy or partner on behalf of sociology.

The intersection of economics and sociology, namely economic sociology, offers explanations to phenomena such as social capital. Social capital is an umbrella concept and different viewpoints to the concept include the sources, outcomes or mechanisms related to social capital. In organization studies the concept has provided prominent insights related to issues such as strengthening supplier relations, regional production networks, and interfirm learning (Adler and Kwon, 2002) reflecting the outcomes of social capital. In interorganizational relationships, social capital can contribute to a firm's functioning and it can service as a facilitator for the exchange and the combination of resources, thus reflecting the mechanism viewpoint. Elaborated more specifically, social capital helps access partners for combining and exchanging resources, it provides the motivation to combine and exchange resources, and it aids in the evaluation of the anticipated value of the interaction, in other words, will it prove worthwhile (De Wever, Martens and Vanderbempt, 2005; Nahapiet and Ghoshal, 1998; Tsai and Ghoshal, 1998). These findings are in line with the general definition of social capital provided by Coleman (1990, p. 302): social capital is the value within social-structural relationships that an actor, such as an individual, an organization, or a network of organizations can mobilize to make possible the achievement of certain ends that would not be attainable in its absence.

Among the outcomes mentioned earlier, social capital and its integral part trust function also as mechanisms to facilitate knowledge flows between organizations, and to provide informal governance (Mu, Peng and Love, 2008). Trust is a social capital resource and embedded in relationships (Dovey, 2009) and it plays a key role in the willingness of network actors to share knowledge. In interorganizational relationships trust is based on

behavior, meaning that the partner needs to signify its trustworthiness through its behavior in alliance (Inkpen and Tsang, 2005). With the emergence of trust, knowledge acquisition has been mentioned in several studies as a direct benefit of social capital (Adler and Kwon, 2002; Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998). For a long time TCE and social science argued that trust and formal control were opposing alternatives, but in the light of recent research interorganizational trust has been seen both a complement and a substitute to contracts between organizations. However there is a difficult causal relationship between them making it hard to distinguish which one is the antecedent but with the presence of trust, the need for formal control mechanisms decreases. (Woolthuis, Hillebrand and Nooteboom, 2005)

With this literature review we argue that the traditional theoretical approach of examining open innovation through neoclassical economics, such as through TCE, is not sufficient for OI research as is no other single perspective either. Thus we introduce a multi-theoretical approach combining economics, sociology, economic sociology and organizational theory to establish more coherent theoretical underpinnings for open innovation, and our attempt is in line with current research on open innovation (see for example du Chatenier, Verstegen, Biemans, Mulder and Omta (2010) and Huggins (2010)). With the examination of problems related to OI, the combination of different theories proves worthwhile.

Table 1. Summary of theoretical perspectives to Open Innovation

	Focus	*Determinants of cooperative arrangement or interorganizational relationships*	*Key references*
Industrial organization	The relationship between R&D cooperation and the level of knowledge spillovers	• Cooperative R&D in general encouraged by the high level of spillovers (imperfect appropriability has also negative effects on cooperative R&D, however) • Asymmetry between incoming and outgoing spillovers (depends on type of R&D cooperation)	Cassiman and Veugelers (2002); Belderbos et al. (2004) For reviews see e.g. Veugelers (1998); Beath, Katsoulacos and Ulph (1989)
Transaction cost economics (TCE)	The costs associated with different governance structures are seen as determinants of organizational boundaries	• The decision on governance mode is based on the *minimization of the sum of production cost and* (internal and market) *transaction cost* • *Bounded rationality and opportunism of economic agents* cause additional, indirect transaction costs • Three main factors (transaction attributes) that affect the choice of governance mode: *asset specificity, external uncertainty and the frequency of transactions* (alliances usually preferred when asset specificity is of an intermediate degree)	Child and Faulkner (1998); Kogut (1988); Williamson (1975, 1985) For reviews see e.g. Barringer and Harrison (2000); Lowensberg (2010)
Resource-based view (RBV)	How firm can achieve competitive advantage by efficiently utilizing the resources it possess	• Resources should be *heterogeneous* and not perfectly mobile • They should also be *valuable, rare, not easily imitable or substitutable* • The theory focuses on the *firm-internal* aspect but is linked to RDT	Barney (1991); Dierickx and Cool (1989); Wernerfelt (1984)
Resource dependency theory (RDT)	Interorganizational relationships and boundary-spanning activities as a means to obtain necessary (scarce) resources	• The aim to *exert power or control over other organizations* • A need to *fill resource gaps* (exchange of complementary assets)	Das and Teng (1998); Das, Teng and Sengupta (1998); Peffer and Salancik (1978) For reviews see e.g. Barringer and Harrison (2000); Lowensberg (2010)
Economic sociology	Organizations are embedded in networks on interdependencies and social relationships	• *Social capital* can examined from source, outcome or mechanism viewpoint • As a mechanism, social capital can help for example to exchange can combine resources and *trust* as a social capital resource can help knowledge acquisition	Adler and Kwon (2002); Coleman (1990); Granovetter (1985); Nahapiet and Ghoshal (1998); Tsai and Ghoshal (1998) For reviews see e.g. Barringer and Harrison (2000); Lowensberg (2010)

3. SHORTCOMINGS OF OPEN INNOVATION THEORY

Even though open innovation as a theory is often promoted as a paradigm shift and a renewal to older theoretical viewpoints that lack explanatory power for the business anomalies of today (Chesbrough, 2003; 2006a), it itself is an incomplete theoretical construct. The current state of research (e.g. Enkel, Gassman and Chesbrough, 2009; Elmquist, Fedberg and Ollila, 2009) acknowledges several academic shortcomings as well as managerial issues that persistently impede a true paradigm shift from taking place on a wide scale.

In the authors' opinion the most prominent theoretical shortcomings can be summarized to five points. First, the problem of definition has been with the young research stream of open innovation since the beginning. While there are a multitude of definitions, most tend to use the definition by Chesbrough (2006a), where the concept is defined by the in- and outbound flows of knowledge through the firm boundaries. However, the exact nature of these knowledge flows and what constitutes the boundaries of the firm are left uncommented, leaving the concept ambiguous in terms of which actions constitute an 'open' business practice and defined by reference to a further unspecified 'porous boundary' (Chesbrough, 2003). This is further compounded by the problem of measurability. Despite academic efforts to this end (e.g. Laursen and Saulter, 2006), an agreed set of open innovation metrics, indicators or measurement systems that would enable extensive empirical data to be gathered has not emerged (Enkel, Gassman and Chesbrough, 2009). Due to that shortcoming the theory construction is slowed by reliance on primarily anecdotal evidence and case studies. As a third complication, the problem of proficiency refers to the poor success that open innovation researchers have had in answering the fundamental research questions of this stream of literature. These include questions such as what capabilities and/or attributes govern effectiveness and efficiency in managing open innovation, and which firms should attempt to implement it (West, Vanhaverbeke and Chesbrough, 2006). Beyond these, critique has been found in the problem of brokerage. Due to the logic of the open innovation theory (and the predictions of Chesbrough (2006b)) there should be a prospering group of technology brokers or innovation intermediaries to counteract the inherent imperfectness of the knowledge market. Contrary to such predictions, these firms have had overall very low success rates and impact on the knowledge markets (Lichtenthaler and Ernst, 2008). Finally, there is the

problem of balance between open innovation and closed practices. Since the earliest works (Chesbrough, 2003; 2006a), there has dawned a realization that managing open innovation also requires finding the correct degree of openness, or balance between open and closed innovation (Enkel, Gassman and Chesbrough, 2009). The theoretical literature up-to-date does not respond to this need by providing any confirmed indication as to what this balance might be, nor how to measure it.

These theoretical shortcomings invoke a plethora of managerial problems to implementing and managing the open innovation model. The authors identify seven essential problems reported in the contemporary literature that impede the wide-scale adoption of the concept. The internal problems of the open innovation firm are the problems of mindset and incentive. The managerial problem of mindset (alternatively corporate culture, e.g. van de Vrande et al. 2009) has been present with open innovation since the founding literature of this research stream (Chesbrough, 2003). It's effect is most discernable in the classic 'Not Invented Here' (Katz and Allen, 1982) and 'Not Sold Here' tendencies (Chesbrough, 2003) in firms attempting to open their knowledge flows. The mindset problem has even recently been promoted as the central managerial challenge in the implementation of open innovation (de Man, Hoogduyn and Dekkers, 2008). According to de Man et al. the problem of incentive is a further inhibitor preventing open practices from taking root in organizations. It refers to a lack of concrete management practice (e.g. reward system) to support the grassroots employee's adoption of the concept. The internal problems manifest as fear of losing knowledge or control and incurring extra costs (Enkel, Gassman and Chesbrough, 2009) that in turn originate from a real problem of spillover. Outgoing spillovers can lead to leakage of core technologies (Gans and Stern, 2003), lessening the rarity of the unique knowledge resource of the firm and overall dilution of competitive advantage (Torkkeli, Kock and Salmi, 2009). There are also managerial problems with open innovation outside the firm boundaries. The imperfect knowledge markets persistently obstruct the search and evaluation of potential partners, retain asymmetry of information between them and generally cause considerable uncertainty and cost to the knowledge transactions (Teece, 1998; Bidault and Fischer, 1994). Considering that the idiosyncratic nature of knowledge as a tradable asset (Arora, Fosfuri and Gambardella, 2001) makes valuation, opportunity identification and value communication problematic (Kutvonen, Torkkeli and Lin, 2010), it is no wonder that implementation of the theoretically incomplete OI concept is struggling.

4. DISCUSSION

Considering the shortcomings of the open innovation research stream thus far and the implications thereof to the implementation of the concept presented above, we see that most of them have remained identified and unsolved since the concept of open innovation was established. Furthermore, extant research primarily discusses the managerial problems, which we argue would be less resilient once the underlying academic issues are better understood. Therefore, we present a fresh perspective on these problems by applying our multi-theoretical viewpoint to the fundamental academical problems of the concept below in table 2.

Table 2. Academical viewpoints to OI problems

Problem	*RDT*	*RBV*	*TCE*	*Social capital*	*Trust*	*Social network*
Measurability			x			
Proficiency	x			x		
Brokerage				x	x	x
Balance	x	x				

A solution to the measurability problem could be derived from transaction cost economics. As transaction cost economics focuses only on cost minimization, literature on interorganizational relationships has emphasized the other side of the coin, the benefits. A reasonable starting point for any set of 'open innovation' indicators should begin with an established measure for closed innovation R&D, adding further elements to deal with the knowledge transactions instead of only focusing on 'open' aspects.

The proficiency problem, referring to questions such as what capabilities and/or attributes govern effectiveness and efficiency in managing open innovation, and which firm should attempt to implement it, benefits from social capital approach and more practically oriented knowledge management practices. Previous studies have come to conclusion that the possession of social capital positively influences knowledge acquisition and knowledge exploitation (e.g. Yli-Renko, Autio and Sapienza, 2001). Further explanatory power to the fundamental question of which firm should adopt open innovation could be found by relying on resource dependence theory that deals explicitly with the necessity of boundary spanning collaboration.

An understanding of the brokerage problem, the very low success rates of brokers and innovation intermediaries, stands to gain considerably from reviewing it via a social capital

perspective as the brokers are effectively in the business of capitalizing on social capital. The attempt to explain this problem should also be derived from economic sociological viewpoints on open innovation, emphasizing especially the relevance of social networks and their structure. Sociological viewpoints to structural issues on social networks, such as whether to have a closed network (where all the actors are connected to each other) or to rely on bridging the network and its structural holes (i.e. disconnections between a firm's partners), via brokers or intermediaries and the type of ties (direct or indirect) are possible approaches. Sociology has two schools of thought on structural issues (Ahuja, 2000). Burt (1992) favors open social structure with structural holes while Coleman (1990) relies on dense, interconnected networks. Open social structure explains that there are opportunities for brokerages to bridge different actors together, and considering Walker, Kogut and Shan's (1997) findings about the formation of an industry network, structural hole theory applies better to networks of market transactions such as transactions between a broker and an 'open' firm. By bridging structural holes, the broker enables the creation of both direct and indirect ties leading to cooperative relationships between participants of open innovation and to network closure thus leading to creation of social capital and trust between participants. Thereby regarding the brokerage problem as contextual problem, denoting the social context of open innovation leads to a more holistic problem-solution approach than just focusing on the content of brokerage.

Balance problem, the appropriate fit between open innovation and closed practices, could be significantly advanced by approaching it from resource viewpoint. Both resource dependence theory and resource-based view have insights to offer. As resource-based view explains how a firm can achieve competitive advantage by utilizing the resources it possesses, this could be seen as analogical to closed approach. Those innovation activities, crucially implementing firm's ability to create competitive advantage, should be kept closed to be able to protect the sources of it (Torkkeli, Kock and Salmi, 2009) and those innovation activities where the company cannot manage on its own should be opened in order to attain complementary resources to fill resource gaps. In many cases firm's critical resources may span firm boundaries thus embedding them in interorganizational resources and routines. In these cases there is a possibility to create relations rents (Dyer and Singh, 1998) leading to *inter*organizational competitive advantage, combining theoretical underpinnings both from RDT and RBV.

In conclusion, we advocate the uptake of a softer, more socially oriented toolkit of theories in an attempt to overcome the fundamental academic issues in open innovation research and have presented some suggestions for starting points in this direction. By thus reinforcing the academic fundament of the open innovation construct could lead to major strides also in solving the managerial problems with implementing open innovation. For the researchers taking a special interest in the managerial problems, a similar multi-theoretical treatment could also directly award new significant insights. Especially applying social and economic sociology theories with a focus to the relational or knowledge flow aspects involved is seen as a potentially fruitful enterprise.

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Open Innovation in a Systemic Innovation Context: Analyzing Online Mass Innovation Process from Systemic Perspectives

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ABSTRACT

This study briefly introduces the National Open Innovation System (NOIS) paradigm, which enables open innovation and online social network (OSN) approaches integration to National Innovation Systems (NIS) and higher education. With the help of interpretive field research methodology, we present our case study findings regarding the implementation of NOIS and associated mass innovation system as a part of Finnish NIS and especially higher education. This study builds a broad knowledge foundation which helps us to better understand the main obstacles and challenges of this implementation process. Our basic idea is to connect theoretical aspects of open innovation paradigm to a systemic innovation theory, especially to ecosystems thinking of innovation. It is suggested that the biggest implementation challenges are the recruitment of human resources and the ability to change the current practices of higher education organizations. On the basis of field experiment results, we propose that a system failure matrix should be used in the foresight process of open innovation processes. Also mass innovation process requires some background planning and proactive prevention activities of system failures.

Keywords: Open innovation, mass innovation, systemic innovation theory, national open innovation system paradigm

1. INTRODUCTION

In this article we analyze open innovation in a systemic innovation context. We pay special attention to analyze online mass innovation process from systemic perspectives. As we know modern innovation processes are influenced by many factors. Innovations are new creations of economic significance. Organizations and people are not innovating in isolation but in complex environments. They occur in interaction between organizational and institutional elements, which can be called “systems of innovation”. “Systems of innovation” is a key concept of modern innovation studies. In the pursuit of innovation firms and other organizations interact with other organizations to gain, develop and exchange various kinds of knowledge, information and other resources. Organizations are suppliers, customers, competitors, financial institutions but also universities, research

institutes, schools and local governments and other organizations. Innovating firms and other organizations cannot be regarded to be isolated and individual decision-making units. Other organizations constitute constraints and incentives for innovations. The incentives include laws, health regulations, cultural norms, values, social rules and technical standards.

A key question in this article is to analyze this critical question, especially from the perspectives of open innovation process and mass innovation process. Open innovations and mass innovations emerge in such complex systems of innovation. If we want to describe, understand, explain and perhaps influence processes of innovation, we must take all important factors shaping and influencing innovations into account. What are these factors? The systems of innovation approach is designed to answer this question.

2. INTRODUCING THE THEORETICAL FOUNDATIONS

2.1. Systemic innovation thinking

The first person to use the expression `national system of innovation´ was Bengt-Åke Lundvall (1992). After Lundvall, the concept was used by Richard Nelson (1993). The OECD and the European Union soon adopted the use of this expression. The systems of innovation approach and its development has been influenced by different theories of innovation such as interactive learning theories and evolutionary theories. The systems of innovation approach is compatible with the theoretical notion that processes of innovation are characterized by interactive learning. The process of innovation is seen as interactive. Thus, constrains and incentives of interactive learning are probably very important factors in innovation processes.

The neoclassical model of the profit-maximizing firm is seen an inappropriate tool for interpreting certain important aspects of the processes involved in generating and diffusing innovations. Many of the actors and organizations involved in R&D and processes of innovation are not primarily governed by profit-seeking motivations. Non-profit organizations and profit-seeking organizations interact with each other in complex ways when they pursue learning and innovation (Nelson & Winter, 1977, 50-52).

Technological change and innovation processes can be understood as an evolutionary process (Nelson & Winter, 1977). Key components of evolutionary theory are: (1) Reproduction of some entities, (2) mechanisms which create diversity, and (3) selection mechanisms of competition which constitute a filtering mechanism. (Nelson, 1995). According to evolutionary theory technological change is an open-ended and path-dependent process where no optimal solution to a technical problem can be identified. Innovation processes involve considerable randomness. Often innovation processes take a considerable time.

The systemic innovation approach underlines that the relations between organizations and institutions are crucial for the functioning and change of systems of innovation. Also specifications of different kinds of institutions and organizations matter. Thirdly, different kinds of institutional and organizational change are important in an analysis of the performance, structure and change of systems of innovation. (Edquist, 2005, 60).

2.2. Closed and open innovation thinking

The paradigm of closed innovation says that successful innovation requires control in organizations and institutions. In the closed innovation model organizations must generate their own ideas, and then develop, build, market, distribute and support them on their own. Another alternative key concept of modern innovation studies is the concept of open innovation. Open innovation is an innovation research paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Thus, open innovation has been proposed as a new paradigm for the management of innovation (Chesbrough, 2003). The open innovation concept is related to (1) user driven innovation, (2) cumulative innovation, (3) Know-How Trading, (4) knowledge management, (5) innovation democracy, (6) mass innovation, and (7) distributed innovation.

Open innovation is defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively” (Chesbrough et al 2006, 1). Technology acquisition and technology exploitation are key elements of open innovation thinking (Lichtenthaler 2008). Technology exploitation includes purposive outflows of knowledge. Purposive inflows

refer to technology exploration. Technology exploration refers to activities which enable organization to acquire new knowledge and technologies from the outside.

In a fully open setting innovation model, firms or organizations combine both technology exploitation and exploration in order to maximize value of their technological and other capabilities. Open innovation is a management challenge for SMEs and larger corporations, but it is also challenge for educational and academic organizations.

Closed innovation model assumes a different kind of systemic approach to innovation process than open innovation model. This is an interesting difference between these two alternative innovation models. In a closed model, incentives and constrains do to not promote knowledge sharing. In open innovation model an innovation system promotes knowledge sharing. Thus we can conclude that a particular innovation system determines whether closed or open innovation model works in reality.

2.3. Ecosystem approach to innovation process

What do we understand by ecosystems? It is advisable to discuss the semantic dimensions of such a biological metaphor. As we all know, continuous competition takes place between different species and between the individual animals of a single species. Changes in the environment are reflected in the food chain, the biological processes, and the population. Innovation begins with ideas, but ideas need to be transformed into useful commercial and social outcomes. An innovation ecosystem model encompasses more than knowledge inputs and incorporates all relevant factors and stakeholders that generate value to customers.

The importance of software technologies is increasing. Software has a special role because it is the technology that is used to implement the new forms of social and societal practice. A profound understanding of software technologies is a critical success factor of the knowledge society (including European universities). In the global economy the commercialization of innovations will be an increasingly central source of value. Knowledge economy is an innovation economy. This has already become visible in the fact that employment growth has focused on young well-educated workers. A highly evolved innovation ecosystem enables participants to work across company boundaries, focus on customer value creation, respond quickly and with agility to shifts in market

demand, accelerate the transition from research to production, and be more adaptive to change. Innovation ecosystems build a collaborative advantage and a strategic asset for economic growth and profitability in the years ahead.

The scheme of the national innovation ecosystem proposed by the Council on Competitiveness (Watanabe & Fokuda 2005, 6) includes the following propositions:

- Innovation is much more than technology — many additional resources and services are essential for market success;
- As with human health, there is no single attribute adequate to capture innovation dynamics and multiplicity features;
- The success and diffusion of innovation is ultimately determined by the demand side and not just by technical inputs and product features;
- Firms are beyond the dichotomy of technology push and market pull; they are embracing both sides of the equation by collaborating more closely with customers, associating with external sources of innovation, networking resources into new business models, and focusing innovation on global market opportunities, and
- Nonlinear dynamics characterize the entire innovation value chain end to end at the national and the firm level.

In Fig. 1 we have presented key elements of innovation ecosystem.

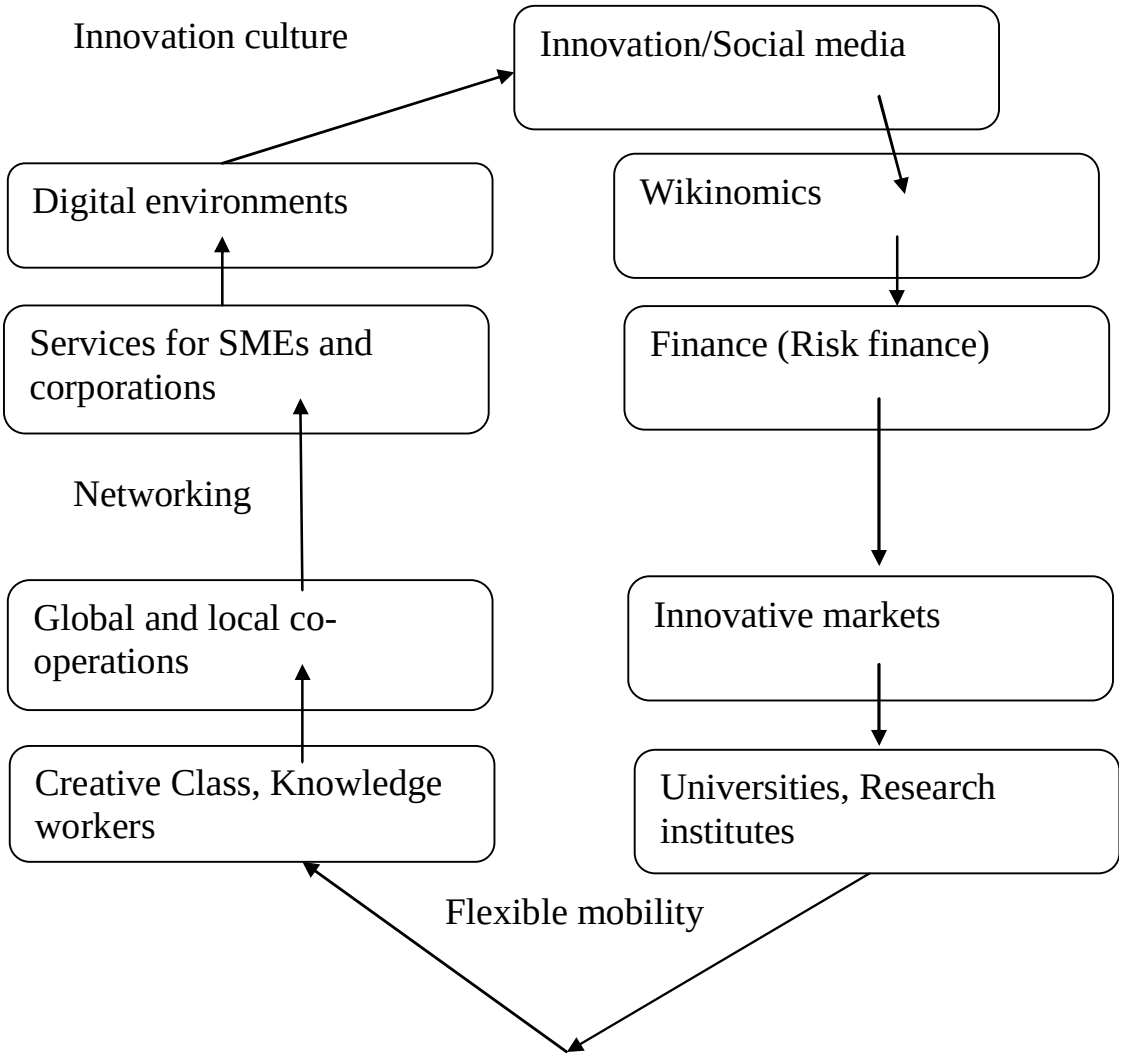

Figure 1. Elements and dynamics of innovation ecosystem (modified from Hautamäki 2008)

2.4. Defining mass innovation

Innovation literature has identified numerous definitions for innovation, yet something is common for most of them. The term innovation is typically used as a synonym for something new (Huiban and Boushina, 1998), which has been put into practice (Ståhle et al., 2004) and is bringing added value to companies and customers (Haho, 2002). To simplify the difference between idea and innovation, the following summary can be made: idea is always the starting point, plan or intention for potential innovation. Idea changes to innovation during the successful execution process. Without the successful execution, the idea will not change to innovation (Santonen et. al. 2007).

When combining a wide range of people and their different but complementary insights and creative interaction, novel thinking outside the box is possible and mass innovations can emerge (Santonen, 2009 adapted from Leadbeater, 2008). Some authors use the term mass collaboration, which occurs when a large group of people work independently to achieve shared outcomes through communication technologies and loose voluntary networks (adapted from Tapscott and Williams, 2006). Without supporting technologies this kind of mass co-operation would be impossible.

3. RESEARCH METHODOLOGY

3.1. Sample selection

The data collection for this case study was carried out in Finland. According to the Global Competitiveness Report 2008-2009 (World Economic Forum, 2009) Finland is not only ranked number one in higher education and training indicators but also ranked number two in innovation indicator. As result of these rankings, we argue that our case selection – Massidea.org as a part of Finnish National Innovation System (NIS) – could be regarded as an extreme sample (Yin, 1990). Extreme cases are able to reveal more information than so called average cases and therefore are important tools in understanding a novel phenomenon such as mass innovation. Even if Finnish NIS has been rated high in comparison studies according to a number of other indicators, Finland's rating has been dropping in the past few years. In order to respond to the changes and challenges in the global environment, the Finnish NIS was recently evaluated by an international panel. The panel published their final report on October 2009 and indicated that Finnish NIS is facing radical reform (Taloustieto Oy, 2009). In our opinion this indicates that there appears to be demand for novel open innovation concepts such as Massidea.org.

European Social Fund (ESF) is funding Open Innovation Banking System - project (later OIBS) which is implementing Massidea.org as a part of Finnish NIS. OIBS-project is developing and maintaining www.massidea.org online social network website including required online and offline supporting structures. OIBS-project is coordinated by Laurea University of Applied Sciences and lead by co-author of this paper Dr. Santonen. OIBS-project was started on May 2008 and it is scheduled to end in June 2011. In this study the unit of analysis is the OIBS-project.

3.2. Introducing Massidea.org case

An open innovation (Chesbrough, 2003) online community Massidea.org – smashing ideas is founded on series innovation theories (Santonen et. al., 2007, 2008a and 2008b, Santonen 2009). Figure 2 presents an Innovation Triangle framework which can be implemented as an online social network site such as Massidea.org.

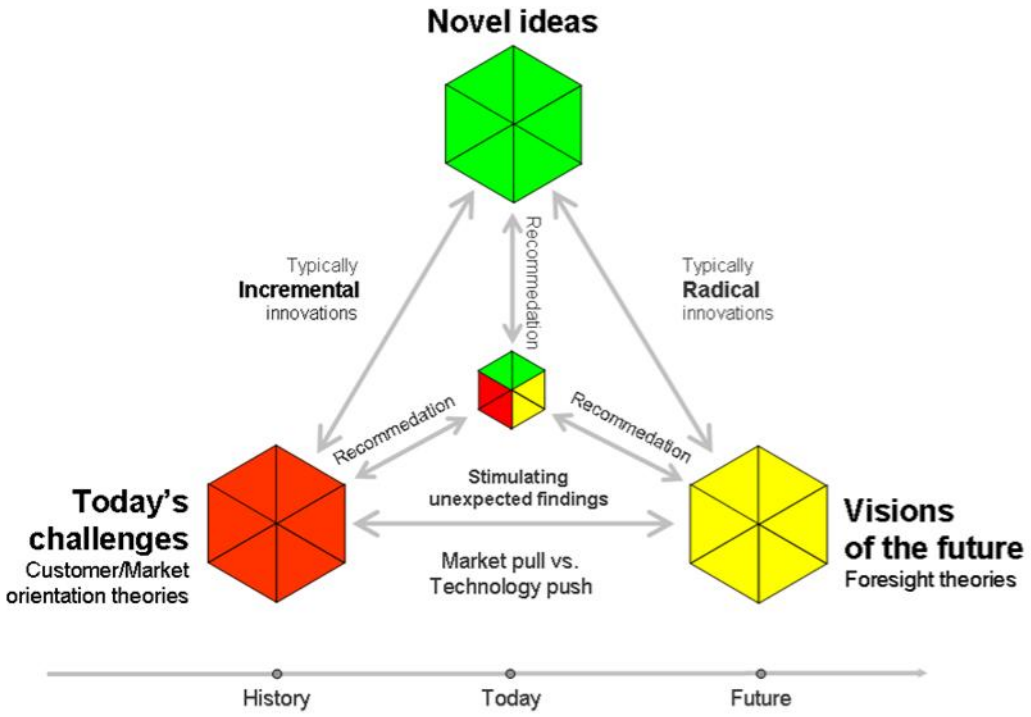

Figure 2. The Innovation Triangle – Stimulating unexpected findings - throughout content recommendation

With the aim of generating new ideas (i.e. the top cube) the framework includes two different yet complementary innovation sources: first, current market environment information, presenting today's challenges derived from history (i.e. the left cube) and second, future market environment information, presenting visions of the future (i.e. the right cube). Today's challenges based innovation process is producing novel ideas from practice, which typically generates small incremental improvements (i.e. incremental innovation) to current offering (Junarsin, 2009). This approach is certainly important, but it is not complete. Therefore mankind needs developers and researchers who are able expand our current understanding and knowledge into new fields by following the vision of the future. On the contrary to challenges based incremental innovations, this foresight driven approach is more likely leading to real novelties. These radical or disruptive innovations and technologies are innovations which eventually overturn the existing dominant technologies and innovations in the market (Clayton, 1995).

According to Herstatt and Lettl (2000) in technology-push theory, an emerging technology or a new combination of existing technologies provide the driving force for an innovative product and problem solution in the market place, while in the case of “market pull” the product or process innovation has its origins in latent, unsatisfied customer needs in the market place. In practice ideas are transferring to innovations only if there is a balance between market pull and technology push. Even if an idea is possible to construct and implement as a concrete entity, it does not necessarily mean that there is a market need for it.

3.3. Defining a common content format

When masses of people collaborate and share their insights, eventually a large cumulative database of contents will be created. In order to make the communication and interaction between contents and users easy, a common content format should be defined. In a fast-paced world readers do not want to spend more than few seconds in the information-gathering process, yet they do want to collect all the required information. For this reason adjusted press release format is suggested as a good tool to share innovation related information. A press release is typically kept to one page or roughly 300 to 500 words. In press releases, the Five Ws concept (who, what, when, where and why) is a popular way to deliver the whole story in a compact format. Therefore, distributing innovation related information content one should give basic answers to the following questions depending on whether it is a challenge, a vision or an idea: (1) what is the thought, (2) why the thought is important and valuable, (3) who is the target group and who is working on the thought, (4) when (temporal dimension) the thought is topical and (5) where (geographical or physical location or circumstances) the thought is happening? By following the above guidelines, easy to read and link cumulative content repository can be created.

3.4. Increasing the likelihood of unexpected findings

By integrating various content recommendation tools (Santonen, 2007) to the innovation triangle (i.e. the arrows in the middle), we can increase the dynamics of the individual’s creativity and increase the likelihood of occurrence of unexpected findings from expected findings. In case of an expected finding, the phenomenon fits with human expectations relating to the future while in case of an unexpected finding, phenomenon is not coherent with the individuals cognitive and belief system and it therefore breaks the conventional habit (Santonen et. al. 2007). For example, serendipity is a process by which one

accidentally discovers something fortunate, especially while looking for something else entirely (Thagard and Croft, 1999). Obviously, the likelihood of unexpected findings naturally increases when the number of interacting users and content increases. However, without advanced content recommendation systems, the unexpected findings potential might remain modest.

3.5. Defining the key players

In order to identify the key players, we ground our suggestions to the enhanced Triple Helix model. The Triple Helix is the most well-know framework to describe the collaboration between universities, policy institutions and industry (Etzkowitz and Laydesdorff, 1999, 2000). In the Triple Helix model each actor has its own task: universities produce research, industries manufacture, and the government secures certain stability for maintaining exchange and interaction. The Triple Helix regime operates on these complex dynamics of innovation as a recursive overlay of interactions and negotiations among the three institutional spheres. The different partners engage in collaborations and competitions as they calibrate their strategic direction and niche positions.

In the past, national innovation system models grounded on the Triple Helix model have been very successful. However, in our opinion Triple Helix is lacking a genuine market orientation (Kohli and Jaworski, 1990, Narver and Slater, 1990) and is not fully utilizing users as innovators (von Hippel 1986, Urban and von Hippel 1988) and users as content creators phenomenon (Le Borgne-Bachschmidt et al. 2009), which currently are emphasized in innovation literature. Critical thinkers might say that the voice of user, consumer and people is totally missing in Triple Helix. Moreover, Triple Helix does not recognize the innovation potential of other educational sectors such as basic education and upper secondary education, which are covering children and young people. On the contrary to traditional Triple Helix model, the taxonomy for online social network based open innovation system requires strong end-user interaction and does not exclude other educational sectors besides universities (Figure 3).

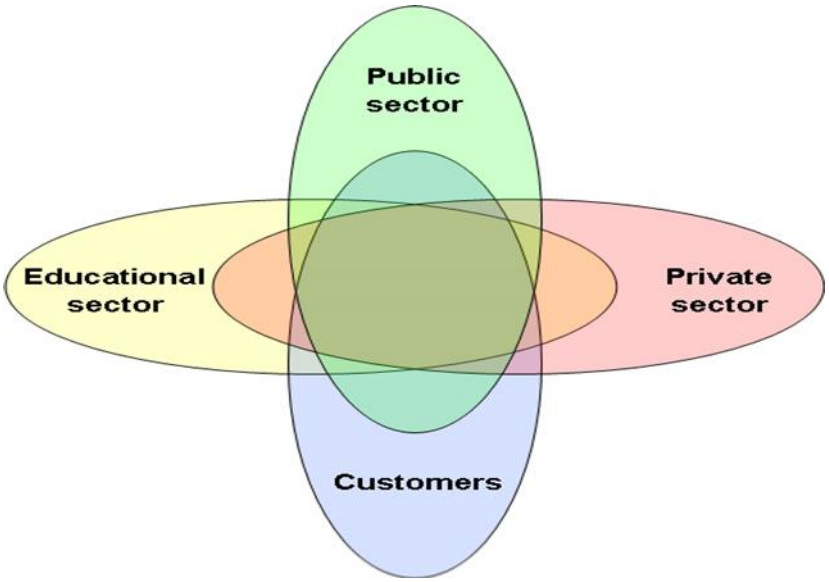

Figure 3: Key players in Massidea.org based open innovation system

3.6. Data collection analyzing framework

The research strategy of this study loosely follows the principles for interpretive field research presented by Klein and Myers (1999). In interpretive field research, the interpretive researchers' and other research participants' preliminary understandings and interactions also affect the study results. Therefore it is important to note that one of the interpretive researcher and author of this study is also leading the OIBS-implementation project. For this reason multiple sources of evidence were used to increase the credibility of our findings (Yin, 1990). These evidence include: (1) www.massidea.org online social network website, (2) official ESF reports and documentations, which are OIBS-projects tools to communicate with the funder and report the project progress, (3) OIBS Wiki, which is the home of OIBS-developer community including all development and marketing documentation, 4) OIBS project in www.sourceforge.net and www.github.com, which offers web-based management tools to open source software projects, 5) seminars and events which bring together the project partners and finally 6) personal documents, discussions and emails between authors of this study and other project participants.

3.7. Analyzing framework: Understanding obstacles and challenges of mass innovation process

According to PFI (profiting from innovation) tradition of systemic innovation research we can use the following framework to investigate obstacles and challenges of mass innovation process and the functioning of open innovation approach (Teece 2006, 1138-

1143). According to the PFI research tradition these kinds of critical issues are important in the innovation system:

3.7.1. Complementary innovations

Complementary innovation and complementary technologies are critical assets for the open mass innovation processes. Many technologies and innovations are systemic. That is why complementary innovations and technologies deserve a special attention in the innovation process. Successful commercialization requires bringing together complementary technology and patents. If complementary innovations are not available, also open mass innovation can fail.

3.7.2. Supporting infrastructure

Supporting infrastructure is also a very important success factor for the implementing innovations. New institutions, organizations and laws and the provision of complementary assets may be necessary before certain innovations can be developed. Public sector can provide a supporting infrastructure for innovations.

3.7.3. Capabilities

Capabilities create a critical constraint for a innovation process. Especially the diversity of capabilities is a critical factor. Capacity building can help to solve various problems related to capabilities.

3.7.4. Finance

Finance is always a constraint for innovation process and commercialization of ideas. Availability of risk and venture capital is important for innovative organizations.

3.7.5. Decision framework

Decision framework is an important factor in innovation processes. Decision-making processes in organizations can support innovations or not support them. Typically, imposing an “outside view” (Kahneman and Lovallo 1993) is likely to assist in generating less biased view. A limited cognitive framework may cause problems for innovation implementation.

3.7.6. Supply chain issues

All the innovations are connected to some kind of a supply chain. Typically there are three basic alternatives: (1) outsourcing, (2) collaboration and (3) internalization in relation to a supply chain choice (Teece 2006, 1140). Innovators must make decisions in relation to supply channels and chains. Wrong decisions may destroy successful commercialization of ideas and innovations.

3.7.7. Standards, increasing returns and network effects

Katz and Shapiro (1994) have emphasized the importance of network effects and increasing returns in the context of innovation process. Also dominant design and associated standards can create increasing returns and network effects. Wrong design choices can lead to a loss of network effect and increasing returns.

3.7.8. The multi-invention licensing option

If an innovation is systemic, the multi-invention licensing option is an important aspect of innovation process. Today in the field of biotechnology and microelectronics many inventions are systemic. Wrong licensing arrangements may be harmful for new innovations.

3.7.9. Intangibles and knowledge management

Intangibles and knowledge management is big issue in innovation processes. A good knowledge base promotes learning and innovation processes. Investments in intangible capital are a big trend in leading firms of the global markets. Strong intellectual rights and ownership of the complementary assets are together a foundation of successful innovation process.

3.7.10. Other elements of business model

Business model is of course an important issue for innovation commercialization. The product/services architecture and business model together define the manner by which the firm deliver value to customers, entice customers to pay for value and concert those payments to profit. (see e.g. Chesbrough and Rosenbloom 2002, 533-534).

3.7.11. Systemic issues

In some cases (1) system boundaries, (2) system failures and (3) system elements create problems for innovation processes. Key systems can be technical, economic or social.

In Figure 4 Systems failure analysis process and system failure matrix are presented. Systems failure analysis begins with a clear understanding of the failure. This includes a definition of the problem in innovation ecosystem. Once this has been accomplished, all potential failure causes are identified using fault tree analysis (FTA). Actually the key results of the PFI tradition can create a fault tree analysis. Fault tree analysis means identifying all potential failure causes (Leveson, & Harvey 1983, Sinnamon, & Andrews 1996)). Fault tree analysis is a graphical technique that identifies all potential failure causes. FTA has been used in new product analysis but its use can be widened to the analyses of open innovation process and systemic innovation process. FTA may be qualitative or quantitative. When failure and event probabilities are unknown, qualitative fault trees may be analyzed for minimal cut sets.

The process then objectively evaluates each of the potential failure causes using several techniques. These techniques help in converging on the causes of failure among many identified potential causes.

These techniques are: (1) Complementary innovations analysis, (2) supporting infrastructures analysis, (3) capabilities analysis, (4) financial analysis, (5) decision framework analysis, (6) supply chain analysis, (7) standards, increasing returns and network effects analysis, (8) multi-invention licensing option analysis, (9) Intangibles and knowledge management analysis, (10) Business Model analysis and (11) system boundary, internal system failure and system elements analyses.

Once the system or systemic failure causes have been identified, the approach outlined herein develops a range of corrective actions and then selects and tracks optimum corrective action implementation. FTA can also help stakeholders of innovation process to manage risks in a better way (see. Condamin, Louisot & Naim 2006).

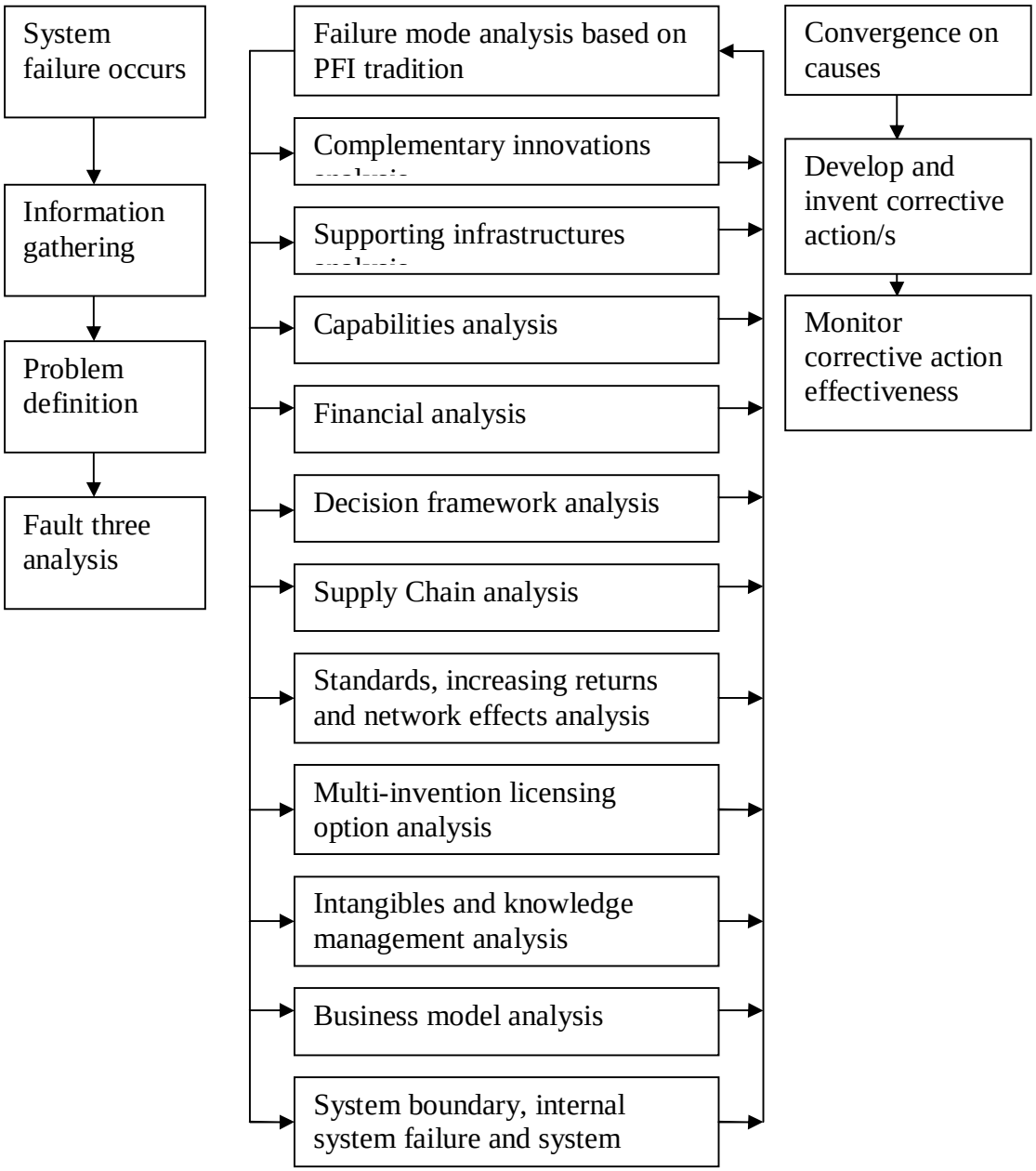

Figure 4. System failure process, fault three analysis and system failure matrix based on PFI research tradition

Thus, we recommend that the FTA methodology is integrated to the PFI methodology to manage systemic aspects of innovation failures. This is a new idea and requires further methodological development.

4. RESULTS

In the following we will present our results based on four elements of PFI research tradition (Teece 2006) including finance, supporting infrastructure, decision framework and capabilities. In this article we are focusing on 4 key issues of mass innovation. The

reason why we are not presenting wider analysis is that the project OIBS is still running and it is too early to make final conclusions of the project. Later we can provide deeper insights but not we focus on the issues where we have reliable research findings and case study observations.

4.1. Finance in the case study

In November 2006 the project idea was first time publicly presented by Dr. Santonen. An open call to join the yet non-existing project was announced in a national seminar. As a result, eleven universities of applied sciences indicated willingness to participate and a Goal-Oriented Project Planning (GOPP) workshop was organized in the March 2007. Later on two funding applications were filed. The Finnish Funding Agency for Technology and Innovation (later Tekes), rejected the first application, but a tentative financing decision from the European Social Fund (later ESF) reached the project group in April 2008. Before this successful funding decision the implementation activities remained modest.

A series of additional information requests were indicated by the funder. The most significant requests focused on the budget cut from 1.9 M€ to 1.1 M€. The consortium was facing a major challenge. According to the funder, especially the personnel costs had to be significantly cut off and back-loaded. Basically the project's human resources had to be cut nearly in half and moreover totally restructured. This increased the risk of implementation failure since nearly the same outcome was expected with half of the assumed resources. At the time it was also noted by project management that the cost structure is likely to be front-loaded on the contrary to required back-loaded model.

Since the final project consortium included 13 partners, the level of funding per one participant would remain rather modest (ca. 45.000 € per co-partner in three years, excluding those having a special role in the project). Therefore a structure having only a minimum core team was seen as an only solution. The majority of the project work would have to be integrated as a part of normal duties of the faculty members without extra costs. However, this was inline with NOIS theory, which suggested that development and content production is possible to integrate as a part of normal duties if there is a real will. Moreover it became evident that the main currency for students would have to be study credits instead of money. The simultaneous rewarding with study credits and project funding was also prohibited by the funder.

4.2. Supporting infrastructure

Evidently without technological support, mass innovation is impossible. The technological platform for Massidea.org has gradually been developed during the project as an open source project. Most of the coding for Massidea.org application has been conducted by the students as a paid job or as their internship tasks. Typically the technical team has included five to seven students at a time. However, it was assumed during the project planning that the participant technical universities are able to smoothly integrate the platform development work as a part their normal courses (e.g. some application features would have been coded as a part of course tasks). If this would have succeeded, the number of technical recourses would have increased significantly. Now with limited number of technical team members, the progress of technical platform has been significantly slower than planned. As a result, the end-users have been forced to use beta versions with limited functionality, which does not fully support the defined NOIS and Massidea.org concept. This has clearly resulted frustration especially among the participant teachers, who have been waiting the fully functional application. This expectation has made the implementation process more difficult, even if the project management has since the beginning pointed out that the project participants are supposed to develop concept and technical platform together.

Moreover, the current multiple campus model is clearly causing challenges. Most participant universities have multiple campuses in different cities, which in addition appear to very independent. This combined with the academic freedom of each teacher to execute their lectures as they which, results in a significantly fragmented “market”, which basically means implementation one by one teacher/course. When this kind of market is combined with the current limited resources, it has become evident that implementation is extremely slow and human resource intensive. Interestingly, many teachers also appear to be so busy with their current workloads and working models, that voluntary contribution to what at the first glance looks something “extra” is out of question.

4.3. Decision framework in the case study

As a result of the project funding structure, the majority of the development work and content production is based on voluntary contribution (i.e. not paid by the project). Based on our observations even if a lot of people are convinced of the goodness and benefits of

the project idea, it is amazingly hard to recruit university faculty members and students to contribute especially when the technological infrastructure is not fully ready.

There also appears to be structural and organizational barriers. In order to fully integrate something to educational processes in universities, there should be integration to university specific curriculum. If the way of working is not a part of the objectives of the curriculum, it must be implemented by individual teachers. Basically this means winning hearts one by one. The curriculum integration takes easily years since university curriculums are not changed annually. Especially the teachers responsible for basic courses (i.e. having masses of students) are in a key role in content production. Other key target groups are 1) the teachers responsible for internships, which are compulsory in universities of applied sciences and 2) teachers responsible for thesis supervision and seminars. Only if these teachers are defining studying tasks whose outcomes are shared to NOIS, the critical mass of users can be achieved.

In participating universities, the project management has requested that the suggested working model should be tightly integrated to above processes. However, the lack of university management support at the decision-making level has been evident. The management willingness to force or even to officially recommend the teachers to utilize Massidea.org as a part of these processes has been impropriated in most cases. Instead of strong central implementation support, project is supposed to act on its own and follow the winning hearts one by one implementation model. This is somewhat confusing since during the consortium agreement each participant member promised to engage 50 percent of their students to Massidea.org by end of project. At the moment only small part of this goal has been reached and stronger tools have been asked from the university management, yet without success.

4.4. Capabilities in the case study.

The tradition of the increasing number of ever changing technological applications teachers must master is causing trouble in project implementation. It has been said in some participant universities that the limit of learning new applications has been reached and there is no more room for learning new technical application and working methods.

Most of the participating universities in project are universities of applied sciences, which are focusing applying things in practice instead of theoretical issues. This on the other hand attracts those students who are into doing things in practice instead of theoretical issues. Therefore, the capability to write quality content is not as strong as it is in traditional universities. Also generally speaking the way of writing content favors longer project reports and documents, instead of the short press release kind of format what massidea.org is using. Finally, there is a clear learning curve for newcomers to participate in the development activities. Hence a longer period is required to start effective development work.

All these issues are related to capabilities and willingness to change current practices. Interestingly, these observations are in line with previous studies which have identified the participation inequality in the case of OSNs. The diffusion of innovations theory is offered as an explanation (Rogers, 1962). It appears that only innovators – the first individuals to adopt an innovation – are joining the project. Teachers' and students' contribution evidently requires changes to the current studying model. Necessarily these changes are not big in workload point of view, but are demanding from the state of mind viewpoint. The old habits – e.g. studying individually or with a small team, not openly sharing the unfinished outcomes right away to masses of people – have been printed hard in higher education. Changing this is a slow process, but if succeeded, it might deliver a substantial competitive advantage to participating individuals, universities and nations.

5. SUMMARY

This study briefly introduces the National Open Innovation System (NOIS) paradigm, which enables open innovation and online social network (OSN) approaches integration to a National Innovation Systems (NIS) and higher education. With the help of interpretive field research methodology, we present our case study findings regarding the implementation of NOIS and associated mass innovation system as a part of Finnish NIS and especially higher education.

This study builds a broad knowledge foundation which helps us to better understand the main obstacles and challenges of this implementation process. Our basic idea is to connect theoretical aspects of open innovation paradigm to a systemic innovation theory, especially to ecosystems thinking of innovation. In this study we used key findings of PFI research

tradition and created a test tool for this case study of mass innovation. By the help of this PFI based tool, it is possible to avoid systemic problems of innovation process beforehand (on the basis of ex ante evaluation), but also use this PFI based tool in ex post evaluations of innovation process. In this case we used 4 key issues as PFI evaluation tool. Evaluation gave us many interesting results concerning the development of a mass innovation. These new results can be used in later phases of the pilot project. It is also useful to use other PFI based ”control” issues in later evaluations when the pilot project is fully finalized.

On the basis of this case study we suggest that the biggest implementation challenges are the recruitment of human resources and the ability to change the higher education organizations’ current practices. On the basis of field experiment results we propose that FTA failure matrix based on PFI research tradition should be used in the foresight process of open innovation processes. Also mass innovation process always requires some background planning and proactive prevention activities of system failures and systemic failures.

We recommend that the FTA methodology and the PTI methodology are integrated to manage complex systemic aspects of innovation failures. This methodology can be useful in the implementation of open innovations and mass innovations. This is a new idea and requires further methodological development.

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Universities in the Regional Open Innovation System and Strategy: Case Study Reflections of National University Reform of Finland

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ABSTRACT

The basic idea of Open Innovation emphasizes, among other things, that firms can benefit from acquiring valuable knowledge from external sources and/or selling internally generated technologies, which have low value within the firm's current business model, to other companies or organizations. Universities have played an active role in the regional innovation system and strategy. In Finland the government has implemented a wide-ranging university reform and presented new university legislation. In this paper the authors analyze Finnish universities as regional knowledge hubs and open innovation partners in a new institutional and administrative setting. The key research questions of the study are: (1) Are universities in Finland now more ready to open innovation co-operation? (2) How has the national university reform changed the role of universities in regional innovation systems and strategies? (3) How should open innovation management be organized in Finnish universities? The case study is based on material from four case studies and their interpretations. The case studies focused on Aalto University, on the University of Turku, on the University of Eastern Finland (University of Kuopio, Joensuu and Savonlinna), and on the University of Lapland with the local universities of applied sciences of Rovaniemi and Kemi-Tornio. In the case studies special attention is paid to (1) problems, (2) decisions, (3) evaluations, and (4) rules. The case studies are based on William Ellet´s (2007) Case Study Methodology developed in Harvard Business School

Keywords: Universities, regional open innovation system, innovation ecosystem, national innovation system, open innovation paradigm, public domain benchmarking, Finland

1. INTRODUCTION

Albeit often gradually, the roles that universities undertake in society change and evolve over time. “The medieval university looked backwards; it professed to be a storehouse of old knowledge . . . The modern university looks forward, and is a factory of new

knowledge." So wrote the English biologist Thomas Henry Huxley (1892) in 1892, remarking on the transformation that industrial society had stimulated in long established functions of universities. This kind of evolutionary process will also take place in the future. Evolution in the role of universities is proceeding from knowledge storehouse (mode 1) to knowledge factory (mode 2) to knowledge hub (mode 3) and finally to innovation factory (4). Universities are not ivory towers, but innovation engines and learning environments in contemporary societies (Carayannis & Campbell, 2006).

It is today widely accepted that universities and public research institutes (URIs) played a substantial role in the development of many high-technology regions (Bresnahan & Gambardella 2004) and entrepreneurial spirit and activity (Clark 1998).

In this article, we analyze the development and strategies of Finnish universities. The focus of our analysis is on (1) the innovation thinking and (2) the strategic development models of the universities. The key issue is to investigate if Finnish universities are adopting the open innovation paradigm and how do they see their role in the Finnish innovation ecosystem. We also investigate the critical question: (3) are Finnish universities focused on innovation processes? There are also other studies that find this approach interesting (see Boune, Gould-Williams, Law & Walker 2005).

In contemporary societies, universities have three main functions. Through science, technology, and innovation (STI) universities (1) are working to provide research achievements needed in the society, (2) promote different modes of technology transfer to improve productivity, and (3) realize the universities' mission of talent education and social service. These functions of universities are strategically very important for the competitiveness of countries and regions. (Etzkowitz & Leydesdorff 2000).

On one hand, universities must strengthen their capability of scientific research innovation, produce first rate research achievements that can be recognized internationally; on the other hand, Finnish universities need to transform research achievements into practical productivity, make full use of them in the industrial and service sectors and in the public sector. In doing so, universities utilize extensive social and economic resources, which not only promote social development, but also raise more funds and absorb more resources for themselves, and enhance their economic strength. Universities have assumed an extended

role in science and technology based economic development that has become of interest to catch-up regions as well as to leading innovation locales and learning regions.

Innovation is the ability to create economic value from new ideas and the pursuit of innovation requires organizations to define strategies. For firms and other organizations a central concern in innovation strategies is finding a balance between the exploration of new ideas and the exploitation of existing competences and well-developed expertise. Organizations focusing on exploitation are building on the organization's existing internal knowledge with external partners´ specific capabilities. Other organizations emphasize exploration, which includes tapping external knowledge to aid in investigating trajectories that are new to an organization (March 1991, Ahuja 2000). We can expect that universities also do the same, combine exploitation and exploration strategies. Universities must add new ideas to old ones in a balanced way. They must also consider their strategies in higher educational markets and R&D activities.

In Finland, recent years have been a time of renewal and new strategic processes. In the 2006 report of the Science and Technology Policy Council, entitled *Science, Technology, Innovation*, the development policy guidelines concerning society and the economy are defined as follows (Science and Technology Policy Council of Finland 2006, 2008, 7):

"Finland's strategy is to ensure sustainable and balanced social and economic development. However, it is crucial for the economic development to be connected to the other developments in society and the environment as well as to increasing the well-being of the population. In addition to other factors, the positive development is maintained by the high level of education of the population as well as versatile development and application of knowledge and expertise. These mostly self-created national strengths must be retained in the future as well. In a globalised environment, more international co-operation is needed to this end."

This definition is still valid and it is firmly rooted to Porter´s (1998) competitiveness thinking. Prerequisites supporting the realization of this strategy are a stable economic environment, high rates of employment and productivity, and a high level of international competitiveness.

The aim of education, research, and innovation (ERI) policy is to strengthen the strategy and prerequisites of its implementation. Education policy is an increasingly important part of this whole, but also research and innovation policies matter. In Finland, the government has implemented a wide-ranging university reform and presented new university legislation. In this paper the authors analyze Finnish universities as regional knowledge hubs and open innovation partners in a new institutional and administrative setting. The key research questions of the study are:

(1) Are universities of Finland now more ready for open innovation co-operation?
(2) How has the national university reform changed the role of universities in regional innovation systems and strategies?
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The case study is based on material form four case studies and their interpretations. The case studies focused on Aalto University, on the University of Turku, on the University of Eastern Finland (University of Kuopio, Joensuu and Savonlinna) and on the University of Lapland with the local universities of applied sciences in Rovaniemi and Kemi-Tornio.

In the case studies special attention is paid to (1) problems, (2) decisions, (3) evaluations, and (4) rules. The case studies are based on William Ellet´s (2007) Case Study Methodology developed in Harvard Business School.

Our case studies do not include whole university "systems" but only some key strategic aspects of the analyzed universities´ strategic renewal processes. These strategic issues are: (1) the key contents of strategies, (2) visions of the universities, (3) missions of the universities, (4) the core values of the universities, (5) scientific orientation and expertise, (6) study programs and students, (7) finance and budget, and (8) administration and organization.

2. UNIVERSITIES AND OPEN INNOVATION PARADIGM

As is generally known, open innovation has been proposed as a new paradigm of innovation (Chesbrough 2003). The definition of open innovation is an important starting point to understand the paradigm. Open innovation is defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the

markets for external use of innovation, respectively" (Chesbrough et al 2006, 1). Technology acquisition and technology exploitation are the key elements of open innovation thinking (Lichtenthaler 2008). Technology exploitation includes purposive outflows of knowledge. Purposive inflows refer to technology exploration. Technology exploration refers to these activities which enable an organization to acquire new knowledge and technologies from outside.

Several factors have led to the erosion of closed innovation. First of all, the mobility and availability of highly educated people has increased over the years. As a result, large amounts of knowledge exist outside the research laboratories of large organizations. Furthermore, when employees change jobs, they take their knowledge with them, resulting in increasing knowledge flows between companies. Secondly, the availability of venture capital has recently increased significantly, which makes it possible for good and promising ideas and technologies to be further developed outside the business organization. Besides, the possibilities to further develop ideas and technologies outside an organization are growing, for instance, in the form of spin-offs or through licensing agreements. Finally, other organizations in the supply chain, e.g. suppliers, play an increasingly important role in the innovation process. As a result, organizations have started to look for other ways to increase the efficiency and effectiveness of their innovation processes; through active search for new technologies and ideas outside the firm, but also through cooperation with suppliers and competitors in order to create customer value. Another important aspect is further development or out-licensing of ideas and technologies that do not fit the strategy of the organization. Open innovation can thus be described as: combining internal and external ideas as well as internal and external paths to market to advance the development of new technologies.

3. STRATEGIC ORIENTATIONS OF FOUR FINNISH UNIVERSITIES: STRATEGIC INSIGHTS

In this case study of four universities we study the strategic orientations of four Finnish universities. We pay a special attention to innovation related strategic issues, especially to issues related to the open innovation paradigm.

3.1. Benchmarking of Finnish universities

A typical benchmarking project consists of three phases: (1) planning, (2) benchmarking performance, and (3) presenting improvements. We shall follow this basic phase model of benchmarking. Planning consists of all internal preparation for benchmarking study. Benchmarking performance contains the collection of benchmarking data and its analysis (see Appendix 1). The improvement phase consists of the conclusions and policy recommendations of the benchmarking study (Stapenhurst 2009, 1-11). Typically, this phase includes learning from others, improving ideas, and new strategy initiatives. This study is a typical *public domain benchmarking* (Stapenhurst 2009, 20-26).

In the next sections we give our report on the results of this public domain benchmarking. We have adopted the key ideas of Ellet (2007), who emphasizes in the context of case studies problems, decisions, evaluations, and rules. We have tried to identify these issues in this case study of Finnish universities. In this case, our *key research problem* is effective promotion of innovation activities in Finnish universities. *The decision aspect* is focused on the analysis of strategic decisions of these four Finnish universities. Our *evaluation* is based on the public domain benchmarking study. Finally, our questions connected to *rules* are based on a simple research question: Do Finnish universities follow the insights of the open innovation paradigm or not. Another rule question concerns the other insights they may follow. As we know, rules exist in virtually every area of business and public sector, including universities. The question, what kind of rules do universities follow in their innovation strategies and processes, is a very interesting research problem.

In the selection of case universities we have used the case study criteria of implemented structural changes that have forced universities to re-think their strategies. In Aalto University, in the University of Turku, and in the University of Eastern Finland mergers and new strategic reformulations are implemented. In the University of Lapland a new networked structure is formulated with regional polytechnic universities. The University of Lapland has also created a common innovation strategy with its partners, which is a part of the university's implementation plan.

We can first make some general notes concerning innovation thinking. In the strategies of each university the innovation approach is emphasized. An exception is the University of

Eastern Finland, which focuses on the actions which strengthen the merger process of three universities. New strategies of these four Finnish universities tell us that the spirit of the time and the role of universities is to boost innovations and new ideas. At the highest level of university administration, leaders and managers have understood that the society can be successful and competitive if universities are an elemental part of creative economy and work at the heart of many innovation processes. Universities do not want to be outside the emerging innovation eco-systems and they want to develop their internal capabilities of innovation management.

However, all the investigated strategies of universities are examples of a conventional linear paradigm of innovation. The big idea of innovation in Finnish universities seems to be that just making high quality research in selected fields and providing high quality higher education are the only activities needed for the innovation strategy. This strategic goal is presented clearly by the University of Eastern Finland, which notes that it will be a central actor in the national and international innovation systems because it will provide high-quality academic research and higher education. On the basis of our investigations we cannot claim that Finnish universities are presenting a lot of new path-breaking ideas and inventions in their new strategies. Our analysis is indicating that universities are not providing any surprises in the Finnish innovation eco-system. The participation of Finnish universities in national innovation activities seems to include much rhetoric and many formal statements, which are easy to accept by many other organizations and institutions. The spirit of the strategies is largely based on the Triple Helix type of innovation thinking (Etzkowitz & Leydesdorff 2000).

Another important strategic approach in Finnish university strategies is that by networking with different organizations and institutions they can strengthen innovation activities in universities. Thus, universities in Finland expect that by increasing interaction with other organizations they can promote and make progress in innovation processes. Strategic partnerships with firms are said to be strengthened by the Finnish universities. According to these strategies R&D activities with firms are intensified by the universities. This strategic approach of networking can, in principle, be seen as an opportunity to increase open innovation activities in Finnish universities. Our benchmarking investigation reveals, however, that only Aalto University mentions open innovation as an important strategic objective. This is an interesting result of our benchmarking study.

The strategies of the analyzed university documents indicate that Finnish universities do not have any informed insights of the open innovation paradigm or other scientific insights of their role in the Finnish innovation ecosystem. The framework of innovation thinking in Finnish universities is vague and thin.

Our benchmarking analysis indicates that the innovation activities of the universities are connected to their missions and scientific orientation. Aalto University wants to be an international innovation university. Innovation activities constitute its key profile. Aalto University is unique with its innovation activities and work culture. It wants to be the strong research, development, and innovation hub of Finland. Aalto University wants to influence European research, education, and innovation strategy. Local economy aspects are also mentioned. Aalto University aims to participate in the metropolitan area development of Helsinki. The key fields of expertise include creative economy and development projects connected to creative industries.

The University of Turku is largely focused on selected areas, especially on business and innovation research. This strategic orientation is motivated by the fact that the Turku School of Economics was merged with the University of Turku. The University of Turku wants to build innovation environments in this specified field of knowledge.

In the University of Eastern Finland innovation activities are focused on new structures and multidisciplinary research teams. In the University of Lapland regional arctic research orientation and international tourism research are the strategic priorities. The University of Lapland wants to serve the local economy in the best possible way.

A general conclusion of our comparative benchmarking is that Finnish universities emphasize organizational and institutional structures in strengthening innovation systems and activities. Less attention is paid to their role in the regional innovation system or the national innovation ecosystem. A hidden assumption of the strategies of the universities seems to be that clusters with polytechnic universities, mergers with other universities, and new organizational and institutional structures will automatically create some new innovations and better innovation systems. This hidden strategic assumption may be a problem for Finnish universities in the future. The utilization of modern innovation research could be beneficial to Finnish universities. The second hidden assumption of

university strategies in Finland is that multidisciplinary research will automatically lead to better innovation activity and profiting from innovation. The third visible assumption is that all networking leads to better results in innovation activities and innovation systems. The role of universities in regional innovation systems and the national innovation eco-system is quite vague in the strategies we analyzed. A general open innovation strategy for Finnish universities is a missing element in these university development strategies.

Finnish universities seem to be searching solutions to how they could benefit from participation in innovation activities. They want to be members of innovation networks and innovation eco-systems. Intellectual property rights have not been a big issue for universities but now their importance has been noted. The clarification of IPR issues is one trend in Finnish universities.

Aalto University and the University of Turku mention in their strategies some new principles and practices by which they want to strengthen their innovation management systems. A new organizational innovation in Aalto University is the Factory Model, which has been started in order to increase all kinds of test bed activities and social interaction inside the organization of Aalto University. The University of Turku also mentions the Factory Model and the Innovation Platform Project.

In their public strategic statements, the University of Turku and Aalto University claim that innovation activities and creative thinking will be connected to the educational programs of these universities. For example, the University of Turku has a strategic goal that all members of the university community adopt the idea of creating something new. Aalto University emphasizes the role of creative environments and environments that support individual and social creativity. Concrete action plans for these interesting ideas are still missing.

After investigating the strategies of these four universities we have problems in finding strategic initiatives which would redirect administration and management into a direction that supports innovation activities in Finnish universities. This may be another problematic issue if the society wants to use universities as innovation platforms. Reforms of management are, however, mentioned in the development strategy of Aalto University. The other universities emphasize “light administration”.

One critical conclusion of our benchmarking analysis of the strategic documents of the universities is that “light administration” easily leads increasing administrative work loads on individual researchers, which leads to lower innovation capacity and activity. Action to strengthen the innovation activities in Finnish universities does not have a comprehensive approach and it is not realistic. Many reformulations of innovation strategies are cosmetic and not based on modern innovation research and its basic paradigms like the open innovation paradigm.

Tables 1, 2, and 3 show the public domain benchmarking results of four Finnish universities.

Table 1. Benchmarking of four Finnish universities: Strategic orientation, vision, and mission

	The Aalto University	**The University of Turku**	**The University of Eastern Finland (University of Kuopio, Joensuu, and Savonlinna)**	**The University of Lapland with the local universities of applied sciences in Rovaniemi and Kemi-Tornio**
Basic strategic orientation	Internationalization	Emphasizing the focus areas and schools	Implementation of the fusion of three universities	Regional and local needs
Vision	International innovation university	International research university	Future university today	In favor of the North, for the world
Mission	Internationally respected multifield university	International and multischool university	Multifield science and research university, who profiles itself through strong scientific fields	Internationally attractive, creative, multicultural, and serving the region of Lapland

Table 2. Benchmarking of four Finnish universities: Values, expertise and scientific orientation, students, and key educational programs

	The Aalto University	**The University of Turku**	**The University of Eastern Finland (University of Kuopio, Joensuu, and Savonlinna)**	**The University of Lapland with the local universities of applied sciences in Rovaniemi and Kemi-Tornio**
Values	Freedom to creativity and critical thinking, passion to learn new things	Freedom of science	Regional development emphasis: Eastern Finland and forestry	Creativity, critical approaches
Expertise and scientific orientation	Innovations, creativity *School structure:* School of Art and Design School of Economics School of Science and Technology	*Basic sciences:* Faculty of Humanities Faculty of Mathematics and Natural Sciences Faculty of Medicine Faculty of Law Faculty of Social Sciences Faculty of Education Turku School of Economics	*Faculty structure:* Philosophical Faculty Faculty of Science and Forestry Faculty of Health Sciences Faculty of Social Sciences and Business Studies Independent Institutes and Service Centers	*Faculty structure:* Faculty of Education Faculty of Arts Faculty of Law Faculty of Social Sciences Lapland Institute for Tourism Research and Education Arctic Centre
Students and key educational programs	Many research schools in different fields, international exchange and staff recruitments	Lifelong learning, research school	Education of researchers, new study subject structure	Co-operation in post-graduate education, science-based education

Table 3. Finance and budget framework, personnel, professors, and researchers (Ministry of Education 2010, Kota Database, Universities own statistics)

	The Aalto University	**The University of Turku**	**The University of Eastern Finland (University of Kuopio, Joensuu, and Savonlinna)**	**The University of Lapland with the local universities of applied sciences in Rovaniemi and Kemi-Tornio**
Finance & budget framework (Kota)	346 million euros (2009 real) 368 million euros (2010 estimated)	221 million euros (2009 real) 221 million euros (2010 estimated)	208 million euros (2009 real) 222 million euros (2010 estimated)	45 million euros (2009 real) 59 million euros (2010 estimated)
Personnel total 2009 (Universities own statistics)	4512	3217	2730	646
Professors and researchers 2009 (Kota)	1606	845	766	103

On the basis of Table 3 we have calculated some indicative indicators of the 4 universities (see Table 4).

Table 4. Budget/personnel, Budget/research staff and the budget share of teachers and administration in 4 case universities in Finland

	Aalto University	The University of Turku	The University of Eastern Finland	The University of Lapland
Budget/Personnel, euros	76684	68697	76190	69659
Budget/Research staff, euros	215442	261538	271540	436893
Budget share of teachers and administration, %	64%	73%	71%	84%

From organizational innovation potential perspective, when we use as an evaluation criteria budget share of the teachers and administration, the best university is the Aalto University (lowest budget share of the teachers and administration (64%), the second best (71%) is the University of Eastern Finland, the third best (73%) is the University of Turku and fourth best (84%) is the University of Lapland.

While reading universities personnel amounts and tittles from databases and annual accounts we have to notice universities different practices to make interpretations from personnel and professional titles which vary from universities to universities. Even in the same university there can be research focused lecturers and teaching orientated lecturers. In this paper lecturers and teachers are classified to be out of research staff. We have taken statistical figures from Kota database in purpose to treat universities equally. In that perspective results are robust, but indicative.

4. SUMMARY

In this article we have analyzed Finnish Universities' strategic orientation from the perspective of innovation. The key research questions of the study are: (1) Are Finnish universities now more ready to open innovation co-operation? (2) How has the national university reform changed the role of universities in regional innovation systems and strategies? (3) How should open innovation management be organized in Finnish universities?

It is possible to argue that universities have strategic aims, which means that an open innovation perspective could be useful to them. Universities are trying to create, for instance, more collaboration with different kind of actors. They are seeking to be part of a network in innovation issues. Universities see multidisciplinary collaboration as an essential issue in innovation systems.

Hence, it seems that an open innovation perspective is not a very important aspect in universities' strategies. According to our material, Aalto University is the only one to mention open innovation in their strategy. The reason is that universities tend to have a very strongly traditional approach to innovation systems. They emphasize, for instance, the importance of education and high quality research. It seems that universities have no particular framework behind their strategic maps. For this reason, it is quite obvious that universities have no deep and systematic knowledge of how to manage innovations. According our material, universities emphasize innovations, but this does not affect their managerial system, for instance. On the basis of strategies, the innovation perspective is not a comprehensive approach.

The national university reform has affected universities' orientation so that they are now willing to be part of innovation systems. According to their strategies universities have adopted the understanding that the success of societies depends on innovations and creative economy. Universities should have a role in innovation systems.

It depends on the university's mission how they understand their role in the innovation system. Aalto University's mission is to be an important player of international level and they emphasize the global innovation system. The University of Turku emphasizes innovations in focusing on strategic areas. The University of Lapland and the University of Eastern Finland have strongly regional orientations and they emphasize universities' roles in regional innovation systems. It is possible to say that, thanks to the new law, universities are now focusing differently on innovation systems. It is still too early to say how this will affect universities' actions in practice in the future.

On the basis of strategies, universities have adopted different ideas on how they see their roles in innovation systems. Aalto University would like to be the centre of the innovation system. This means that it would be the centre that creates innovations in society. Other universities prefer to support innovation systems at the regional, national, and international levels. The Aalto University has less administrative staff than other investigated Finnish universities. It has better average salaries of research staff. The Aalto University has also adopted open innovation thinking to some extent to its strategy. On the basis of these criteria the Aalto University is the "innovation system champion" of the 4 benchmarked Finnish universities.

From the perspective of our material, we have the impression that universities have approached innovation management with too unsystematic frameworks. For this reason, we think that if we want to encourage the open innovation perspective in Finnish society we need a national policy program for universities' innovation policies. With such programs it would be possible to generate basic knowledge for universities' strategy work. Obviously, on a general level, we can note that if universities' strategy work could be connected to broader national innovation ecosystem thinking and regional innovation systems, this would probably lead to better results from the national innovation policy.

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Appendix 1: Data sources of the public domain benchmarking study of 4 universities

The strategy of the University of Turku:

http://www.utu.fi/faktat/strategia/Turun_yliopiston_strategia_2010-2012.pdf

The strategy of the Aalto University:

http://edustajisto.ayy.fi/images/2/24/Aalto_yliopiston_strategia.pdf

The strategy of the University of Lapland:

http://www.ulapland.fi/Suomeksi/Tietoa_yliopistosta/Strategia.

The strategy of the University of Eastern Finland:

http://www.uef.fi/uef/strategia

KOTA online service, maintained by the Ministry of Education, offers statistical data on universities and fields of education from 1981 onwards.

https://kotaplus.csc.fi/online/Etusivu.do

Railway Freight Markets' Innovations in European Union and Russia

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ABSTRACT

During the last decades innovation is noted to have a vital influence on companies' success. As transport sector has a decisive role in economy, recently studies have concentrated on innovations in the field of logistics. However, studies have mainly scrutinized sea, road and air transport, research concentrating on railway freight market's innovations is lagging behind. This paper tried to tackle the gap by evaluating the status of innovations in two European, Swedish and Polish, and Russian railway freight markets. By utilizing semi-structured theme interviews were revealed, that there exist clear discrepancies between the countries. In Sweden innovations were noted as part of organizational culture, the concentration was on service innovations. Russia represented the opposite example; the main concentration was on technical innovations. Poland was noted to have influences from both counterparts. However, the level of service innovations was estimated to increase in near future, because the Western lifestyle is penetrating both Polish and Russian railway freight markets.

Keywords: innovations, Russia, European Union, railway freight market, deregulation

1. INTRODUCTION

The field of transportation has confronted considerable modifications during the centuries. Globalization, mergers and acquisitions, and the trend of transferring production to low-cost countries have put pressure on transportation. Transport has a decisive role in economy, transferring cargo from the place of production to place of consumption. Therefore, transport sector is often note to have a key role in economic activity. World Trade Organization's statistics (2010) support the construct: in 2009 world's merchandise trade (import and export) amounted over $ 12 000 billion.

Innovations are critical to companies' success. The innovation research has mainly concentrated on manufacturing industry (see for example Cho et al., 2008; Pineda, 2009; Teresko, 2009; Woerter & Roper, 2010); in recent years service sector's innovations have attracted attention (Lee et al., 2009; Thrane et al., 2010; Toivonen & Tuominen, 2009). One of the classic examples of new service-based industry is logistics (Chapman et al., 2003). Logistics sector has ignored innovations in studies; however, as worldwide trade is sharpening and the need for transport increase, during last decade companies have started

to pay more attention to logistics sector innovations. Donovan (2004) noted the importance of finding better means to move cargo was recognized already in 1776, when Adam Smith expressed in The Wealth of Nations the connection between manufacturers, markets and transport inefficiencies. As major transport innovations in 19th century were noted steam railways and iron steamships (Knowles, 2006): These innovations helped to increase international trading system. Twentieth century's main transport innovations were bulk shipping, containerization and electronic data interchange (EDI), among many other innovations in the field of logistics. (Grawe, 2009; Kimura, 2005; Knowles, 2006) Furthermore, the deregulation wave which started in 1980s had positive impacts on logistics innovation: according to Kimura (2005), deregulation leads to strengthened competition, which promotes innovation in logistics.

As the research field "Innovation" has numerous sub-groups, it is vital to state the level of innovation this paper tries to tackle. Due to the fact the concentration is on logistics and especially on railway transport, and logistics is noted as one of the classic examples of service-based industries (Chapman et al., 2003), this paper concentrates on service sector innovations. Furthermore, as the intention is to understand especially logistics innovations, service sector innovations are only briefly described. According to Wu (2006), patenting is relatively unimportant as an appropriation device in logistics industry. Tamura et al. (2005) noted most of the patents in transport sector are related to machine tools and technical characteristics (vehicles, railways and ships). Therefore, patenting is not widely considered in this paper.

Studies related to transport sector have concentrated on the mostly utilized transport modes, sea and road (see for example Jenssen, 2003; Kimura, 2005; Langmyhr, 1999). Although railway market has been widely evaluated for example in deregulation thematic entity, innovations in railway sector have not been broadly studied. Although Russian railway market has attracted various researchers' interest, the number of English publications is limited. Besides, the status of railway innovations between European Union and Russia is not available. This study tries to attenuate the existing gap by introducing the situation in European Union, especially in two countries, Sweden and Poland, and Russia.

The objective of this study was to examine the stage of innovations in railway market in European Union and Russia. The study familiarized with the theoretical knowledge of

deregulation and logistics innovation and brought it to empirical level by scrutinizing the experts' opinions concerning the innovations in railway market. The purpose was to find out whether innovations are visible and overall noted in railway markets. The intention was also to define the main innovations and clarify the topic's future prospects. Innovation in railway transport market has not been widely studied, which provided the research gap. By providing data from actor level, study reveals new knowledge both to academia as well as practitioners. By elaborating the research's main objective, research questions were developed. The research questions of the study are:

- What is the status of innovations in railway transport sector in European Union and Russia?
- What are the main discrepancies between the European Union and Russia?

This manuscript is structured as follows: In Section 2 we review the literature related to railway transport market deregulation and logistics innovations. Section 3 introduces the research methodology. In the following Section 4, empirical results are described and illustrated. Overall research findings are discussed in Section 5, where Russian railway market innovations are noted to have backbone in technology. In final Section 6 we conclude our work and provide paths for further research in the area.

2. LITERATURE REVIEW

Service sector innovations have grabbed researchers' interest worldwide (see for example Lee et al., 2009; Thrane et al., 2010; Toivonen & Tuominen, 2009). According to Chapman et al. (2003), one of the classic examples of service-based industry is logistics. Kandampully (2002) represented three requirements for service innovation: 1) technology, 2) knowledge, and 3) relationship networks. When increasing the level of efficiency in the field of logistics, these are noted vital characteristics. Jenssen (2003) stated skills, competencies and strategic assets must play together and create an aggregate. Integrating core competencies in and between companies may create innovation and capabilities which are difficult to imitate. (Jenssen, 2003)

In order to be able to survive and compete in the growing transport market, companies need to pay special attention to innovations. Jenssen (2003) argued the innovation has to create economies of scale or involve tailor-made solutions that bind customers to

companies, in order to create sustainable competitiveness and profitability. When innovations do not give sustainable competitive advantages, competitors can easily copy the innovations. This has been noted for example in shipping industry, where technical innovations have been quickly imitated by competitors. (Jenssen, 2003)

According to several studies, adopting innovations is the most important tool for companies to increase their competitive advantage (Lin, 2007). This has also been noted in the field of logistics: Studies have noted in order to satisfy diversify customer requirements, logistics service providers need to improve the service efficiency (Mason-Jones & Towill, 1999; Sauvage, 2003). Furthermore, top management level is noted as a driving force in the process of innovation (Jenssen, 2003; Kimura, 2005). Grawe (2009) and Autry and Griffis (2008) highlights knowledge within the organization and in interorganization relationships as the key in developing innovations. Collaboration is noted useful if the parties involved want to pursue innovation. For example, technological innovations can be achieved by complementing resources either via horizontal or vertical integration. (Soosay et al., 2008) Richey et al. (2005) noticed innovation was recognized to be related to strategic performance and to operational service quality. Study of Simatupang and Sridharan (2005) revealed that supply chain members having higher level of cooperation practices achieved better operational performance and innovation activities.

Flint et al. (2005) studied logistics innovations in USA and few European countries (Sweden, UK and Switzerland). They found out that the main innovations in logistics sector were developing new software, designing new packaging, creating new delivery processes, building new facilities and developing new services. Interestingly, they noted often customers do not ask for special services, but instead they explain the changing goals and objectives. Often logistics innovations are invisible to business communities, due to the fact they are mainly located in functions which are hard to notice. In order to create a logistics innovation, it does not have to be a new to the world service. Even relatively small new products or services were noted as innovations. For example, improved temperature integrity in transport is not observable by outsiders. However, fresh fruits are well recognized by customers. (Flint et al., 2005; Grawe, 2009)

However, this does not mean the logistics companies do not pay attention to innovations. According to Sirilli & Evangelista (1998), in Italy 29.8 percent of road transport

companies and 33.3 percent of shipping and sea transport companies are innovative firms. Interestingly, road transport sector stated 27.6 percent of innovations are service innovations, while 28.7 percent of respondents noted they are utilizing process innovations. The same figures for sea transport are respectively 33.3 percent and 23.1 percent, stating the service innovations are more common in sea than road transport sectors. Industries innovating mainly through acquisition of new machinery and equipment are sea transport (89.2 percent) and land transport (93.4 percent). (Sirilli & Evangelista, 1998)

Table 1. Importance of technology for firms' performance (Adapted from Sirilli & Evangelista, 1998)

Service sector		1993 - 1995			1996 - 1998	
	Not relevant	Moderate	Very important	Not relevant	Moderate	Very important
Road transport	20,4	63,9	15,8	12,2	51,1	36,7
Sea transport	8,5	70,1	21,4	3,9	33,5	62,6

Table 1 illustrates the importance of technology for firms' performance. As table notes, both in sea and road transport the importance of technology has risen sharply. Especially intensive it was in sea transport, where 62.6 percent of respondents noted technology was very important in 1996-1998, whereas the same figure in 1993-1995 was 21.4 percent.

Deregulation and privatization is noted to reduce transport costs, encourage innovations and stimulate demand. Among the pioneers in railway market deregulation was USA, which liberalized the market by Staggers Rail Act in 1980. (Knowles, 2006) Although the European Union deregulated the railway freight markets by the legislative demands only in 2007 (see for example Alexandersson and Hulten, 2005; 2008; Jahanshahi, 1998; Laisi, 2009; Mäkitalo, 2007), few European countries deregulated the railway freight market already earlier. Among the first countries were the United Kingdom, Germany and Sweden (Jahanshahi, 1998). Sweden opened the markets in 1990s and today the railway freight market has dozens of railway undertakings. Poland deregulated the market in 2000, four years before joining the European Union (Wronka, 2007). As in Sweden, Polish market has today several operators; the market shares differ between a massive market leader to minor operators with few percents' share. Rallying point is the fact the earlier monopoly companies still run the markets: The former monopolistic operators in both countries have more than 75 percent market share!

Russia is often noted to have influences from various deregulation trends. In the United States, deregulation was vertically integrated, stating operators owned also infrastructure (Hilmola & Szekely, 2006). Situation is totally different in Europe; according to legislative demands of the European Union, infrastructure is separated from operations and it is handled by an own organization (Laisi, 2009). Japan can be placed between earlier examples: infrastructure and freight operations are separated, whereas passenger transport utilizes vertical integration (Szekely & Hilmola, 2007). The era of structural changes in the Russian railway freight market started in 2001, when the Railway Structural Reform Programme was launched. While railway market was divided into governmental and operational functions, the Russian Railways (RZD) was established. Although traction is still under monopoly in Russia, private companies are able to offer wagon leasing services. Numerous companies have entered the Russian railway freight market; today, there are around 2200 private operators (Grantham, 2008; Kamalov, 2009). Although innovation in logistics and railway market is often noted to have concentrated on service innovations, in Russia the amount of patents have increased sharply. Consequential results of innovation activities in 2009 were tripling the number of patents for technology developments in railway industry (from 134 in 2008 to 400 in 2009) (RZD, 2010).

3. METHODOLOGY

In order to gain comprehensive understanding of the engrossing railway freight market, semi-structured theme interview was chosen as an interview type. Because a thorough comprehension in this scarcely studied sector was needed, a qualitative research method was selected. In accordance with Eisenhardt (1989), qualitative case analysis is a recommend way to gather information while researching novel topics. Besides, Häkkinen and Hilmola (2005) noted case study research is widely used research strategy in logistics. Additionally, qualitative research's main intention is to understand the research subject, which was the main objective in this paper. (Hirsjärvi et al., 2004) Due to lack of earlier first-hand data in the research field, by interviewing experts having root-level knowledge about the market, we were able to gather versatile and genuine data. Although study's main intention was to scrutinize the factors related to deregulation processes, innovations were noted an important area of research. Furthermore, according to Kimura (2005) deregulation increases innovation, wherefore it is vital to understand the basics of deregulation process in the studied countries.

At the moment there are 17 railway undertakings that have a licence to practice railway freight traffic in Sweden. Polish markets have more licensed undertakings: altogether over 90 have the license, 49 are counted as active operators. A contact letter was sent to 16 Swedish railway undertakings. One railway undertaking was excluded due to its small size (employs only one person). Afterwards, a phone call round was done, securing all market actors were reached. Six persons representing six Swedish companies were interviewed. Due to the extent nature of the Polish railway freight market, an extensive sample of 18 companies was chosen, including various types of railway undertakings (small undertakings concentrating on transporting one product and large undertakings providing services all around the country). Altogether seven persons representing seven companies were met from Poland. Due to extensive size of the Russian market, a diverse interviewee base was chosen. Because the main intention was to gather versatile and veracious data, few Finnish companies operating and or doing business in Russia were included. A contact letter was sent via e-mail to the companies which were noted as the main actors. Basically, this meant around 20 companies. Altogether were met 15 persons from 11 different companies or organizations. Therefore, altogether this paper handles the information gathered from 28 interviews. All interviewees representing three countries were working on the management level, which ensured they had required knowledge concerning the railway freight market, and therefore were adequate to answer with needed validity in the stated questions.

4. EMPIRICAL RESULTS

4.1. Sweden

Sweden commenced deregulation process in 1988 and the first private railway undertakings entered the market in 1990 (Alexandersson & Hulten, 2005). Railway freight market's extension has been constant: Today there are 17 railway undertakings operating on the market (Wolf, H 2009, pers.comm., 26 March 2009). Private railway undertakings mainly entered the market during 1994–2006: Old governmental organization, Statens Järnvägar (SJ) decided to discontinue unprofitable short-lines in 1994 and gave an opportunity for new railway undertakings to take over the lines in question. Therefore, several railway undertakings have direct background from old SJ.

As Kandampully (2002) stated, requirements for service innovation are technology, knowledge, and relationship networks. Swedish market belongs to the mature railway freight markets in Europe, wherefore the three requirements were easily recognized. New railway undertakings that entered the market after the deregulation have purchased both new and used rolling stock, which states they have paid special attention to technology. As several operators had background from the incumbent, knowledge level is really high. Furthermore, due to the fact the Swedish railway freight market is rather small, having only 17 railway undertakings, and many companies have background from the incumbent, the personal relations between the company representatives are warm and close. Therefore, also the relationship networks are well maintained.

Although no one from Swedish interviewees noted there are any technical innovations at the horizon, the need for service sector innovations were confronted monthly-base. According to interviewees the customers are requesting more specialized services, which create new ways to serve the clients. Furthermore, the level of information systems has sharpened during the last decade, which ensures the customers can attain the needed information efficiently.

4.2. Poland

Poland started the railway freight market's deregulation in 2000. Although the incumbent had first mover advantage, the amount of private operators started to increase in 2003. (Wronka, 2007) Today the number of private operators is over 90, which is among the most competed railway freight market in the whole Europe (Wrobel, J & Imieninska, J 2009, pers. comm., 25 March 2009). Several new railway operators had background from industry, for example mining companies established own railway undertakings in order to guarantee the needed transport services.

When considering the Polish railway freight market based on Kandampully's (2002) findings, the situation varies from Sweden. Due to the fact the incumbent did not sell rolling stock to new entrants although there were thousands of units untapped, companies had to pay special attention to technical side. Basically, this meant millions of US dollar investments to technical operability. Polish railway freight market was noted closed, employees are moving between the companies which ensures the high level of knowledge. Although the interorganizational cooperation was not stated as good as in Sweden,

company representatives observed the overall cooperation in the market is good. Although the Polish interviewees did not notice clear innovations in the railway freight market, few stated the future novelties might concentrate on technical functions. However, the importance of customer service was noticed vital: according to respondents, during the monopoly customers were not used to get any service, wherefore introducing customer service to railway transport sector was a great improvement.

4.3. Russia

The era of structural changes in Russian railway freight market started in 2001, when the Railway Structural Reform Programme was launched. While railway market was divided into governmental and operational functions, the Russian Railways (RZD) was established. Although RZD has a monopoly position in traction, companies transporting own cargo as well as operators leasing wagons, entered the market. Today, there are more than 2200 operators, who have mainly entered the market during the last years. (Grantham, 2008; Kamalov, 2009)

Due to the fact the Russian railway freight market is still ongoing the reform, the situation is rather interesting. When evaluating the market via Kandampully's (2002) observations, it can be noted the technological side is well taken care of. According to RZD (2010), the number of patents threefolded between 2008 and 2009. This state the main innovations in Russian railway market are recognized in technical improvements. Overall the sector's knowledge level was noted high: as especially important function was noted the railway universities, which are educating knowledgeable people to railway market's needs. Furthermore, the cooperation between operators was noted viable.

The status of technical innovations in Russia is noted to be top class. Especially strong attention is paid to rolling stock: new locomotive and wagon types are built. According to interviewees, the Russian Railways has a special technical development program, which partly explains the high number of patents in railway sector. However, according to respondents the market is lagging behind in the service culture, although private railway operators are paying more attention to customer demands. This was noted especially significant problem in the Russian Railways, although the information systems are on a high-level due to modernization done few years ago.

5. DISCUSSION

Polish, Swedish and Russian railway freight markets are different, partly because the latter country does not belong to European Union, which harmonizes the markets within its area. However, there exist discrepancies also between Sweden and Poland, partially because liberalization process was done during different decades. Sweden started the liberalization process in 1988 and Poland in 2000; first private operators entered the markets in Sweden 1990, whereas the amount of private operators increased in Polish market in 2003 (Alexandersson & Hulten, 2005; Wronka, 2007). However, due to national peculiarities, like the type of main industries, we can assume the situation would have been the same although countries would have done the process concurrently. The situation in Russia varies greatly from European model, starting from the fact the market is still partly regulated. However, the level of liberalization is increasing in Russia.

The statuses of innovations differ between the countries. In Sweden the reforms are ordinary and noted as part of organizational culture. Therefore, often innovations are not particularly recognized. However, the level of service innovations in transport sector was observed. Railway undertakings, including the incumbent as well as private operators, are satisfying the demanding customer requests by providing new services. Although new actions may be individualized to certain client, in process of time novelties spread to daily service method. In Poland innovations are mainly technology-related, due to the nature of the market. Overall the service sector is increasing its influence, which has affected on the transport industry as well. However, Polish railway market has many other matters to be solved, for example the level of railway network infrastructure is rather low. Russian market specializes on the technical innovations: based on literature and respondents' comments, rolling stock development is noted as the main target for development. Although customer service sector's importance is growing due to demanding clientele, it is still considerably lagging behind when comparing to European level. However, it must be noted the studied countries represent the extremities in the European scale: Sweden is part of Western Europe, where the level of service culture is overall higher than in Eastern European countries. Although Polish service culture has strong influences from the Soviet Union time, the level of customer service has increased since Poland joined the European Union. This is also noted in transport sector and in railway freight market, where customers are requesting and appreciating good customer service. Therefore can be

estimated, that in near future the level of service innovations will grow in Polish market. Russia represents the Eastern country, where the service culture is lagging behind when comparing to European countries. This is also noted in railway freight market's innovations, as the main concentration is on technical side, namely in developing locomotives and wagons. However, due to ongoing Reform Programme and the fact the Western lifestyle is penetrating the market, the service sector's innovations are expected to increase in near future. Already today Russian clientele is noted demanding, which creates a fruitful basis for future innovations.

6. CONCLUSIONS

In order to be able to survive and compete in the growing transport market, companies need to pay special attention to innovations. Although the studies have previously concentrated on manufacturing industry (Cho et al., 2008; Pineda, 2009; Teresko, 2009; Woerter & Roper, 2010), recently more attention has been paid to service sector innovations (Lee et al., 2009; Thrane et al., 2010; Toivonen & Tuominen, 2009). Although the field of logistics is compounded of various functions, it can be counted as service-based industry (Chapman et al., 2003). Although Wu (2006) noted patenting is relatively unimportant in logistics industry, formerly the transport innovations were mainly noted in technical side. Tamura's (2005) research confirms the fact by stating most of the patents in transport sector are related to vehicles, rolling stock and ships. However, according to Kandampully (2002) technical functions are important in service sector innovations, together with knowledge and relationship networks.

This study has provided insights into the innovations in railway freight markets' in three countries, Sweden, Poland and Russia. The main purpose of the study was to recognize the level of novelties and elaborate the main innovations. The transport sector innovations were identified and the situation in case countries was briefly described. Results were approached on country basis, followed by a comparison between countries concerned. Based on this research, there exist discrepancies in the status of innovations in the railway freight markets. European countries, especially Sweden representing Western European country concentrates more on service sector innovations, whereas in Russian railway freight market the importance is on technical functions. Poland was noted to have characteristics from both West and East: although technical innovations have received

strong status due to market's peculiarities, service culture is getting influences from Western Europe.

The fact both European and Russian railway freight markets are ongoing changes, provides interesting paths for further research. Although the modifications in the European Union are not as radical as in Russia, the innovations in harmonization process could provide interesting insights both to transport market and overall the business world. Russian railway freight market's Reform Programme is still continuing, which creates uncertainty to the market. However, while the functions are finding their form, it would be a good chance to see how service sector innovations are developing in Russian market. Overall, this paper only scratched the topic, wherefore deeper research could unfold interesting characteristics. Therefore, study should be repeated within couple of years' time in a more engrossed manner.

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Interfacing Intellectual property rights and Open innovation

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ABSTRACT

As the paradigm of innovation becomes more user oriented and collaborative, to benefit from this changing paradigm, firms need to adjust their intellectual property rights management strategy and devise tools to manage openness. Crucially, firms need to resolve is how to interface the "closed innovation" paradigm required to acquire intellectual property rights in law and to introduce openness in the process of innovation and decentralised innovation process. While the topic of open innovation has produced numerous works especially in the area of business administration and organizational studies, literature on interfacing open innovation with intellectual property law is rare or rather focused on specific subject matters of IP. For example, legal research on open innovation focus on computer, open source software or user generated contents types. This leaves out vast areas of technology uncovered and under researched. Based on literature review and qualitative case studies on a group of Finnish firms, this paper aims to identify tools that are required to manage openness, in response to legal context, and examine to what degree the protection of intellectual property, in particular patent, can be adapted or interfaced with open innovation paradigm.

The paper finds that (1) open innovation is dynamic, (2) all commercial open innovation is always managed or controlled, and that (3) actors and modalities of exchanges are heterogeneous and dynamic. Two of these aspects makes it difficult to regulate open innovation with intellectual property law (1) multiple claim holders who have heterogeneous interests and (2) openness in the communication in their exchange. Multiple claim holders – as contributors, investors, co-inventors, collaborator call for a governance structure over how their claims can be prioritised. This paper argues that intellectual property law do regulate the question of co-inventor, co-creator, and co-owner but do not regulate how these rights may be coordinated or managed, in what hierarchy. To prevent disputes, we find proactive private ordering is necessary. Furthermore, open innovation benefits from open exchange in communication, in the absence of clear and certain rules on how such exchange lead to loss of right, "open" communication may not occur. In other words, unless openness is managed, communications that are crucial in open innovation will not occur. Thus we find that openness in innovation is always managed either formally (through formal governance means i.e. contract, explicit firm policy) or informally (through community norms, trust and implicit corporate culture.)

The paper argues that governance means are best provided by the firms either as a contracts, or general policy over information exchanges, in other words a broader form of contract (Private ordering). As a secondary option, a certain proposals to the patent law revision can also be made through introduction of limitation and exception to the right. This paper has two practical implications. First, in the absence of proper legal safeguard for own collaborative input, the paper advocates contract based governance approach. Reflecting this, open and collaborative innovation requires firms to more actively and strategically involve in the governance of intellectual property. Secondly, as a proposal for patent law reform, the paper may enlighten law and policy makers to explores for a creation of particular defence against the claims of infringement in patent law.

Keywords: Patent, Open Innovation, Intellectual Property Rights, Governance, Coordination

1. INTRODUCTION

Developments in the information and communication technology make it easier to collaborate or jointly innovate. As collaboration and joint innoation involve multiple actors and calls for various changes in the perception, management of intellectual proeprty (IP) as well as strategies and in the business models of the firms. Additionally, fast speed of technological developments often reduces the value of an individual IP right. Consequently owning IP alone may not give a long term sustainable competitive advantages. To generate and capture the value of innovation, firms need to consider other elements outside the traditional concept of owning intellectual property right.

One such alternative is presented as open innovation model, utilising external actors as sources of innovation. (Chesbrough 2003). To benefit from changing paradigm of innovation, firms are invited to consider practicing open innovation. However, practicing open innovation is challenging for most firms not only because it requires change in perception but also because of the traditional conditions for protection of intellectual property in law, especially patent protection. Patent law tends to discourage open exchange and communication, especially before the patent filing, as published and known innovative idea will not be protected. Under this closed innovation model, firms need to closely control the exchange of innovative ideas even within the firms. Any open exchanges with actors outside the boundary of the firm will be discouraged. In this sense, open innovation requires the firms to interface openness with the closed innovation model that are adopted in law.

The legal uncertainty of protection based on intellectual property rights stresses other forms of protection based on business practices. Firms often use alternative forms of protecting knowledge. Commonly these methods of private ordering require contracts or other types of direct behaviour control. However any contracting for intangible innovation is extremely challenging as the parties would not be able to specify the result of their cooperation. (Lee 2009) contracting for these types of innovation may seem highly incomplete even. The incompleteness also makes it difficult to agree beforehand on the sharing of the profits and costs as well as on the ownership and use of the result of cooperation. In contrast to this, contract law based on the model of sale of tangible goods often starts from the requirement to define the object of the contract including the

definition of the goods and the price. Intangible innovation and open ended collaboration are often a poor fit. Furthermore, flexibility, which is the starting point of open innovation, is an exception according to contract law and unclearly defined contract terms can be interpreted as no contracts at all. (Nystén-Haarala et al. 2010).

Since both contract law and IP law offer only weak supports for open innovation, open innovation may require particular innovative capability in firm to manage openness and interface it with the closed innovation model, through private ordering means. Additionally as business models which build on open innovation may also require a different IP strategy as well as contract policies aligned with the IP strategy and the business model.

Based on literature review from legal and business organizational studies and a qualitative case study on a group of Finnish firms, this paper aims to identify tools that are required to manage openness, in response to specific legal context, and examine to what degree the protection of intellectual property, in particular patent, can be adapted or interfaced with open innovation paradigm. The paper applies some of the findings of the research project of Intellectual Property in Open Innovation (IPOB) that empirically tests the viability of "open innovation", as a theory of innovation practice. In particular, the project researches how firms may or may not utilise the open innovation, as an alternative or as a complementary model to manage the path of innovation within a firm and in business to business (B2B) exchanges. The project has been financed by the Tekes (Technology Advisory Board of Finland 2007-201) and was a multidisciplinary joint effort of the State Technical Research Center of Finland (VTT) in Tampere and the University of Eastern Finland.

2. IP AND OPEN INNOVATION – CURRENT UNDERSTANDING

Literatures on open innovation are mainly found in the business or organizational studies. Most often cited literature, von Hippel (1988) and von Hippel (2005), and Chesborough, (2003) are all in the field of business, economics, or organization studies. For example, Dahlander and Gann (2010) reviewed 150 literatures on open innovation, and the survey showed that most of the literatures are from business and organization studies.

Open innovation has a varying degree of openness and as a result, there is some confusion to the meaning of openness. An open innovation in these literature seem to have two

crucial characteristics in that openness is relative and that it is defined by *the willingness to cross the boundary of a firm either to source or diffuse innovation.* In other words, there are *varying degrees of openness* in the definition of open innovation and that as long as the firms are utilising resources outside the firm, this is viewed as open. Earlier capacity focused literature termed this utilization of firm external sources as the acquisition of "specialised capability" (e.g. Arora and Merges, 2004). In others we find terms such as "crowd-sourcing" (Howe 2006) to describe firms' willingness to replace contractor or supplier with community, public or open platform. While some authors used connected yet similar terms such as cumulative innovation (Scotchmer 1991), networked innovation or decentralised innovation (von Hippel 2005 Valkokari et al 2009), as long as firms are willing to use resources outside the boundary of a firm in any phase of innovation, the "open innovation" literature viewed it as open innovation.

Literatures in organizational studies typically contrast this to a closed innovation model that highlights the timely protection of knowledge assets with intellectual property rights and through controlled communication. Closed innovation is viewed to be based on the fundamental assumption that most useful essential innovation may occur only within the boundary of the firm. As a corollary, firms adopting closed business model tend not to utilize the external sources by licensing in the technology nor allow other firms to exploit their knowledge by adopting an internal policy not to license out the core technology. An "open innovation" firm would license in technology either as a means to access complementary technology, to accelerate the process of technological development and to commercialize.

In contrast, literature in law deals rarely with open innovation. Few commentaries are written and the few literatures seem to be focused on two specific types of open innovation – copyright and open source computing, and patents and open biotechnology projects. Open innovation is often associated with free and open source code development in the software industry. (von Hippel and von Krogh 2003) Occasional commentaries on open innovation from more theoretical perspective are often focused on peer production communities (Benkler, 2003) or explore contract terms and liabilities associated with open source licensing terms (e.g. Välimäki and Oksanen 2005). Literature from copyright law also associate this with Creative Commons Project that aim to promote norm of access to contents with less limitation by promoting standardized licensing terms. (e.g. Creative

Commons Website, and Loren 2007) In this context, commentaries explore normative meaning of these projects and enforceability of these terms (e.g. Elkin-Koren 2006). User generated contents and exceptions and limitations to copyright related to the user generated contexts are also discussed in this context. (e.g. Gervais 2009, Tushnet 2008).

In patent, open innovation literatures are even scarcer. Some earlier works on cumulative innovation and how it relates are found from economics perspectives. (e.g. Scotchmer 1991, Merges and Nelson) This may be due to the fact that open innovation is even more difficult to practice with patents, as sharing or publication will destroy novelty of an inventive idea that would lead to loss of right. Sharing of inventive ideas – whether formal or informal - has to be carefully controlled if firms aim to patent on them. However, this does not mean that open innovation cannot be practiced in patents at all. Academic application is limited, but nonetheless found in the context of biotechnology research, research tool patents. For example, in the context of biotechnology research, Hope applies and claims that open source principles can be useful in innovation in biotechnology. (Hope 2004) Similar academic attempts are made by Boettiger and Burk (2004), with case examples such as CAMBIA Bios Initiative that provides various tools including open source type standardized licensing terms implementing similar principles. (Cambia BiOS website, and Berthels 2010).

Additional literatures in law are found in the university or government and private collaboration and challenges for patent law. (Eisenberg and Rai, 2006).If sourcing outside the boundary of a firm is defining traits of open innovation, firms utilising inventive capacity of university could be one such open innovation practices. University inventions have received, in particular large attention from the academy as it is based on the changes in patent laws in most countries affecting patenting activities and patent portfolio management of the universities. In other context, using the lenses of “user innovation,” Strandburg studies on the modalities of patent law that may need to be changed or adapted through private ordering means to practice this particular type of open innovation under the US law. (Strandburg 2008).

3. RESEARCH QUESTIONS AND METHODS

Overall, open innovation seems to gain much momentum in the international policy debates as well. Notably there are normative recommendations for open innovation from

international organization such as OECD (OECD Report, 2008). However, how such open innovation policy has to be implemented nationally within the framework of current intellectual property law has not been explored. To be precise, how to interface open innovation with the current intellectual property seem to be missing.

Given the association with open source movement, the open innovation used in the IP law literature seems to focus on narrow version of open innovation than in business or organizational studies. Furthermore, a systematic account of business to business transaction based on more "open" innovation model seems to be only in the area of open source software and biotechnology. Commentaries in law seem to be focused on either exchanges among the users, or the business to consumer/user type of exchange. The application of open innovation paradigm in intellectual property law seems to be limited to the certain technology area – namely in the area of biotechnology and in the area of computer program and software. This is not unexpected result, as most of the documented successful cases in open innovation management literature also are concentrated in the area of software.

Therefore, this paper aims to explore how to interface open innovation practices with the current intellectual property law and system through examining detailed modalities of private ordering means. We examine to what degree the protection of intellectual property, in particular patent protection, can be adapted or interfaced with open innovation paradigm. As argued in the above, firms practicing open innovation (i.e. innovation that utilizes resources outside the firms either as suppliers, sources of innovation or as distributors and commercialization partners) need to resort to private ordering means. More specifically, we aim to identify and explore *1) modalities of open innovation that requires management* or regulations within or outside the boundary of firms, which are intellectual property law; 2*) private ordering means and tools* to manage the above identified modalities in response to legal context. Through this exercise, we test the viability of open innovation as a sustainable innovation paradigm that has to be considered in the development of norms of intellectual property in general.

The research is structured in a triangular manner – three types of data were collected – from interviews, documented materials and literature. Data on innovation practices across the boundary of the firms have been collected by participating in semi-structured open or

closed forum discussions, selective interviews, and by collecting documented materials with the representatives of a group of six Finnish firms, over the period of 2008-2010. Participating representatives included, but not limited to, those who are entrusted with intellectual property issues within the firm as well as contracting in the firms. The firms involved in business to business transactions but the size and the field of industry varied greatly but all of the firms have been operating internationally. Some firms were selected as they were more actively participating in the open innovation while others were selected as they were known to be a closed innovation firm. We analysed this empirical data against the findings of the existing literature both in the field of organization studies and in law to identify the need and means of regulation and management in these innovation practices.

4. FINDINGS

4.1. Modalities of Open Innovation

1) Strategically Managed Openness and the Boundary of a firm

As open innovation is contrasted to a closed innovation model, defning openness is crucial. (Dahlander and Gann 2010). Firms in our case group showed initially reservation toward the idea of “openness” and open innovatio. This was due to the perception that openness in intellectual property and intangible asset management was more associated with cost of disclosure and loss of rights than the benefits. If the openness fundamentally hinders firms’ acquisition of IPR, particularly patents, as well as assertions of rights, firms with strong IP portfolio or patent portfolio over the core business areas may not practice open innovation at all. At the same time, if patenting is the norm of certain industry sector (i.e. pharmaceutical), open innovation may not be recommended over the core business knowledge . On the other hand, if the openness of the “open innovation” model does not hinder patent grants and assertion of right, the benefit of practicing open innovation model, namely utilization of the expertised outiside the boundary of the firm should be considered as one alternative to closed intra firm R&D activities.

When the boundary of a firm is the crucial characteristics of open innovation, openness becomes a question of a degree that can be strategically used and calibrated. From this perspective, when the willingness to source the knowledge ourside the boundary of the firm is stressed, firms in our case group showed less reservation toward open innovation, and noticed that some of them were indeed already practicing a certain degree of open

innovation. Even in a relative closed inventive process, it is not uncommon to use external scientists and collaborators in the inventive process leading to the grant of the right, and during the commericialisation process. During discussions, firms initially identified as practicing close innovation in core business area realised that they perform research collaboration with partners outside the boundaries of the firms – such as universities and research insititutes. In the innovation process, openness can be introduced in the conception and creation of the innovation, in the production/sourcing of the innovation, and in the use and distribution of innovation. Likewise, firms do not necessarily practice openness in the stage when it is not desirable for the firm such as when it would cost the firm to lose the claims to the inventive idea. Further, literature documents that the result of the innovation – innovative product themselves may incorporate openness in the product design by allowing open access to the underlying product information technically, and legally, or encourage improvements by user innovations. (Strandburg, 2008). Any of these approaches may be combined to achieve a desirable degree of openness in the innovation in the process and in the product.

Various factors affect firms' adoption of openness. This includes – nature of the product and its lifecycle; industry context including competitor's behaviour, presence of cooperative partners (or community); firm internal organizational resources and strategy; and regulatory context including non-IP related regulations. In this regard, we found that firms could make strategic decisions where, when and with whom they would practice open innovation.

As openness to practice the "open innovation" is the question of degree, we found that open innovation may be calibrated to make the open innovation interoperable with the general operations of intellectual property right. If so, openness in the innovation as a process may be applied at various phase and aspects of innovation. At the same time, even in the firms that are actively participating and building their business models with open innovation, they made conscious and strategic decisions to select what to disclose and share, and to what extent. We also noted that the openness is dynamic in the sense that depending on the stage, commercial and strategic importance of the innovation task and time, open innovation may become closed and closed innovation may become open again.

2) Heterogeneous actors and dynamic modalities of exchanges

Open innovation practices that are noted in the literatures and adopted in our case firms involve diverse actors with various interests. While actors are commonly present outside the boundaries of a firm, open innovation participants have heterogeneous interests with different role in the value chains. Literature documents all types of actors in open innovation in different industries (e.g. Laursen and Salter 2006, Chesbrough and Crowther 2006, Christensen et al. 2005). Common firm external collaboration experiences within our case firms verify this diversity. Actors may be individuals firms/ inventor/ investor or a collective group of individuals (including community), or firms (including associations). They may be private individuals or firms or public organisation, for profit- or not for profit. Participants may be university (within the university or spin-offs) or industry. They may be sellers or producers of innovative ideas or solutions, suppliers including contract manufacturers, or intermediaries including open innovation forums, technology transfer firms or licensing platforms, may participate as end users/customers. Our case firms open innovation conducts confirm this finding in the literature.

Initial literature documents two types of open innovation – exploration or exploitation or inbound and outbound open innovation(e.g. OECD Report, 2008). Earlier, we have described them in terms of the network types as transaction networks or co-creation networks. (Valkokari et al., 2009) to highlight why firms create networks of innovation outside the boundary of the firm. Among these, depending on the pecuniary interests, one can define the open innovation further. Using these terminologies, modalities of open innovation can be summarised in the table 1 below.

Table 1. Modalities of Open Innovation

	Inbound	Outbound
For Profit Transaction / Exploitation	Acquire / Buy /Contract In/ License In	Sell / License Out / Contract Out
For Profit Co-Creation / Access	Cross License & Barter, Pool	
Not for Profit Co-creation / Exploration	Take (formal & informal) / "Open Source"/ Crowd Sourcing/ User Sourcing	Disclose (formal & informal) / Contribute & Publish / User Participating Kit /

When firms practices open innovate for profit, the innovative exchanges are likely to be transaction to exploit the innovation. In inbound exchanges, this means that firms either buy or license in the innovative knowledge from actors outside the first. Often in these

exchanges, innovative knowledge are clearly defined as IP or related to the use of the clearly defined IP, in case of know-how or related heuristic knowledge is necessary. In outbound exchanges, this means that firms either sell or license out the IPs that they hold. As the core of the knowledge will be defined as IP, transaction or exchanging these types of knowledge will be relatively clearer. In these types of exchanges, IP indeed provide certainty as they will provide information on pre-contractual liabilities and minimize transaction costs, as noted by Merges. (Merges 2005). As such, firms practice uses open innovation for profit, *when there are clearer rules over the ownership over the core knowledge either in the form of IP or through other private ordering means (contracts) or community norms*. Commercial SW firms using open sources, for example, engage in open innovation when they know the act of code writing will entitle them the control over the codes they write, through copyright claims. Their open source licensing allows them to explore the outcome of the result and failure of attribution would invalidate the licenses. For profit, firms' incentive to control and manage the knowledge that are exchanged are greater and thus unless there is a clear rules, openness may not be introduced.

In contrast, not for profit types of innovative conducts are done when the firms want to explore a certain business model or market, or to jointly create knowledge that does not exist. In inbound exchanges, they take what are disclosed or published (public domain knowledge), participate in "open source" type community to jointly create codes or participate in open innovation platforms to unilaterally pose innovation tasks / problems and assignment. (i.e. "crowd sourcing"). Additionally firms may explore users' knowledge in a given product (markets). In outbound exchange, open innovation can be practiced by firms freely reveal or disclose what they know or their innovation "tasks", contribute back to the community where they took the knowledge from or by providing a kit for the users to participate in the innovation process. This can be done wither with known and identifiable actors (a group of community members), with specified group (users, register platform users) or with unknown or unidentifiable mass (a general community, the public). Even in this context, modalities of exchange are controlled through mandatory IP law, or contracts, or norms of the community, or rules of participation (terms of uses, and association).

All three types of exchanges are well documented in the literatures. In contrast, the firms and the representatives of our case firms were not initially aware of crowd or user sourcing

or open innovation platform or identified their conduct of “free- revealing.” Free revealing or disclosure non open source community does exist, especially in the industry where the competition for patent race is high. Firms defensively reveal what they know to defeat other firms patent application to create prior art (e.g. Henkel and Pangerl 2007) and this strategy is often used together with patent opposition filing against rivals to defend freedom to operate. Interestingly, our cases firms did not acknowledge this strategy together with active opposition filing as an open innovation but rather as part of the closed innovation as it utilises existing patent law rules on novelty promoting non-disclosure.

Furthermore, between commercial exploitation and non commercial exploration lies a hybrid open innovation network. A co-creation of “standards” or limited access network are prevailing where IPs are bartered, pooled or cross-licensed. In these open innovation networks, it is openly acknowledged that the innovation lies outside the firms are not only important but also essential for the firms to innovation further and thus, IPs have to be managed collectively. While this could be viewed as a classic open innovation, organization literatures do not necessarily treat the IP pools or licensing platforms or collective IP management as an open innovation but rather private ordering means to ameliorate the negative aspects of IP laws. (e.g. Merges 1996, Van Overwalle 2010)

Table 2. IP Strategies and Open Innovation

Open?	Overall IP Strategy	Appropriation Strategy	Contracting Strategy	Disputes Strategy	Revenue	Example industry
Closed	Exclusive	File for Core Patent Copyright	No licensing (restrictive terms)	Aggressive litigation	Extreme (none or huge)	Traditional Original Equipment Manufacturers, Pharmaceuticals
Mixed	Leverage	Patenting in rivals’ key area Buy patent Copyright	Willing to license out Licensing platform/ pool	Threat to sue (to induce license) Rules of Association	Continuous	Telecom & Standardized technology
Mixed	Defensive	Patent race Opposition (rivals) Copyright where relevant	Cross licensing Limited license in	Defensive litigation, (Counter Suit, Invalidation) Defensive Publication	Almost none	Electronics. (semiconductor), Telecom.
Open	Defensive “Open source”	Copyright No patent filing Publish	Open License	Threat to sue to induce compliance of licensing terms & Community Norms	No royalty from IP	Information Technology & Software

In sum, we found that (1) open innovation is always *dynamic* and fluid (i.e. firms may start as an open innovation firm but later close that particular path of innovation and vice versa),

that (2) the *openness in open innovation practiced in commercial business to business transactions is always controlled, managed and strategically used;* (3) *actors are many* and their interests are *heterogeneous*. The table 2 below shows how these different modalities are manifested in terms of strategies in different industries.

4.2. Legal Context for Open Innovation

The above findings have crucial implications for the policy for open innovations in two aspects – through public or private ordering. Public ordering as a tool to influence open innovation could be implemented through the mandatory law. Laws may regulate open innovation more directly through the operations of intellectual property law or through contract law rules on how parties may contract over innovation. On the other hand, if private ordering (i.e. parties' own solutions to a particular regulatory problem) were to be encouraged, then laws should interfere minimally to the degree that that the laws only enforce private ordering means and no more. As a matter for policy then first we need to evaluate if public ordering or private ordering would be preferable, and then proceed to explore which means that are available in the IP law and contract law that can be used to regulate open innovation.

1) Duality of Intangible Knowledge – Intellectual Property or Contract?

IP rights and law not only provide incentives for innovation, and protect them as property, but also coordinate the modalities of their exchanges. However, this is not the only form of intangible innovations that can be commercially explored. At a most obvious level, innovation can be embodied in the tangible products and services that the firms offer. A more intangible aspect of innovation is the processes and routines of a firm. Whether they are called intellectual capital, organizational learning, organizational routines, or simply human capital composed of proficient employees, they are part of the intangible innovation or a firm. In particular, firms utilize their capabilities in the internal or external exchanges of intangibles. They may also utilize the knowledge they have generated for the internal efficiency of organization and improve the general organizational capabilities. On the other hand, if there are demands from the market/customer, industry structure, and technological features, and if the regulatory contexts and the general capabilities of the firm can support it, firms may choose to extract values by commercializing them.

Not all commercially valuable knowledge can be isolated and belong to the firm and protected as IP. Some of the knowledge collectively resides with the firm, based on their past experiences, and some with individual employees. This includes knowledge that must be collectively defined as a "service" of the firm as it is the collective tacit knowledge of the organization, or aggregated knowledge that belongs to the engineers of the firm, gathered through their experiences in the firm. This dual nature of the intangibles makes it crucial to isolate this capability from other ad hoc or personalized management of the protection and transactions of intangibles in a firm. Intellectual property rights in law, is one means of isolating intangible and valuable knowledge from the concept of services that may inherently reside in the personnel. At the same time it is possible to physically and/or contractually control and isolate the knowledge. Utilizing organizational process to regularly transfer the knowledge from R&D personnel to the organization and contractually bind them to non-disclosure obligations is one such example. (Lee 2008)

When firms introduce openness in their innovation process, this dual nature of knowledge becomes manifested. If the knowledge were to be treated only as property, firm's internal policy on IP alone would be sufficient to implement and introduce openness in the innovation process. However, duality of knowledge makes it important not only to implement IP policies but also other means to control the knowledge sharing and protect them may also have to be considered. Confidentiality clause which is often regulated with firm internal policies and through non disclosure agreement in collaborating parties is often used to complement IP policies. Additional means include prohibition of competition, recruitment freeze, limiting the access of the circle knowing about the innovation, defensive publications, and making the innovation rhythm faster to be ahead of the competitors. Our case firms seem to recognize this need of protection and utilize various means beyond IP. At the same time, they are not always aligned with IP strategies or in some cases, stricter rules on confidentiality may lead to failure in collaboration.

2) Interfacing IP Law and Openness – Public Ordering?

Two aspects of open innovation that may be seen to be conflicting with the standards set in IP law. First, as open innovation involves resources and capabilities outside the boundary of the firms, this increase the number of holders to the potential IPR on the inputs as well as the output of the collaboration, who do not have the same interests. In other words, in open innovation there are (1) *multiple claim holders* who have heterogeneous interests. At

the same time, to practice open innovation, sharing and communication is crucial among these claim holders. This (2) *openness in the communication* in their exchange is the second crucial aspect of open innovation that IP law need to consider. Multiple claim holders – as contributors, investors, co-inventors, collaborator call for a governance structure over how their claims can be prioritised. IP law do regulate the concept of joint inventor, co-creator, and co-owner. (Lee 2009) However they do not regulate how these rights may be coordinated or managed, in what hierarchy the rights or claims can be used. Furthermore, open innovation benefits from open exchange in communication, in the absence of clear and certain rules on how such exchange lead to loss of right, "open" communication may not occur. To introduce openness, a decision as to when to strategically choose disclosure over confidentiality has to be made. The strength and the necessity of having confidentiality clauses, for example, seem to be prohibiting and may not be conducive if the purpose of collaboration is explorative learning or co-creation. In other words, unless openness is strategically managed, communications that are crucial in open innovation will not occur. Thus we find that openness in innovation need to be always regulated or managed either formally (through formal governance means i.e. mandatory laws, contract, explicit firm policy) or informally (through norms, trust and implicit corporate culture).

Regulating through public ordering means that the law need to incentivize actors to introduce more openness through these two core aspects in mandatory law. This is seen to be more challenging. For example one way of introducing openness in the innovation would be through the use of specific limitation or exceptions in the IP law. Two such obvious examples could be posited as an exception to disclosure before the acquisition of a patent (i.e. novelty rules on patent) and as an exception to infringement for the sake of "open innovation" in patent law. First example would call for introducing longer or more extensive "grace period" to preserve the novelty of the invention. At a glance would promote open discussion and sharing in a given forum. At the same time, this would defeat the users of defensive publication. Introducing a more extensive grace period would have to be carefully approached. Providing exceptions are more difficult. Arguably, introducing research and experimental use exceptions to patent infringement for example would not necessarily promote openness in the innovation because this will only benefit researching actors who are participating in the process. (Strandburg 2010). In other words, dynamic and heterogeneous nature of the actors makes it difficult to introduce an actor or behaviour

specific limitation or an exception in IP law for open innovation. However, to protect the interests of joint collaborator, one potential doctrinal elements that would empower open innovator, may be own invention defence for own use against the claims of infringement may be useful and needs to be carefully explored. Most patent laws however do not provide this defence. In sum, given the current legal context, in the absence of IP law revisions, to prevent disputes, we *find proactive private ordering is necessary to interface IP laws with open innovation.*

3) Private Ordering Contracting into Open Innovation

The above finding advocates that private ordering is one significant tool for firms to introduce openness in the innovation process. More recent literature in law such as O'Connor (2010) and Van Overwalle (2010) seem to advocate the superiority of the private ordering means over legal reforms to provide means of coordination and govern use of intangible resources. Among the private ordering means, contracting is a most formal and often used means to privately control the innovation process and formalize it. (e.g. Vlaar et al 2006) Contracting at the same time provides governance and in the words of Williamson contract provides a governance method between hierarchy of the firm and market composed of discrete contracts. (Williamson 1985)

The literatures in law on open innovation commonly look into *contractual aspect of sharing* to introduce openness either in the standardized licensing terms or templates that a certain community advocates or as a condition to join the community. In other words, they commonly look into the private ordering means to either to provide openness into the closed innovation model or to manage flow of information in the continuous or repeated innovation - process of sharing. Furthermore, contracting for open or semi-open innovation contracts requires different contracting capabilities than e.g. the sale of goods in all three aspects of contracting – content, process and relational capabilities. (Nystén-Haarala et al. 2008) As open innovation may require anything from open source license agreement, joint R&D contract to supplier contract or contract manufacturer contract, contracting for open innovation cannot be uniform in its contents and process.

When this observation is tested in our case firms, we found that innovation contracting in general calls for development of different contracting capabilities. Our case firms regarded contracts extremely important for joint innovation. At the same time they emphasized that

contracts do not in practice protect them unless they are based on trust, and parties care for their reputation. This of course applies to any contracts including mixed innovation contracts. This attitude to contracting seems to be ambiguous. One of the reasons for this ambiguity is that innovation contracts challenge the very core of contract law. Contracts should be binding and the legal system should sanction breaches of contract. Innovation contracts, however, are often so incomplete that even the aim of the contract may be unclear. Contract law protects a complete and well defined contract in which everything can be anticipated. This is partly because contract law has developed to support the sale of tangible goods, in which liabilities of contracting parties can be presented clearly (Nystén-Haarala 1998). Such contacts are static and change of circumstances is an exception.

Innovation contracts, however, are evolving and *flexibility* is the rule in cooperation for innovating. (Nystén-Haarala et al 2010). Several authors started to observe that in practice, almost all contracts are either open ended or incomplete and in the context of contract interpretation in courts. (e.g. Kreitner 2006:163-175, Goldberg 2002). Additionally, in the exchanges surrounding intangible innovation, the contract tends to be more incomplete (Hart and Moore 1990) and thus more emphasis seem to be given over the control right over contingencies. The *control right* is the right to "make decisions about the issues that cannot be contractually specified" (Lerner and Merges 1998). In open innovation contracting, this would for example, mean that who among the multiple actors would be able to mediate the various IP claims (to acquire, manage and assert the rights) and that provides for the process of the inputs and outputs of knowledge can be shared and managed, and disputes can be settled against opportunism. In open innovation, an incomplete and evolving contracts need to be understood as means of private ordering. This is seen as a challenge for cooperation parties, who need to understand the role of contracting as a devise of private ordering than a complete yet static document.

In sum, we find that contract is a crucial private ordering device to formalize the open innovation process and that we find that open innovation calls for a broader perception of contracting to the participants of the innovation process. Open innovation seems to result in incomplete and open ended contracts which has to be complimented by contract external elements including the broader contacting capabilities such as contracting process and relational aspect (i.e. trust) of the contract.

Table 3 Contracting Capabilities for Open Innovation; Modified from Lee 2008

Capabilities	Essence	Modalities for Intangibles
Contract Contents	What	Control appropriations and contingencies; Ownership arrangement for IP inputs and IP outputs Allocation of right to control contingencies ("control rights") Flexible terms
Process	Who, How, When	Coordinate information flow: Control information leakage before, during and after contracting Provide a channel for intra and inter-firm communication
Relational	With Whom, How	Acquisition of firm external specialized capabilities, when necessary Build trust Manage and control potential competition from the contracting partner IPR dispute resolution strategy

5. CONCLUDING REMARKS AND PRACTICAL IMPLICATION

The paper argues that as open innovation is dynamic and involves multiple actors with heterogeneous interests, the governance means for open innovation are best provided by the firms either as a contracts, or general policy over information exchanges. This private ordering means necessarily has to be proactive, flexible and thus calls for a broader perception of contract beyond a static and complete document. As a secondary option, this paper has explored a few options of public ordering including grace period and own invention defence. However both of these options however currently do not uniformly provide incentives for the firms to actively engage in open innovation.

The findings in this paper has two practical implications. First, in the absence of proper legal safeguard for own collaborative input, the paper advocates contract based governance approach calling on managers to actively engage in the private ordering means to introduce openness.. Reflecting this, open and collaborative innovation requires firms to more actively and strategically involve in the governance of IP, not just in terms of acquiring and defending them, but also to use the rights and to generate royalty. Secondly, as a proposal for patent law reform, the paper may enlighten law and policy makers to explores a particular defence against the claims of infringement in patent law, namely own invention defence for own use, to safeguard the interests of the joint innovator. T would help in implementing open innovation policy recommendation into national legislation, acknowledging strategic dimension of open innovation would help businesses in using the benefits of open innovation, with the knowledge of the cost of doing so.

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Services, Open Innovation and IP Management

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ABSTRACT

The paper describes findings from an interview study about knowledge and intellectual property (IP) management in the development of service innovations with external actors. There are a few studies available in the extant literature on the protection of knowledge and innovation in service business. The studies, however, include only little aspects related to open or networked innovation. Therefore, the research question of the paper is, how service firms are managing their knowledge and IP in the development of service innovations with external actors. Qualitative multiple-case study approach was used in the study. Empirical findings were based on semi-structured face-to-face interviews of 14 organisations whose main business is in services or they have, at least, significant service business as a part of their tangible product business. Concerning innovations related to their services, the interviewed companies usually spoke about technological (including software) innovations that were often developed together with an external actor. The knowledge and the technology related to the innovation itself were either transferred to the service company by some form of open innovation or co-created with a supplier. The interviewed organisations could be identified into four categories according to critical knowledge in their service innovations and the actual service business: technology based services, human resources based services, research and engineering services, and innovation support services. The results show that service companies and service innovations can not be considered as a single, large group but one has to understand the special form of the service and, then, consider the management of IP and open innovation in that form of service. The results would help service companies in understanding different forms of services and what opportunities and challenges open or networked innovation will bring for that.

Keywords: services, open innovation, innovation management, intellectual property, knowledge management

1. INTRODUCTION

Services form a growing proportion of the world economy. Services are as old as the division of labor and have been provided in various forms. What is then new and has resulted in the growing importance of services in the economy? It is the fact that people are nowadays able and willing to pay more for experience, advice, information, use of infrastructure, and less on growing, building and owning physical goods. That has lead to rapid growth of complex service systems to provide services to meet the increasing demand in various fields of life and business (IfM & IBM, 2007).

Service involves a provider and a customer working together to create value. Accordingly, IfM & IBM (2007) have defined services as provider-customer interactions that co-create value. Services are processes, performances or experiences that one person or organization

does for the benefit of another. Service involves deployment of knowledge, skills and competences (Lusch & Vargo, 2006). Thus, one may say that service is a system of interacting parts that include people, technology and business. Accordingly, IfM & IBM (2007) have defined service system as a dynamic value co-creating configuration of resources, consisting of people, technology, organizations and shared information. Teboul (2006) divided activities in a service system into two categories: front-stage and back-stage activities. Front-stage is the actual part of service where the interaction between the service provider and the customer takes place. All other activities related to the production of the service belong to the back stage. A modern service system may consist of several actors in the value network of service offering.

Service innovation is the combination of technology innovation, business model innovation, social-organizational innovation, and demand innovation to improve existing or create new service value propositions (offerings or experiences) and service systems (IfM & IBM, 2007). One may argue that incremental service innovation is the result of operational changes (continuous improvement) that are limited by the infrastructure employed, and radical service innovation is the result of infrastructure changes (Christensen *et al.*, 2004; Furseth *et al.*, 2010). In a complex service system, service innovations are more and more frequently a result of interaction between two or more actors in the value network. While incremental innovations may originate in the front-stage, we argue that radical service innovations require innovative actions in the back-stage part of service system.

Many service innovations are intangible in their nature. This is particularly valid for incremental service innovations related to interaction and gradual improvements of existing processes. Radical service innovations related to infrastructural changes often contain tangible elements related to new technology or essentially new processes. The formal system for the protection of intellectual property (IP) has mainly been developed to cater the needs of industrial manufacturing of physical goods. The intangible nature of many service innovations creates challenges for the existing IP systems (Miles *et al.*, 2000; Päällysaho & Kuusisto, 2008). The protection of knowledge and IP, however, is as relevant in the service business as in the manufacturing of physical goods, since the imitation and copying of services may happen almost instantly once the new service has been launched on the markets. The challenge is that formal IP rights cover only some elements of service

innovation (Miles *et al*., 2000; Päällysaho & Kuusisto, 2008). Additional challenge for the protection of knowledge and IP related to service innovations comes from the fact that there are often two or more actors involved in the creation of service innovation. Service providers are actively applying the paradigm of open innovation (Chesbrough, 2003, Bader, 2006).

In this paper, we have studied how service firms are managing their knowledge and IP in the development of service innovations. There are few studies available on the protection of knowledge and IP in service innovation and new business development (Miles *et al*., 2000; Bader, 2006; Päällysaho & Kuusisto, 2008) but aspects related to open or networked innovation are scarce in these studies. Therefore, the goal of this work is to deeper in the topic to understand how service firms are managing their knowledge and IP when their new services are developed with external actors.

2. SERVICES AND OPEN INNOVATION

According to Chesbrough (2006): "Open Innovation processes combine internal and external ideas into architectures and systems. They utilize business models to define the requirements for these architectures and systems. The business model utilizes both external and internal ideas to create value, while defining internal mechanisms to claim some portion of that value." When considering service business, it is not easy to find out a service system that does not apply the paradigm of open innovation (either knowingly or unknowingly). The front-stage activities of service are, by definition, interaction between the service provider and the customer. The back-stage activities of service may take place within the boundaries of the service provider, but often there are innovation interactions between the service provider and another actor, such as a technology supplier enabling the service.

In services, a customer is a co-creator of value. In service innovation, a customer – a firm or an individual consumer - can also be initiator, co-developer, source of inspiration and generator of new ideas (von Hippel, 1988, 2005; Magnusson, 2003; Lusch & Vargo, 2006; Payne *et al*., 2007; Öberg, 2010). The main motivation of customers to be active in innovation is that they can directly benefit from the innovation through a better product or service (von Hippel, 1988, 2005).

Many service innovations are due to an enabling technological innovation, process innovation, or a new application of existing technology. They are, thus, related to the back-stage of service. Many service providers rely on external technology providers. The back-stage activities of service innovation come close to product innovation: the service provider forms a classical customer-supplier relationship with the technology provider, or acts as a system integrator (Pavitt, 2002; Hobday *et al*., 2005; Paasi *et al*., 2010a) orchestrating the innovation network of actors in the service system. The knowledge or IP required to the service innovation is either transferred to the service provider from the supplier or co-created together with the actors (Valkokari *et al*., 2009; Paasi *et al*. 2010a, Paasi *et al*., 2010b).

3. MANAGEMENT OF KNOWLEDGE AND IP IN SERVICE BUSINESS

The ways for protecting knowledge can, in general, be divided into three categories according to their formality: formal protection methods often called as intellectual property rights (IPR), contractual (semi-formal) protection methods, and informal protection methods (PRO INNO Europe 2007). Formal protection methods include patents, trademarks, utility models, rights to commercial names, copyrights. Contractual/semi-formal protection methods include different types of contracts, such as confidentiality agreements, prohibition of competition clauses in agreements, proprietary and access rights clauses in agreements, etc. Informal protection methods attempt to prevent the loss of key knowledge or restrict undesirable access to sensitive information either inside the firm or in external relations. Secrecy is one of the main methods of informal knowledge protection. On the other hand, publishing can also be used as a method of knowledge protection: it prevents others from appropriating the knowledge, thus, confirming the freedom of action for the firm. Fast innovation rhythm is frequently used way to protect service business. Informal protection practices also help capture tacit knowledge and transform it to explicit knowledge, which can then be shared within the company. That will decrease company's risks and dependence on individual employees. An overview of typical methods for knowledge protection in business is given in Table 1 (modified from WIPO; PRO INNO Europe, 2007).

The studies done on the protection of IP in service sector (Miles *et al*., 2000; Päällysaho & Kuusisto, 2008) reveal that, in addition to formal protection methods, contractual and informal methods of knowledge protection play an important role in the protection of

business in service firms. In that sense the situation is not different to that of firms manufacturing physical goods (Kitching & Blackburn, 1998; Blind & Thumm, 2004; Olander *et al.*, 2009; Luoma *et al.*, 2010). What is different between service and manufacturing firms is that service firms patent much less than manufacturing firms due to the intangible nature of services. In Europe a patent describes the parameters of a technology (product or process) over which the patentee owns limited rights. Thus, the patent system is better suited for manufacturing than service firms.

The studies of Miles *at al*. (2000) and Päällysaho & Kuusisto (2008) aimed to an overview of the topic (IP protection in service production) and, accordingly, they summarized their findings from different sectors of knowledge intensive business services, thus fading away any possible differences between service sectors. On the other hand, there may be large differences in the way of knowledge and IP management also within a service sector. For example, in financial service sector, the service system and the value network of providing the service could be very different in classical banking service based on face-to-face interaction, compared to novel on-line banking based on virtual interaction though a web-site, or to business incubation services offered by many finance actors. Accordingly, when studying services, open innovation and IP management, one should consider also the actual service system and the value network of the service, and not only sectors of service, in order to understand what opportunities and risks open or networked innovation will bring for that.

Table 1 Common methods for the protection of knowledge

Formal protection methods	*Contractual protection methods*	*Informal protection methods*
– Patent – Utility model – Trademark – Right to a commercial name – Copyright	– Prohibition of competition – Confidentiality – Recruitment freeze – Employee invention – Proprietary and access rights	– Secrecy – Publishing – Restricted access to information – Database and network protection – Confidentiality – Client relationship management – Loyalty building among personnel – Circulation of staff between tasks – Division of duties or subcontracting – Distributed product design – Fast innovation rhythm – Complex design

4. RESEARCH QUESTION AND METHODOLOGY

The findings from the extant literature reviewed in Sections 2 and 3 can be summarized in two statements: 1. service innovations are typically developed in the interaction of two or more actors, 2. protection of knowledge related to these interactions goes beyond the formal methods of IP protection. The extant literature, however, does not go much deeper in these issues, which gave a motivation for the present study. Accordingly, in the context of services, open innovation and IP management, the research question of the study is the following:

How service firms are managing their knowledge and IP in the development of service innovations with external actors?

Qualitative research methodologies – a multiple case study method and qualitative data – were used in the study because an in-depth understanding of a little studied area was necessary (Eisenhardt, 1989b, Yin, 2003). The present study has an interpretative orientation and aims to understand the phenomena from the inside rather than the outside. The empirical findings were based on semi-structured face-to-face interviews in 14 Dutch and Finnish organizations whose main business was in services or they have, at least, significant service business separated from their tangible product business. Accordingly, after sales or design services of manufacturing firms were not included in the study because we liked to address special features of services, depart from knowledge and IP management related to tangible product business where after sales or design services are just “add-ons” for the product business. The selected organizations were known to be innovative and among the leading companies in their fields of business. The firms represented different fields of industry and different firm sizes, bringing diversity to the empirical material. See Table 2 for the list of the organizations whose managers were interviewed.

Table 2 List of the firms in the interview study

Organisation	*Industry / services*	*Personnel (2008)*
ABN Amro	Finance, banking	50 000
Arcusys	IT services	12
Fugro	Technical consultancy, geospatial industry	13 000
Kolster	IP management services	200
KPN	Telecommunications and ICT services	43 500
National Board of Patents and Registration of Finland	Government services, IP industry	500
Nokia Research Center	Telecommunications	500
NVI	Healthcare	400
Rabobank	Finance, banking	60 000
Stevens Idepartners	Engineering and Designing	10
Strukton Rail	Railway construction and maintenance services	3 500
Tamlink	Technology transfer	70
Vebego	Cleaning, facility and personnel services	30 000
VTT	Research services	2700

The empirical material was collected by interviewing a total of 19 managers from 8 Dutch and 6 Finnish firms. The duration of a typical interview was 1–1.5 hours, and two interviewers were generally involved. One author of this paper partook in every interview. Semi-structured theme interviews were chosen as the main source of empirical material, because the study was partly explorative in nature and the meanings of concepts needed to be discussed with the interviewees. The interviewees were specifically senior corporate, R&D, business unit or IP managers. An interview usually began by enquiring into the company's business and its role and position in the business environment of firm. The deeper inter-organizational relationships of firm were then discussed, the main focus being on innovation and new business creation and offerings. Step by step, more specific questions related to knowledge and IP management practices within the firm, and in their inter-organizational relationships, were investigated. The interview material was supplemented by company presentations. In some cases, the interviewees were also asked additional questions later on, in order to elucidate the company's practices and motives. All interviews were recorded and transcribed. The interviewers also made their own notes during the interviews. The analysis of the interview data was based on a computer-assisted analysis of the transcribed data combined with the notes garnered during the interviews. Interview findings were categorized during the analysis in order to have a deeper understanding on the subject. A few approaches were considered as the criterion of categorization, including sectors of business, size of organization, knowledge used in

innovation, etc. Finally, we chose to make the categorization according to critical knowledge in service innovations and business because it seemed to best reflect the empirical data of the study. This categorization did not arise from the literature but from the empirical material.

5. FINDINGS

In this section, we present central case findings related to the knowledge and IP management of the interviewed service firms in their innovation development. Implications of the case findings are given and discussed in the subsequent section.

When speaking about innovations related to their services, managers of the interviewed firms usually spoke about technological innovations (including software). These technological innovations were often developed together with an external actor. The knowledge and technology related to the innovation were either transferred to the service firm by some form of open innovation (buying of technology, acquiring a firm, licensing of technology, subcontracting the knowledge, etc.) or co-created together with a technology provider. The actual new service (i.e. the front-stage activities of the service) was typically developed by the firm itself, but it was often enabled by a technological innovation in the back-stage of the service applying some model of open or networked innovation. In some cases the technological innovation led to infrastructural changes in the back-stage part of service system that enabled radically new services and business in the front-end.

Some interviewees mentioned customers (either firms or consumers) as an important source of ideas and feedback for innovations but only in one firm they considered customers as co-creators of innovations. The interviewees also mentioned that the feedback from customers gives rise only to incremental improvements of existing services, it will not lead to radical service innovations.

Every interviewed firm paid attention to the protection of their service business. In their interorganizational relationships, they underlined contractual methods for the protection of IP. For example, confidentiality agreements were a common practice in each firm. The firms are actively using also informal methods of knowledge protection in their innovation activities with external actors. Most of the interviewed firms had patents related to their services but, in general, their interest to patent technological or process innovations was

low. Reasons for that include the short life cycle of many service innovations (which is not in favor of formal methods of IP protection) and difficulty to monitor and defend infringements of patents in service business. Although most of the firms were not active in patenting their service innovations, they could use other methods of formal IP protection. Most of the service firms were keen on formally protecting their brand, for example, by using trademarks. Concerning the protection of IP in interorganizational relationships, our general findings are very similar to those of Miles *at al*. (2000) and Päällysaho & Kuusisto (2008) which did not address to interorganizational aspects of service innovation protection.

In order to go deeper into the subject, we classified the services that the interviewed firms provide into four distinct categories according to critical knowledge in service innovations and the actual service business. The categories were named to technology based services, human resources based services, research and engineering services, and innovation support services. IP management and open innovation were considered differently in these categories.

5.1. Technology based services

Technology based services are (by its name) services that are built on an enabling technology (software or hardware). Without the technology there is no service. Examples of technology based services include internet and mobile services as well as expert services based on a special enabling technology. In this category, service innovations typically take place in the back-stage activities in the development of enabling technology. The technology development can take place internally in the service firm or in the spirit of open innovation. When the enabling technology is developed by a technology supplier, the findings showed that models of collaboration between the service provider and technology supplier went often beyond classical subcontracting. The service firm might license in external technology or buy the technology as an IP (only explicit knowledge) or as a firm (IP + know-how). There were a wide range of evolving methods in use how these open innovation activities between a service provider and a technology supplier were arranged in practice; how the ownership and right to use the generated IP were arranged (sometimes the ownership was retained to the technology supplier) and how the costs and benefits of innovation were shared (a variety of methods was used for that in addition to the traditional single payment of subcontracting work). The enabling technology might also be co-created

together with a technology provider. There were several ways in use how the ownership and right to use the jointly generated IP were arranged and how the costs and benefits of joint work were shared.

In the category of technology based services, customers were seen as an important source of feedback and input information for innovation. However, customers were not actively involved in the actual innovation work.

The special knowledge of firms in technology based service systems is technology (including hardware, software, processes) as well as in their people, in their knowledge of customer needs and enabling technology. Accordingly, they use actively formal, contractual and informal methods of knowledge and IP protection. The emphasis among the three depends on the life cycle of service innovations. For example, the life cycle of many mobile and internet services is so short that it is no sense to use formal methods for the protection of knowledge behind the innovation. Controlling of infringements of patents and copyrights may also be difficult which favors contractual and informal methods of protection, such as confidentiality agreements and fast innovation rhythm.

From the interviewed firms, Fugro, Strukton, Nokia, KPN, ABN AMRO and Rabobank provide technology based services.

5.2. Human resources based services

Human resources (HR) based services typically have strong and well developed processes in the front-stage of service, which allow easy replacement of persons providing the service. Accordingly, the special and critical knowledge of firm offering HR based services is in processes and service innovations are typically process innovations. Examples of HR based services include classical banking, cleaning and personnel services. According to the findings of the interview study, if the HR based service could be standardized, the service firm tends to innovate alone and they use customers only to gain input for their innovation. On the other hand, if the service requires tailoring, a customer is typically a co-creator of innovation. It is case dependent how this co-creation is contractually arranged in respect to the results of innovation.

Based on the present study, the use of external actors as active innovators in the back-stage part of service is not common.

Protection of knowledge and IP related to innovations of HR based services takes typically place through contractual and informal methods, such as restricted access to information. The firms may also actively use trademarks.

From the interviewed firms, Vebego, ABN AMRO and Rabobank provide human resources based services.

5.3. Research and engineering services

Research and engineering type of services are customized one-time performances to solve a problem or need of customer by using special expertise of personnel in the service firms. Accordingly, the critical knowledge of a research and engineering type of service provider is in its people. Secondarily it can also be in the processes of service firm. Research and engineering type of service firms act themselves as open innovation actors for their customers' innovation process. The service typically creates new IP which often belongs to the customer, although the interest of service firm could be different if their role in the creation of new IP has been significant.

Depending on the case, research and engineering services may be confined to the front-stage of service, but it may include a large back-stage service network including one or more actors, as well. In the latter case, the service provider may act as a system integrator by integrating the knowledge and technology of third party actors to create a desired solution for the needs of customer. Orchestrating such a service network requires special skills of innovation network management, contracting, and IP management (Paasi, 2010a). The third party actors typically have a subcontracting kind of relationship to the service firm during the innovation development phase (i.e. during the duration of the research and engineering service). However, the ways how the technology (IP) of a third party actor is transferred to an end customer are case dependent.

In research and engineering services, contractual methods are emphasized in the protection of the knowledge. Confidentiality agreements are a standard practice. Commission agreements are typically well defined and service firms tend to use their own model

agreements for a commission which grants some rights also to the service firm (not necessarily directly to the generated IP but to know-how related to it).

From the interviewed firms, Arcusys, VTT, NVI and Stevens idé partners provide research and engineering services.

5.4. Innovation support services

There are also service firms that are in the innovation process of their customers, not as active innovators but by giving supporting knowledge based services for the innovation and new business development. Examples of such service firms include innovation intermediaries and IP management service providers. Services of such firms are standardized and based primary on well developed processes of the service firms and, secondary, on the expertise of the personnel. Providers of innovation support services do not aim to create own IP when working with their customers. They have purely supporting role in their customers innovation and new business development. That is an essential difference to the other three categories and, therefore, we separated the innovation support service firms into an own category, although they have much in common with the other open innovation actors, namely research and engineering firms.

The own knowledge of the service firm is protected by a wide range of informal methods of knowledge protection. The service firms, however, are capable in using a wide variety of protection methods but they are doing that as a part of their service offerings.

From the interviewed firms, Tamlink, Kolster, VTT, National Board of Patents and Registration of Finland and ABN AMRO provide innovation support services as innovation intermediaries and IP management service providers.

6. DISCUSSION AND CONCLUSIONS

In this work we studied how service firms are managing their knowledge and IP when their new services are developed with external actors. Managers of innovative firms whose main business was in services, or they have significant service business separated from their tangible product business, were interviewed in order to gain understanding on the subject.
The interviews showed that external actors are actively involved in the new service development. In the front-stage of service, firms are actively gathering input from

customers to their innovation work. However, firms named customers as co-creators of innovation only in few specific cases. In the back-stage of service, the firms effectively applied the paradigm of open innovation. Involvement of suppliers and other external actors in the innovation process was better a rule than an exception. There were a variety of forms how the knowledge and technology of suppliers were gained for the innovation.

The results show that the service firms are using formal, contractual as well as informal methods of knowledge protection in their new service development with external actors. The way how they are doing that, however, depends on the characteristics of the service. The results underline that service firms and service innovations cannot be considered as single, large group. Instead, one has to understand the special form of service and, then, consider the management of knowledge, IP and open innovation in that form of service. In this study, we identified four different kinds of services from the service offerings of the firms in the interview study. The categorization was done according to critical knowledge in service innovations and business: technology based services, human resources based services, research and engineering services, and innovation support services. Management of knowledge, IP and open innovation were different in each category of services. Main characteristic in each category are summarized in Table 3.

Table 3 Main characteristics related to technology based, human resources based, research and engineering and innovation support services from the viewpoint of open innovation and knowledge management

Service category	*Description*	*Role of open innovation*	*Special knowledge to be protected related to*	*Protection methods of own knowledge*
Technology based services	Services built on an enabling technology	Enabling technology developed by external technology suppliers or co-created with them	Technology	Formal, contractual and informal
Human resources based services	Services based on well developed processes in the front-stage of services	Customers as a source of input for innovation or co-creators of innovation	Processes	Contractual and informal
Research and engineering based services	Customised one-time performance services to solve a problem/need of a customer	Service firm itself as an open innovation actor for its customer's innovation process	People and processes	Contractual
Innovation support services	Services aiming to support the innovation process of a customer	Service firm itself as an open innovation actor for its customer's innovation process	Processes and people	Informal

As a practical implication of the categorization, the results would help service firms in understanding different forms of services and what opportunities and challenges open or networked innovation will bring for that.

The work is has both internal and external validity limitations (Gibbert et al., 2008). The exploratory approach of the study with interviewed organizations of different sizes and various fields of industry brought a good general insight to the subject of the paper but limited the depth of the study. Accordingly, all important viewpoints might not come up in the interviews. For example, the categorization of services according to the critical knowledge in service innovation arose during the analysis of interview data. Some other set of empirical data might have resulted in a different categorization of services. Also, if the categorization would be known from the extant literature, more detailed questions could have been asked in the semi-structured interviews. Secondly, the number of organizations that took part in the interviews was pretty small. Accordingly, our results may not cover all relevant characteristics of service innovations. Furthermore, after-sales and design services were not included in the study because of their nature as “add-ons” for tangible product business, because we wanted to address special features of services depart from knowledge management related to tangible product business. For holistic understanding of the subject, all relevant types of services should be included into the study. Thirdly, our qualitative approach does not tell anything about the popularity of a specific knowledge and IP protection method in each service category. Despite of its limitations, the findings of the work add understanding about services, open innovation and IP management. For a better understanding, both quantitative and larger qualitative studies on the topic would be required. Only after that, it could be possible to construct a theory related to the topic.

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Transforming the Value Creation and Value Capture Logic of the Business Model: Implementing Service Provision "From the Cloud" Approach

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ABSTRACT

Communication services, the main source of revenue for mobile operators, have usually been provided from a closed and dedicated service provision environment managed practically always by mobile operators themselves. The technology platform on the other hand, upon which the service provision environment is build, has been managed either by the mobile operator or by a system integrator, who in many cases have also developed the systems. This closed approach has been justified with security and operational reasons, and furthermore, the location of the service environment has been optimized based on the user locations.
However, the operation of a dedicated environment is usually relatively costly even if the systems are operated in hosting centers, and as a response to the expensiveness of the traditional approach on production and provision of communication services, there has emerged an increasing number of communication and other type of services that are offered to the end users from the Internet generally and from unspecified location. This communication service production and provision approach referred to "from the cloud" and implementation of it to the way of operating requires the business model of the mobile operator to change, especially from value creation and capture point of view.
In this paper we will introduce a case where the production and provision of communication services transforms from the traditional approach – services produced and provided by mobile operators themselves in their network center – to cloud based approach. This new approach includes benefits such as enabling more flexible end user pricing, cost efficiency, and faster initiation of services (shorter time-to-market). The goal of this paper is to investigate the transformation of the business model and the value creation and capture logic in particular when implementing the cloud based approach on communication service production and provision, from here on the cloud based approach.
This paper broadens the understanding of business model change by adopting a transformational viewpoint on the concept via a single case study and contributes to the emerging research stream of business models. Besides the contribution to the emerging research, the paper highlights the practical implications such as benefits provided by the implementation cloud based approach.

Keywords: Communication service, cloud based approach, business model, value creation and capture

1. INTRODUCTION

Both the rapid development of the Internet and its technologies and the introduction of Web 2.0 concept and adoption of its principles related to more user-centered software development have challenged and impacted the established software business models. The discussion so far has mainly focused on the impact of Internet technology on value and its

delivery. However, as Teece (2010) points out, there is another side to the coin meaning that technology can transform the business model by affecting the cost side.

The cloud based approach and also its kin, the concept of Software as a Service (SaaS) are usually separated from traditional packaged software with the essential difference in service provision logic: when software is provided as service, it's hosted, deployed, and accessed over the Internet. For operator communication services, the change is similar: in the traditional approach services are developed and produced by the operator and within the operators' network, whereas the cloud based approach takes both the development and production of the services to Internet locations. The cloud based approach and SaaS introduce a new way of providing value to customer and also change the revenue and value capture logic of the provider (Wirtz, Schilke and Ullrich, 2010). Traditionally sources of revenue for an in-house IT system include software license fees, costs related to IT infrastructure, IT personnel, and implementation, and maintenance, support and upgrade costs. Especially enterprise end users looking to reduce costs related to these sources of revenue for the providing company support the cloud based and SaaS approaches since in many cases SaaS approach or a service provided from the cloud may prove cheaper than owning and maintaining an in-house system. (Ma, 2007) Cloud based approach on the other hand reduces and even removes capital investment and thus transforms fixed costs to variable ones (Teece, 2010).

Business model is a commonly referred concept both in every day discussions as well as in management research. The currently disjoined field of research is briefly examined in the following chapter. The mediating role of a business model between strategy and tactics is the basic premise of this study, a transformational approach on the business model is adopted and value creation and value capture are highlighted as the two essential parts of the business model concept in the context of this study.

Value is a solid term used in business and management discourse, most studied in marketing from the viewpoint of a consumer. To business models value offers a starting point for definition, like the one provided by Amit and Zott (2001): "…a firm's … business model is a crucial source of value creation for the firm and its suppliers, partners, and customers." A firm's limited resources are allocated between two fundamental and distinct processes: creating value and appropriating value (Lepak, Smith and Taylor, 2007).

The first one refers to mechanisms related to innovating, producing, and delivering products or services to markets, and the second on is focused on extracting profits in the marketplace. Thus business model performs two important functions: it creates value as well as captures a portion of that value (Chesbrough, 2007).

Following business model terminology, value is created according to a value proposition. It begins by providing value to customers and leads to competitive advantage of a firm if the firm produces greater utility to customers that its competitors (Sirmon, Hitt and Ireland, 2007). Value creation involves either increasing use value, the subjective valuation of consumption benefits by a customer or decreasing exchange value, the amount of the customer actually pays, which represent revenue to a value system (Bowman and Ambrosini 2000; Priem, 2007). Value appropriation on the other hand refers to the process of how value is captured and to the retention by the firm of payments made by customers in expectation of future value from consumption. Thus value capture or appropriation allocates the exchange value (Lepak et al., 2007; Priem, 2007). However it has been observed that the traditional firm boundaries are increasingly extended when referring to the value creation locus. This echoes a shift from the administrative structure to the structural organization of the exchanges with firm's external stakeholders. This calls for a "broader conceptualization of organizational boundaries" and business model can been seen to represent this type of broader concept (Zott and Amit, 2004).

2. BUSINESS MODELS

Since the late 1990s, the term business model has gained foothold both in the colloquial and in the academic language. The growing amount of choices and decisions faced by firms in terms of business models partly explain the interest and in particular, the field of research has been affected by two major environmental shifts. First, advances in ICT and especially the introduction and proliferation of Internet technologies are a major force behind the recent interest in business models; the second important source comes from socially motivated enterprises (Casadesus-Masanell and Ricart, 2010).

Two approaches to business model research dominate the young field. Firstly, after the term business model became established in academic discussions, several attempts to conceptualize the terms were made mainly via basic definitions and enumeration of business model attributes (Lambert, 2006). Mäkinen and Seppänen (2007) criticize these

attempts being “at best incommensurate and at worst even misleading”. Since business model definition has a role of providing a set of generic level descriptions, efforts on this descriptive and explanatory strand of research have steered towards classification of business model taxonomies and typologies (Baden-Fuller and Morgan, 2010; Lambert, 2006; Mäkinen and Seppänen, 2007) and further to the development of business model frameworks and ontologies (Osterwalder, 2004).

Classification serves as a stepping stone in advancing from concepts to theory. It is commonly recognized that business model is a concept (Hedman and Kalling, 2003; Schweizer, 2005), referred with adjectives such as abstract, complex and ubiquitous (Baden-Fuller and Morgan, 2010; Casadesus-Masanell and Ricart, 2010; Lambert, 2006). As business model has not advanced from concept to theory yet, its theoretical underpinnings often come from comparison of business model to strategy. As Shafer, Smith and Linder (2005, p. 200) sympathetically denote, business model suffers from identity crisis and Teece (2010) proceeds that business model lacks an intellectual home in the social sciences or business studies.

Classical economics describe a typical firm as a black box which transforms inputs into outputs. Newer theories starting from transaction cost economics open up this black box (Tadelis, 2010), and strategy and business model literature also contribute to this discourse by positioning the business model concept between inputs used by a firm to gain economic outputs (Mäkinen and Seppänen, 2007). Proceeding step by step from conceptualization to theory building and dissociating itself from comparative approach to strategy, business model is gaining ground as an intermediate between strategy and tactics, according to Casadesus-Masanell and Ricart (2010) reflecting firm’s realized strategy. They further highlight the connection between strategy and business models by stating that “A firm’s strategy primarily involves choosing its business model – the design of which defines the value creation and capture logics specific to the firm. In stable competitive environments there may be a one-on-one mapping of the two, which can make differentiating them difficult – but when external contingencies force the strategy to choose a new business model, the two concepts can be clearly seen to differ.”.

Zott and Amit (2008) also deal with the affiliation between strategy and business model approaching this connection via contingency theory. In contingency theory structural forms

are seen as contingency factors and usually the contingency relationship has been seen to appear between a firm's corporate strategy and its internal administrative structure. However, Zott and Amit (2008) broaden this definition "by introducing the firm's business model as a new contingency factor that captures the structure of a firm's boundary spanning exchange". As with shift in the focus of strategic analysis from the company or industry level to the value chains or networks where different economic actors, such as suppliers, customers, partners and allies, work together to co-produce value (Normann and Ramírez, 1993), the business model can be defined from transactional perspective accentuating the organization arrangement perspective of the concept: the business model is a structural template of how a focal firm transacts with customers, partners, and vendors; in other words a system of interdependent activities that transcends the focal firm and spans its boundaries or a choice how to connect with the factor and product markets (Zott and Amit, 2008; Zott and Amit, 2010).

The second dominant and more prominent research strand emphasizes the dynamic aspect of or the transformational approach on the business model and relates the concept with terms such as experimentation, change, renewal, refinement, re-invention, and innovation[2] (see e.g. Chesbrough, 2010; Demil and Lecocq, 2010; Gambardella and McGahan, 2010; Johnson, Christensen and Kagermann, 2008; Sosna, Trevinyo-Rodríguez and Velamuri, 2010; and Teece, 2010). Wirtz et al. (2010) note, that as the development and adaptation of business model impact a firm's efforts to cope successfully with technological progress, competitive changes, or governmental and regulatory alterations, researchers are increasingly interested with business model change.

The advances in ICT both drive firms to change their business models but also set most fruitful stage to study business model change and development. This stage, characterized with high velocity, is the prototypical kind where business models need to be frequently adjusted to new challenges. Phenomena such as disintermediation, the global distribution of digital goods and services, new types of technology mediated interactions between economic agents, for example computer-mediated communication with customers, differentiate the information/Internet industries from traditional ones (Teece, 2010; Wirtz et al., 2010; Zott and Amit, 2008).

[2] Markides and Oyon (2010) even adopt the Christensenian innovation dichotomy naming highly innovative business models disruptive.

This paper contributes to the emergent literature on business models in following ways. Neither the aim of the paper is to provide a generalized definition of business model concept; meaning we are not taking a stance on classifications or following a particular taxonomy or typology of business models, nor are we aiming at taking the business model concept further to build a theory. We are following the theoretical linkage discussed by others (e.g. Zott and Amit, 2008; Teece, 2010) between strategy, business model and tactics following the definition provided by Casadesus-Masanell & Ricart (2010) of the generic two-stage competitive process framework in whose strategy stage a firm chooses the business model through which it intends to compete and in whose tactical stage choices made from amongst those available, depending on business model choice at first stage. We also contribute to the second strand of literature, the dynamic aspect of the business model, meaning the business model transformation approach, elaborated earlier. ICT is set to be the stage of inquiry and in the context of this paper, the transformation of the operator's business model is elaborated with explanatory single case study related to the implementation of "from the cloud" approach.

3. THE BUSINESS MODEL CHANGE: TRANSFORMATIONAL APPROACH

There is an increasing amount of companies utilizing cloud based approach in their service production and provision; most of them are working on the traditional IT services, e.g. storage, computing, server and enterprise services. The service category in the context of this paper is communication services, produced and provided by an operator to end users (corporate end users or consumers). With this case study we want to distinguish the difference between the traditional approach and the cloud approach, as well as assess the transformation of the operator's business model, value creation and value capture affected by the transition from the traditional approach to the cloud based approach.

Following the strategy-business model-tactics chain, the transition from traditional approach to the cloud based approach is a strategic choice on outsourcing for the operator; choice which could be further elaborated through transaction cost economics and the question whether to make, buy or partner. However, this strategic choice on outsourcing has its implications on the business model and especially on how value is created towards the end user and how value is captured. Figure 1. illustrates the different roles and

responsibilities of the Operator and the Partner[3] in the traditional and in the cloud based approach in production and provision of communication services.

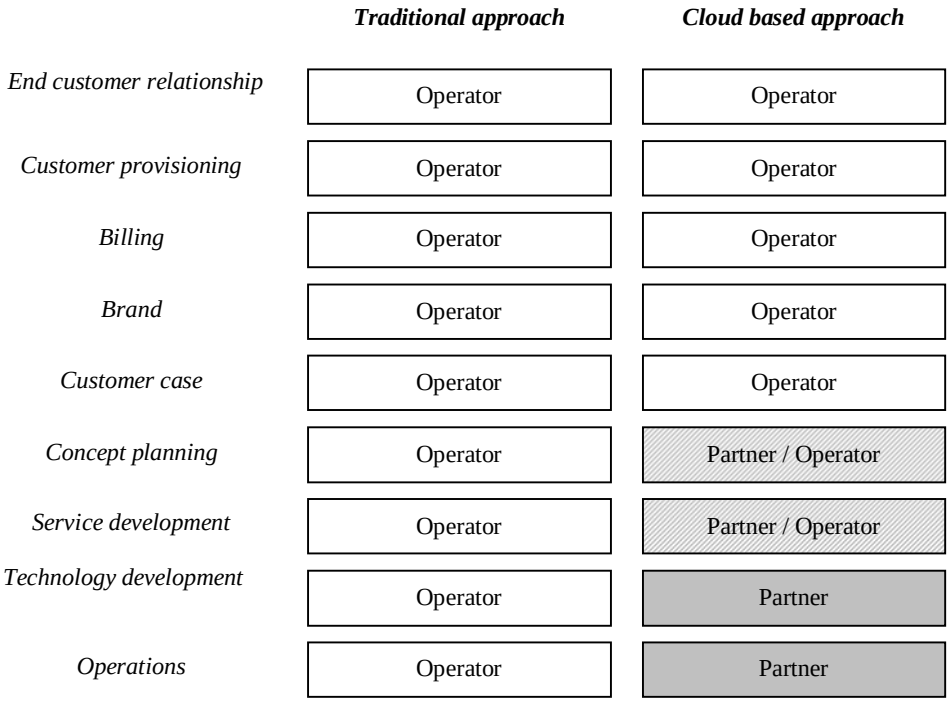

Figure 1. Roles of the Operator and the Partner in service development and provision in the traditional and cloud based approaches.

In this case we are studying a service concept developed and provided by Haloya Inc., a white-label concept and technology provider offering communication service environment as a cloud based service and with the SaaS model for operators and enterprises. Haloya's Unified Communication services are produced with client-server technology, where the server environment and the platform are located in the cloud, or in a selected hosting center, and accessed via the Internet.

From the Operator's point of view, some of the components required for service provision are provided by a Partner that, in many cases, has a strategic role. If the end user service concept utilized for the service, in addition to the technological environment, is provided by the Partner, the Partner takes the role of strategic partner. The Operator may also use the technological environment for outsourced production facility; the question approaches make-or-buy optimization inherent in the transaction cost economics.

[3] By Partner we mean the external stakeholder responsible for the development of the concept and technological environment and provision of the technological platform upon which Operator builds the communication service. In the case, the Partner refers to Haloya Inc.

It is characteristic in both the traditional and cloud based approach that the end customers are owned by the Operator, thus the Operator is the service provider handling the end customer relationship and customer provisioning. The major difference is in the provision of the end customer concept and the technological environment. Traditionally the end customer concept has been created by the Operator based on the Operator targets and market requirements. However, the Partner concept includes different end customer service concepts that may be utilized for faster and more cost efficient market entry.

The biggest different between the traditional and cloud based approaches, however, is the production of the technological environment. In the traditional approach, platforms and servers have always been provisioned by the Operator, operated by the Operator, managed by the Operator, and located in the Operator premises. In the cloud based approach, the servers are located in the cloud, or somewhere in the Internet in the Partner's hosting center with a convenient location. Furthermore, even as the servers are connected to Operator's systems for provisioning, billing and customer management, the technical platform environment is operated by the Partner.

Compared to the traditional approach, the cloud based approach enables very fast time-to-market, as the concept and technological environment is designed and even taken into production by the Partner in advance. Instead of starting the planning from the beginning, Operators are able to utilize the work made by the Partner earlier impacting one of the crucial value creation mechanisms: innovation and new service development. However, the Operators usually request the brand and look-and-feel of the service to be tailored according to their requirements. This type of service adaptation naturally slows the service initiation process, but can be seen as a necessary component.

3.1. Value creation and capture

As the Operator has full control over the entire value chain and service components in the traditional approach, it is capable of producing unique end customer service concepts and services. This has been the case especially earlier when the Operator has been the only source of services. Furthermore, the Operator has been able to and has been requested to produce services of very high Quality of Service (QoS) with almost non-existent downtime of the service. For the Operator this type of quality requirements are easier to fulfill with full control of the technological environment.

The availability of Internet based services has gradually changed the Operator to accept services produced by the Internet providers, e.g. social media and sharing services. Internet based communication services have been controversial from the Operator's point of view as they are competing with the Operator's own core communication service offering. The Operator may, however, accept and benefit from services produced in the cloud, when they retain full control over the customer and the end customer relationship, as well as the ability to charge the end customer for the services.

Faster time-to-market has become a requirement in the present day Operator service development process, as the Operators are facing a clear competition with the Internet providers also in communication services. In addition, the cost structure has reduced the possibility of making soft launches, pilots and test marketing for new services without heavy investments. The cloud based approach with its lighter cost structure enables Operators test and develop the service concept softly during the development phase without compromising the profitability.

The heavy cost structure of the traditional approach of Operator service development enables profitable service provision only with larger volumes of end users with higher profitability with very large volumes. The cloud based service provision allows the operators have profitability already with small volumes, as the cost model is based on the end user numbers. Naturally the profitability increases with the volume also with the cloud based approach.

In the traditional approach of operator service development the value is created by the new services for the end user. The value creation depends very much on the end user numbers and the cost structure of the service. It is apparent that the cloud based approach is increasing the value creation allowing both the Operator and the Partner to concentrate in their core: the Operator to manage the customer interface and the Partner to provide more efficient service development and production. This naturally results in more efficient and faster development with smaller cost of development and operation.

In the traditional approach the value is captured mainly by the operator, sometimes with external providers like infrastructure vendors. The cloud based approach enables a lower cost structure in developing and producing the service, leading thus to a larger total capture

of value. The Partner is able to provide better economies of scale in development and production leading to a smaller total cost of development and production (i.e. service provision) for the Operator as well. This is likely to increase the value captured by the Operator as well. A leading question is how the total value is divided between the operator and the Partner.

Clearly when moving from the traditional approach to the cloud based approach, cost is a major component both in value creation and capture transformation. The traditional Operator service development approach involves major development costs and platform investments (CAPEX- capital expenditure) even before the actual launch of the service. Naturally operations and maintenance costs (OPEX – operative expenditure) derive during the actual operations.

Additionally, the traditional approach of introducing new operator services comprises in-house work, using both financial and personnel resources for all steps of the planning and implementation process from the Operators. The process includes concept design and specification, technology design and specification, service design, technology procurement and commercialization of the service. Although the technology itself has been procured from the vendors, the long process involves a significant amount of Operator resources.

Most of the costs, especially with the services that require platform investment (CAPEX), accrue before launching the service. The up-front costs involved in the process make test and soft launching of new services and service concepts difficult and expensive. Furthermore, because of major investments (CAPEX) new services become profitable only when there are a significant number of users subscribing to this service.

The cloud based approach changes the cost structure investment and development intensity to a monthly fee based pay-as-you-go structure. The same technological platform can be used for producing a number of services either for the same geographical market or different areas using the Internet for access the technological environment. In the same way the premade end user service concept may be utilized. This naturally decreases the cost for producing an individual service for an individual geographical market, as the production of communication services, as well as the utilization of the concept development work made earlier, follow the economies of scale. Furthermore, the need for

Operator resources is significantly smaller in the planning and implementation phases than with the traditional approach. The operator development needs cover mostly technical integration of different systems, as well as commercial planning and marketing of the service.

The monthly fee based charging, especially when it follows the end customer numbers, gives the Operator a possibility to plan the cost structure for the actual user numbers, thus planning the service, its launch, and – last but not least - end user pricing in a way that they support fast takeoff of the service, but in the same time enabling the operator to make profit with the service right after the launch even with small user numbers. In the same time, the pay-as-you-go monthly fee model gives the Operator a possibility to accurately predict the costs involved with the service.

In addition, the transition of the cost model from fixed and variable of the traditional approach to variable of the cloud based approach gives the Operator improved cost efficiency, better predictability of costs, better financing position through reduced investment needs and better profitability of the service. Table 1. summarizes the major differences between the traditional and the cloud based approach in respect to value creation and value capture. The different cost dimensions are integrated into value capture, since it is expected that with decreasing exchange value experienced by the Operator and provided by the Partner to the Operator, the amount of revenue to the whole value system is likely to increase thus affecting value capture and extraction of profits.

Table 1. Value creation and value capture in the traditional and cloud based approaches.

	Traditional approach	*Cloud based approach*
Value creation		
Logic of value creation	Proceeding from the traditional approach to the cloud based approach the Partner decreases especially the exchange value created towards the Operator due to scalability which in turn can be used to decrease the exchange value of end user. The use value towards the end user is increased with possibilities to faster initiation of services and shorter time-to-market.	
Value proposition to end users	Value proposition is based on Operator's business model.	Value proposition is based on the Operator's business model, but in order to create value, boundary-spanning activities are required towards the Partner.
Mechanism for value creation towards end users	Stable mechanisms related to production and delivery. New service with value for the end user by the Operator only.	New services with value co-created by the Operator and the Partner. Mechanisms related more to innovating: both the Operator and the Partner are concentrating in their core leading to more efficient and faster development with smaller cost of development, production and delivery.
Value capture		
Logic of value capture	Proceeding from the traditional approach to the cloud based approach higher margins should be available due to decreased exchange value towards the Operator, increased cost efficiency and scalability rising from following dimensions:	
Technology cost base	Platform and system investment (CAPEX), development costs, operative costs, maintenance costs	Monthly fee based on the number of the end users
Cost timing	Up-front investment	Pay-as-you-go
Operator development needs, resource requirements and usage	Technological development and integration, end user concept development, and commercial development	Commercial development and integration
Cost model	Fixed and variable	Variable
Value capture	By the Operator (and technology vendors when applicable)	By the Operator and the Partner, possibility for a larger total value capture
Profitability for the Operator	With large volumes, possibility for good profitability with very high volumes	With small and large volumes, increases with volumes

4. CONCLUSIONS AND MANAGERIAL IMPLICATIONS

This paper examined the effects of transition from the traditional approach on production and provision of communication services to the cloud based approach. This transition was elaborated more specifically in respect to the changing value creation and capture logic of the Operator's business model with an explanatory case study. Thus the viewpoint adopted in this study was s transformational approach representing one of the two current research strands on studies in business models.

The business model under transformation is the one of the Operator and the need for change comes from the strategic choice to outsource certain parts of production and provision of communication services. With this choice and transition from the traditional approach to the cloud based approach the Operator outsources operations and technology development to the Partner. Further, as presented in the case, the Operator can outsource concept planning and service development thus making the Partner a strategic one.

By making this strategic choice on outsourcing and transitioning from traditional approach to cloud based approach, costs is a major component both in value creation and capture transformation. When considering value creation towards end user, the value creation towards the Operator by the Partner also counts. The Partner decreases especially the exchange value created towards the Operator by transforming the fixed and variable investment, development, operative and maintenance costs to variable monthly fee based on the number of the end users thus changing also the cost timing from up-front investment to pay-as-you-go. This decreasing exchange value should lead to higher margins and better predictability of costs when implementing the cloud based approach. From end user point of view, the decreasing exchange value for the Operator should lead to decreasing exchange value for the end user as well, in particular for the enterprise end users who are affected by the changing charging scheme based on volume. The other component of the value creation, the use value, is increased with possibilities to faster initiation of services and shorter time-to-market.

The other important function of the business model besides the value creation is the value capture. In the traditional approach the Operator is the one who captures usually of all value, meaning all the revenue which comes into value system, which is the amount the end user actually pays and thus equals the exchange value. With the cloud based model, value is captured by the Operator and the Partner thus leading to the question of revenue sharing. However, with the scalability of value created and also value captured, there is a possibility for a larger total value capture.

The transition to the cloud based approach and the reflecting business model change can provide the Operator with significant strategic and operative advantages. These include faster development of new services, less Operator resources required and smaller Operator development needs, clearer cost structure and better predictability of costs, cost efficiency

and economies of scale, costs based on the actual end user numbers, profitable business with smaller end customer numbers, as well as possibility for soft launches. On the other hand, not all the features coming from the cloud based approach are bringing the Operator advantage. Clear disadvantages include: service concept developed by the Partner may be available for competitors leading to a non-unique service concept, as well as no full control over the technological environment. Yet the changed business model build upon the cloud based approach of producing and provisioning communication service is to been as a productive choice through which the Operator can compete with the new competitors from the Internet world.

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Collaborative Method for Developing Practice-Based Innovation Processes

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ABSTRACT

Discussions on open innovation have mostly dealt with openness and cooperation mechanisms between organizations while the issue of utilizing the ideas emerging from different units of organization has mostly been neglected. This paper focuses on how to develop processes to transform employees' ideas to innovations in multi-unit organizations through intra-organizational networks. Practice-based innovation and user-participation in development processes have been shown to be important for the long term success of organizations. Stigmergy and collective intelligence enable more effective collaboration between participants. The goal of this paper is to describe a method for creating collaboratively a concept for a practice-based innovation process in a multi-unit organization. The approach chosen was an action oriented multiple-case study. A development method was constructed and tested in two organizations. Different aspects of the innovation process were discussed in modular workshops and decisions were documented in a Handbook. Only preliminary results from the method can be presented at this point. In both case studies it will take until the end of year 2010 before final results can be evaluated. A Handbook and workshops were designed to support each other and the communication with stakeholders. Workshops facilitate effective discussions and decision making; the method makes the progress visible, helps to stay on topic and makes documentation of results easy. This paper contributes to understanding user involvement in development processes and the implementation of practice-based innovation processes in multi-unit organizations. However, IP and IPR issues are important in both internal and external development networks, hence having slightly different roles and interplay with trust and social capital in intra- and inter-organizational contexts. This paper has practical implications for managers trying to facilitate development inside an organization by presenting one method to take care of the task.

Keywords: Open innovation, Innovation process, Practice-based innovation, Organizational development

1. INTRODUCTION

Tidd (2006) has written that innovation is driven by the ability to see connections and opportunities, and the capability to take advantage of them, and Chesbrough (2003, 2006) about the shift from closed to open innovation paradigm. Capabilities of information sharing and networking inside and outside of the organization are crucial in today's business world. Networking and active communication is needed in every level of organization to access important future signals and transform ideas to innovations. Willingness and motives to share knowledge and absorptive capacity (Cohen & Levinthal 1990) are important levers while developing innovation related capabilities in organizations. Acquisition, assimilation, transformation and exploitation of information (Zahra & George 2002, Todorova & Durisin 2007) in innovation process and dynamic capabilities (Teece & al. 1997) of firms play a key role in innovation actions, agile

responses to changes in operational environment. Absorptive capacity can be limited by insight inertia and action inertia (Godkin 2010) and the capability to integrate different types of knowledge, competences, and experiences becomes important (Parjanen et al. 2010). Networking capabilities can be considered as forcing sources of organization's innovativeness and brokering can help information change (Granovetter 1973, Burt 2004, Parjanen & al. 2010).

According to Smedlund (2009) the development of intra-organizational networks and their tasks are related to the different characteristics of production, development and idea generation processes and networks in organization. It is much about whether performed tasks are routine or non-routine, which is highly related to innovation activities and innovation process management. An innovation process can be described as having three main phases: fuzzy front end, concept phase and product development phase (Apilo & Taskinen 2006). In the early phase of innovation process sharing information to create new ideas is important, later stages include more straightforward problem solving and R&D work to conclude innovations and implement or launch them to markets. This means that every phase of innovation process has its own distinct characteristics of utilizing networks and communication to accelerate innovation activities. Open innovation paradigm focuses on utilizing external information trough cooperation with other knowledge sources and benefiting from IP and related tools to create new business models (Chesbrough 2003). Many organizations, despite the talks, are relying on closed principles and encapsulate the process supporting only idea process or execution process. This easily leads to a lot of ideas not realizing or only few to be processed through effective but very limiting process. Open innovation requires networks, like communities of practice (Wenger, 1998; Brown & Duguid, 1991) to explore and execute innovations. Such networks are also related to the diffusion of innovations (Rogers 2003) and originating of informal and formal norms (Von Hippel, 2005). All these actions are related to intra- and inter-organizational networks and a willingness to share and adapt information. This means, that innovation process development is linked to organizational development (Hannan & Freeman 1984) – and best succeeded when also members of daily operational personnel in addition to management are participating (Klein & Sorra 1996).

Various studies have implicated that user involvement is essential in idea creation as well as innovation development, process development and implementation (Von Hippel 2005,

Klein & Sorra 1996). Practical examples of user involvement in organizational development context include Innovation Catcher (Paalanen & Konsti-Laakso 2008), TQM including continuous quality improvements such as *Kaizen* (Liker 2003), CAD and MRP/ERP-system implementations (Klein & Sorra 1996). Knowledge lies in different layers of organization and units, and can be utilized if processes reach all necessary levels and their connections to other external networks supporting innovations. From this body of research it can be concluded that the development of practice-based innovation processes requires collaboration between various stakeholders. Innovations are mainly created in practical contexts, where many different sources of information are exploited in solution-centered processes (Harmaakorpi & Melkas 2008). Collaboration between people from different backgrounds can be difficult to achieve due to various forms of cognitive, organizational, social etc. distances (Parjanen & Melkas 2008). In order to cross these distances brokering is often required. Such brokering has two roles: facilitation of collaboration and communication and bringing in substance knowledge (Pässilä & al. 2008). One approach that has gained recent interest as a way of facilitating collaboration is to utilize stigmergy.

Stigmergy means mechanisms for indirect coordination of actions between individual agents. The term was originally introduced by Grassé (1959) to explain coordination of nest construction by termites. The regulation of building activities is achieved by the nest structure: stimulating configurations trigger building actions which create new configurations that can in turn stimulate new building actions by the same or different individual (Theraulaz & Bonabeau 1999). The principles of stigmergy can also be used to explain coordination in the context of human interactions. According to Elliot (2007, p. 108) “stigmergic collaboration arises when two or more people utilize some form of material media for the encoding of their collective creative endeavor”. It is closely related to distributed cognition, in which environment functions as a part of cognitive system (Susi & Ziemke 2001). The advantage of stigmergic mechanisms is that they offer simplicity, scalability and robustness: actions of individual agents can remain relatively simple, systems typically function the better the more individuals there are involved and systems stay functional even if parts of it fail (Parunak 2005). Examples of human-human stigmergy include document editing, linked structure of the internet and modifiable public displays (Parunak 2006). Stigmergy has also been proposed to be a partial explanation for the success of open source software (den Besten & al. 2008, Heylighen 2007). Stigmergic

collaboration between people is achieved trough encoding information to some form of media or local environment. This environment comprises of artifacts, objects that mediate interaction and communication between participants of creative endeavor. Externalized shared representations emerge as a result of interactions between participants and environment (Elliot 2007, p. 120). Such self-organization facilitates collective intelligence defined by Malone & al. (2009) as "groups of individuals doing things collectively that seem intelligent" (Bonabeau & Meyer 2001). Other aspects enhancing collective intelligence include the diversity of participants, independence and decentralized decision making (Hong & Page 2004, Surowiecki 2004, Malone 1997).

This study presents the first results from an ongoing research project for creating a collaborative method for developing practice-based innovation processes in multi-unit organizations. It contributes to the current understanding of how to transform ideas of employees to innovations by applying the method in two case organizations. The method for developing practice-based innovation processes is based on a literature review on innovation processes, user-involvement and stigmergic collaboration as well as previous experiences about the development activities of the research group.

2. RESEARCH METHODOLOGY

2.1. Research approach

The research approach of this study is action research. According to Coughlan and Coghlan (2002) action research uses a scientific approach to study important social or organizational issues together with those who experience these issues directly. Action research has always two goals: making the action happen and reflecting what happens in order to contribute to the theory. This process involves collaboration between researchers and members of the organizational system. Action researchers are not just observing change; they are actively working to make it happen (Coughlan & Coghlan 2002). Action research is also self-evaluative. Researchers have to be aware of the impact they have on the situation (Remenyi & al. 1998).

The general phases of the action research process are (Coughlan & Coghlan 2002):

1. planning,
2. taking action,

3. evaluating the action and
4. further planning.

According to Tharenou & al. (2007) action research studies iteratively cycle through diagnosis and intervention until there is an understanding of the situation investigated. In this study, the action research is used to develop practice-based innovation processes in cooperation with the employees of case organizations.

2.2. Empirical research setting

The empirical research is based on two case studies. “Case study is a comprehensive inquiry, conducted in the field, into a single instance, event or setting” (Tharenou & al. 2007). Case studies allow concentrating on specific instances aiming to provide a multi-dimensional picture of the situation (Remenyi & al. 1998). Although the results of case study are difficult to generalize to other cases, the generalizability can be improved by using more than one case (Tharenou & al. 2007).

In this study two case organizations were selected as examples of the collaborative method developed. Case organizations are at this moment developing their practice-based innovation processes through applying the method presented in this paper. Both of the case organizations are multi-unit organizations. However, the development work takes place in different positions of the matrix (see Figure 1.) and both have their own unique features, which make the comparison valuable. The case organizations are introduced next.

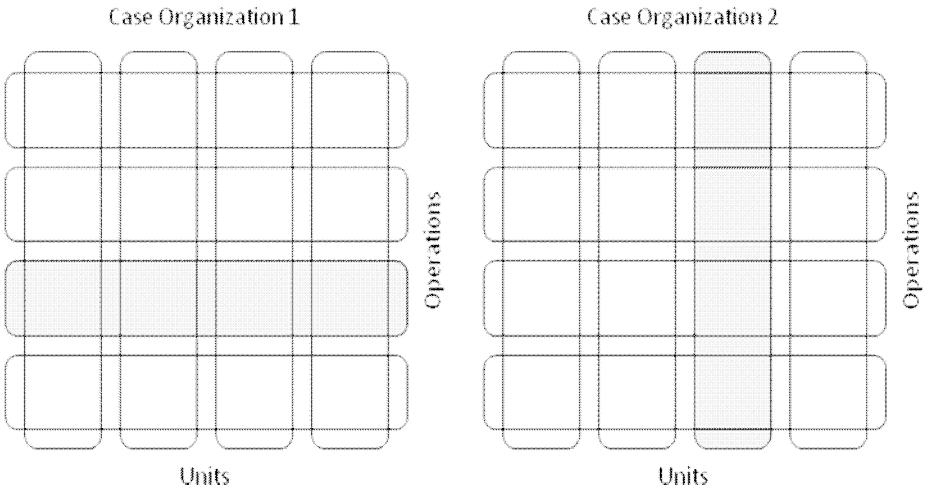

Figure 1. Focus of development in case organizations.

Case organization 1 is a media company located in southern Finland. It has several business units, each with their own functions and different roles in organization. Altogether

there are around 300 employees in the company. Case organization 1, like its competitors in media business, struggles with common challenges in the changing business environment of the industry. It has understood that innovations are needed for renewal and future business success; cutting costs is not enough for survival anymore. Case organization 2 is a Finnish consumer retail company. It is part of a large parent company, which operates in many fields, but this case concentrates only on one of the local units in southern Finland. The case unit has approximately 50 employees. Due to the position in chain, development has been challenging. For supporting the enhancement of innovation culture and developing a procedure for idea generation and evaluation, the cooperation with outside expertise was seen appropriate in both cases, and this gave ground for action research.

Cooperation with the case organizations started in autumn 2009. Action research always requires pre-understanding of the organization's environment, conditions of the business as well as structure and dynamics of the operating systems (Coughlan & Coghlan, 2002). The existing practices of the organizations were explored by conducting a diagnosis. The main purpose was to form an understanding of the situation in case organizations and to clarify the development targets. The diagnosis phase included the following methods: interviewing the employees (both operational and management), stakeholders and customers of the case organizations, performing a diagnosis workshop, collecting stories and conducting an Internet survey. To achieve an overall view of the needs of the organization, employees from all organizational levels participated in the diagnosis. Also differences between unit and corporate development issues (Burgelman & al., 1996) were observed to understand how the innovative capabilities of an organization are enhancing innovation actions in business-units and the interplay with them.

After forming a pre-understanding of the situation, a development method was constructed and tested in two case organizations. Case organizations deployed a team formed of employees representing different parts of the organization to develop innovation process with the support of researchers. The criterion for the participants was that they should have an active role in the organization. Different aspects of the innovation process were discussed in modular workshops and decisions were documented in a Handbook of Innovation. So far one out of ten planned workshops has taken place with case organization 1 and two out of four workshops with case organization 2.

3. DESCRIPTION OF THE METHOD

The aim of the cooperative process between case organizations and researchers was to create the Handbook of Innovation for the case organizations. In this Handbook, the concept for a practice-based innovation process would be described. At the same time the Handbook would be used to communicate results of diagnosis to development team, to give them “homework” in order to prepare for workshop and to document the discussions and decisions taking place in workshops. Documented decisions could then be approved by higher management. This process can then be repeated and development work continued on the already established basis.

The designing of the innovation process took place in collaborative workshops lead by researchers. The number of participants in these sessions ranged from 5 to 11. Workshops aimed to utilize distributed cognition and collective intelligence in collaborative design and decision making process. The structure of workshops was modular; each of them followed the same general agenda with changes only to content. This way the workshops could be easily repeated and development work could be carried on from the results of the last session.

Workshops were divided in four distinct phases. They started with an opening by researchers, where people were introduced, and background information about the purpose of the workshop and a short recap of the previous session was given. After that researchers gave a short theoretical presentation related to the topic of the workshop. In the second part participants generated ideas and solutions to issues and questions the researchers had predefined based on the diagnosis of the organization and results of the previous workshop. During the workshops the utilization of distributed cognition and collective intelligence were facilitated trough the use of whiteboards and post-it notes. Large tables were drawn on whiteboards showing the issues and questions to be discussed and giving short summaries from the diagnosis related to each issue. Ideas were documented and organized with post-it notes in an empty row of the table. Final decisions and remaining open questions had also their own rows. This way everyone could see how the conversation progressed. Next ideas were organized in groups and results were presented to participants. In the final phase decisions were made about which of the proposed solutions and ideas would be implemented. Finally the researchers documented discussions and decisions from

whiteboards and wrote a summary in the Handbook of Innovation. A timetable of a typical workshop is presented in Table 1.

Table 1. Timetable of a workshop.

Phase	Duration	Goals	Notes
Introduction	20 min	Introduction of participants and purpose of the workshop	
Orientation	20 min	Recap of previous session & theoretical background	
Short break	5 min		
Idea generation	2 h	Generation of solutions & discussion about issues	1. Idea generation 2. Change of whiteboards (large groups) 3. Idea generation continue (large groups) 4. Grouping of ideas
Coffee break	15 min		
Summary and decision making	1 h	Reaching consensus about the concept to be implemented	1. Presentation of results 2. Discussion 3. Voting (if necessary) 4. Decision making: solution for each issue is selected and documented to corresponding row

4. FINDINGS

In order to ensure the reliability of results in a case study multiple sources of evidence should be used. At this point only experiences of researches from action research are available, so only preliminary results from testing the method can be presented. In both case studies it will take until the end of year 2010 before final results can be evaluated. So far one workshop has taken place with the case organization 1 and two workshops with the case organization 2, with on average 5 and 10 participants respectively.

Researchers had an important role in this method. Well before the workshops they analyzed the results of diagnosis and made suggestions for topics of workshops for the management of case organizations. Researchers then defined the issues and questions and made short summaries of diagnosis, which were pre-filled to tables on whiteboards before the session. In the workshops they performed the dual role of a broker: they facilitated collaboration and contributed to the substance about theoretical aspects of the issues at hand. Collaboration was facilitated by directing the conversation, asking questions and by

writing and organizing notes. Researchers made their knowledge available to participants by giving presentations about relevant topics and by participating in discussions.

The use of environment as a mediator for communication was emphasized in the method. Relevant ideas and comments were written on notes, attached on whiteboards and later organized in groups. The use of notes was thought to allow also shyer people to participate, but during sessions most of the notes were written by researchers. For some reason people seemed a bit reluctant to write their comments on notes. The method was simple and therefore participants did not have to spend time on learning new skills; instead the time could be spent on the substance. The method helped to make collaboration between people from different units efficient and effective, thus offering possibilities for different point of views to unfold. All the important aspects of discussion were documented and made visible, which made it easy to steer the conversation. If the topic started to wander it was possible to move smoothly to a corresponding new column or instruct the participants to focus on the column at hand. Returning to previous topics was also possible and improvements upon them could be made without unnecessary repeating of already discussed points. In workshops with case organization 2 participants were divided into two groups that worked on same issues in turns. Using environment as a mediator for communication allowed participants to continue on the basis built by the first group after a short presentation of the intermediate results. An example of a table used in workshops is presented in Table 2 with some examples of the types of content produced in each row.

Table 2. Example of a table used in workshops.

Topic of the workshop	Issue 1	Issue 2	Issue 3	Example: Idea evaluation
Summary of diagnosis	A short summary of important points from diagnosis			- Too many ideas - Management suffers from information overflow - Ideas do not seem to go forward
Suggestions/ ideas	Discussions are documented here with post-it notes			- Electronic system for idea evaluation - Regular meetings - Every idea should be processed
Decisions	In the end of the day decisions are documented here			- Electronic system for idea evaluation
Open questions	Questions requiring further clarification are documented here			- Who will take care of implementation? - What are the specifications?

It can be said that a collective representation about the issue at hand emerged reasonably effortlessly. Even though the topics of the workshops were relatively complicated and multi-faceted these representations were a useful support for final decision making: usually only one or two real options per issue were left at the end of a workshop and all the alternative solutions and combined knowledge related to them were visible to participants. If several competing solutions had emerged, participants were allowed to vote, but most of the time consensus decisions were made. Results were also readily documentable after the workshop; notes from the whiteboard were just written down in a chart, which could then be used as a basis for writing a summary in the Handbook of Innovation.

During the workshops information was encoded to local environment, and as the theory on stigmergy predicts, shared representations emerged as a result of interactions between participants and environment. Furthermore many of the elements claimed to facilitate collective intelligence were present. Participants had diverse backgrounds ranging from management and employees from different parts of the organizations to researchers. At least parts of the decision making were decentralized through the use of voting. However, the independence of opinions could not be guaranteed: participants influenced each other's views through discussion, and at times people with a low status in organizational hierarchy did not participate actively in the conversations. This could be improved by splitting the participants of the workshop into two groups according to their position in organization.

The method seemed to improve communication, clarify and visualize common goals and problems related to resources and tools in multi-unit organization. It created trust and willingness to share information with less fear of internal IPR-related issues, such as other business units stealing ideas and profiting from those. Also, communication to corporate executive board and their confirmation to the future innovation process and corporate commitment to tools with clear simple documents from meetings seemed to be promising. The method also gives possibilities for future development and updates of a company's description of innovation process while using the Handbook and learned cooperative methods.

All workshops were effective and their goals were achieved. The Handbooks of Innovation are well under way in both organizations. At the moment case organization 1 has defined management and decision making responsibilities related to innovation process and the

roles of so called innovation agents. Case organization 2 has defined the concept for practice-based innovation process, the testing of which will begin in autumn 2010.

5. CONCLUSIONS

This study presented results of two case studies, in which a collaborative method was utilized in order to design a practice-based innovation process in intra-organizational context. Handbook and workshops were designed to support each other in a modular way and to improve communication with stakeholders. Workshops facilitated effective discussions and decision making; the method makes the progress visible, helps to stay on topic and makes the documentation of results easy.

As a conclusion, it seems that the method presented in this paper is a suitable way to develop practice-based innovation processes. As regards the generalizability of the results, according to Kasanen & al. (1993) if a solution works for one organization, it is reasonable that the method is applicable for other same type of organizations as well. In further research the functionality of the method will be evaluated more thoroughly after the cases have been finished at the end of the year 2010. An interesting direction of research would be to apply the developed method in inter-organizational context.

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When culture matters

Explaining challenges to open innovation through peculiarities of national culture.

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ABSTRACT

Open innovation literature has widely covered matters of strategies, business models, and benefits together with challenges of the open innovation approach; however, the people's side – innovation cultures – has been scarcely researched so far. Opening up the innovation process starts with the mindset. Creating culture which values outside expertise and ideas is of high importance for open innovation practice. This culture is influenced by many factors, such as organisational processes, incentives, mission and strategy. But the meaning of individual mindset has been mainly neglected in the previous literature on open innovation, even though widely covered in studies of organisational culture. The values and attitudes of each and every employee form the culture and attitude of organisation towards new innovation processes. The reluctance of personnel to change has been noticed and coined by terms Not Invented Here syndrome and Not Sold Here syndrome. This paper analyses the roots of these syndromes leading to national culture and concludes with assumption that the adoption rate of open innovation in different countries is heavily dependent on the national cultures, and introducing the ideas of openness in diverse context would require different set of measures, predefined by initial cultural background. Managerial implications to address cultural peculiarities for fighting the Invented Here syndrome and Not Sold Here syndromes are offered.

Keywords: open innovation, barriers, culture, NIH, NSH

1. INTRODUCTION

Traditionally, most industrial firms have focused on internal development of new technologies and implementation of them within company into own products. In 1990s, the situation started to change due to the development of markets for technologies (Arora et al. 2001). This has led to the situation when companies were using external technologies and knowledge in their R&D processes to bigger extent (Grandstrand et al. 1992). Introduced in 2003 (Chesbrough), the open innovation (OI) has developed from a small club of leading multinational companies and academic research in high-tech areas to widely accepted around the world practice. The evidence on different rates of OI adoption around the globe as well as its different modes has been demonstrated widely during past years by single case company research (Huston and Sakkab; Chesbrough 2003, 2006; Dodgson et al 2006), industry (Herzog 2007; West and Gallagher 2006; Bekkers et al 2002) and country and cross-country analyses (Lichtenthaler and Ernst 2006; Salmi et al. 2009; Poot et al 2009).

The essence of open innovation is in combination of purposeful inflows and outflows of ideas, knowledge and technology to and from company respectively, aiming to increase company's performance in the long run. Gassmann and Enkel (2004) have distinguished three core processes of open innovation: outside-in, inside-out and coupled processes. The outside-in process refers to technology acquisition and has been widely studied in the previous literature on collaboration (Allen and Cohen, 1969; Hagedoorn, 1990; Mowery 1983; Cohen and Levinthal 1989), horizontal and vertical integration (e.g. cooperation with users by von Hippel (1988), and network model of innovation (Rothwell and Zegveld 1985). The inside-out process, meaning the external commercialization of own technology, on the other hand has attracted less attention in the literature, apart from extensive coverage recently by Lichtenthaler (2007, 2008, 2010; Lichtenthaler and Ernst 2006). The coupled process represents the combination of the two mentioned and is not separately reviewed in this paper.

The flows of knowledge from and to company require adaptation of certain corporate processes for the integration of acquired knowledge into the research process and preparing own knowledge for external commercialization. Despite the variety of literature on these topics, the human factor still remains uncovered (Herzog and Leker, 2007). Witzeman et al (2006) point out that with the switch to new mode of innovation management, not only technological systems need to change. The more external innovation is sourced by the firm, the more of systems, processes, values and culture also needs to be modified. Witzeman et al (2006, p. 27) states that, "harnessing external technology for innovation requires a fundamental change in employee thinking. "The Not Invented Here" syndrome is replaced with the "Invented Anywhere" approach". However, many companies demonstrate reluctance to change, showing strong path dependency (Menon and Pfeffer, 2003). Also Dodgson, Gann and Salter (2006) analyzing the example of R&G recognize that the cultural changes as well as new skills are necessary; the technology does not replace existing practices and it does not overcome the uncertainty of innovation. Hence, the change of attitudes and values of every employee in the company might be necessary for opening up the company boundaries.

The values and attitudes of employees are often the sequence of strong mental models imposed by national culture. In the open innovation settings, these cultural attitudes emerge in forms of Not Invented Here (NIH) and Not Sold Here (NSH) syndromes, which

might be results both deep cultural believe or technological gap and low absorptive capacity of the firm (Cohen and Levinthal; 1990).

In the cultural dimension literature “cultural values” are considered to be the most important explanatory variables of behavior (Kluckhohn 1951). In this context the work by Hofstede (1980, 2001) is based on responses by IBM staff across the world deriving four value dimensions: power distance, individualism and collectivism, masculinity and femininity and uncertainty avoidance. More dimensions were added with later research. Certain cultural requirements of Open Innovation have been mentioned in the literature, as Not-Invented-Here and Not-Sold-Here syndromes (Chesbrough 2006).George and Zahra (2002) refer to culture as to a determinant of entrepreneurial behavior. Here it is important to distinguish between general national culture or universal values, such as measured by Hofstede (1980), Schwartz (1994), Inglehart (1997) and House (1998) and context-specific attitudes. A number of scholars point out that there is a statistical association of Hofstede’s scales of culture and e.g. entrepreneurial activity (Hayton et al. 2002; Uhlaner and Thurik 2007; Hofstede 1980). It reflects recent findings on relationships between national cultural values and practices generally (Javidan et al. 2006).

The paper strives to analyze different kind of barriers appearing on the way of inflows and outflows of corporate knowledge into out of the firm, having special emphasis on cultural roots of those barriers. Hence, the research question is *what is the influence of culture on possible appearance of NIH/ NSH syndromes while implementing open innovation*? The analysis deploys the data collected during set of international open innovation surveys in Finland, China and Russia to support the claims with descriptive statistics. However, the paper is mainly conceptual, offering the research agenda for further analysis of role of cultural factor in open innovation adoption and conducting the cross-country analysis of the phenomena. As an explanatory factors for culture were used the cultural dimensions developed by Hofstede (1980) and his analysis on different countries.

The paper contributes to stream of open innovation research by defining the research agenda for studies on culture and open innovation as well as providing first results to start filling the gap in this stream of research. The assumptions and conclusions made in this paper might be of high interest to both academics and practitioners, who could benefit

from understanding the obstacles imposed by national culture and by being able to prepare for them and overcome them.

Structure wise, the paper starts with introductory part, explaining phenomena of open innovation, then continues with delimitating the notion of culture as it is use in the paper and introducing the dimensions to measure it; goes on with discussion on different kinds of barriers to open innovation and defining the ones, related to national culture and concludes with giving examples to explain cultural factor in relation to open innovation barriers in some countries.

2. DEFINING CULTURE

Culture has been defined in many ways. Below are presented few most common definitions, as the one by Kluckholn (1951)

> "Culture consists in patterned ways of thinking, feeling, and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional ideas and especially their attached values".

The other definition was offered by Hall (1981), who sees culture primarily as a communication system that can be used to create, transmit and store information. Only people with similar cultural background could understand each other's message.

Another definition is by Mårtensson (1998), who sees culture as *"the total amount of knowledge, experience, conceptions, values, attitudes, meanings, hierarchies, religions, relations to time, roles, relations to space, concepts of universe, material objects and possessions acquired by a large group of people during many generations through the efforts made of both individuals and groups"*

The definition used as central in this paper was offered by Hofstede (1991), who defines culture as "*collective programming of the mind that distinguishes members of one group or category of people from another"*. The sources of one's mental programs lie within the

environment in which one grew up and collected experiences. Mental programs vary as much as the social environments in which they were acquired. (Hofstede, 1991).

2.1. National and organizational culture

As almost everyone belongs to a set of different groups at the same time, people carry several layers of mental programming within themselves, corresponding to different levels of culture (Hofstede, 1991):

- national level according to one's country;
- regional and/or ethnic and/or linguistic affiliation level, as most nations are composed of culturally different peoples;
- gender level;
- generation level, which separates grandparents from children;
- social class level, depending on educational opportunities, profession and occupation;
- organizational or corporate level, according to the way of socialisation inside organisation.

The organizational culture was studied in many aspects. Among those, there has been wide research from management to psychology on leadership, teambuilding, innovativeness and creativity and personal human traits for them, which would arise from culture (Ahmed, 1998; Martell, 1989; Robbins, 1996; and Schuster, 1986). However, those are out of scope of this paper, as well is culture for producing innovations. Motivation for innovative creativity is different from motivation for acceptance of external innovations and releasing the own ones. Nevertheless, culture is often viewed as a determinant of innovation (Ahmed, 1998) as culture has different elements which can serve to enhance or inhibit the propensity to innovate. To this extent, if the strong innovation oriented culture is supposed to create innovations, the same strong culture and attitude towards creativity may inhibit the willingness to acquire the ready technology, instead of developing it.

National culture is a common characteristic of people within borders of one country, and it should be differentiated from culture of societies or ethnic groups. Within nations which have existed for some time there are strong tendencies towards integration: they share national language, education system, political system etc. Organisational culture is

different in many aspects from national culture: organisation is a social system of a different nature than a nation. (Hofstede, 1991)

2.2. Hofstede's dimensions of national cultures

Hofstede (and Bond 1984) indicated that societies which score high on individualism and low on the power dimension have a higher economic growth and greater tendency to innovate, a finding confirmed by Shane (1992).

Power Distance (PDI) is the extent to which the less powerful members of societies, organizations and institutions accept and expect that power is distributed unequally. It suggests that a society's level of inequality is endorsed by the followers as much as by the leaders. In small power distance there is limited dependence of subordinated on bosses and consequently the dependence is stronger in high power distance countries (Hofstede, 1991). High-power distance cultures prefer centralised hierarchical structures whereas low-power distance cultures prefer decentralised hierarchical structures.

Uncertainty Avoidance deals with a society's tolerance for uncertainty and ambiguity. Hofstede defines uncertainty avoidance as the degree to which member of a given culture perceives and react to an undefined treat and unknown situations (Naumov and Puffer, 2000). It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured situations. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures. (Hofstede, 1991). In countries with strong uncertainty avoidance the need for rules is high, and the willingness to take risk – low. Hofstede found that high- uncertainty avoidance cultures seek more control over their environments (Herbig and Dunphy, 1998).

Individualism on the one side versus its opposite***, collectivism***, is the degree to which individuals are integrated into groups. Individualism pertains to *societies in which the ties between individuals are loose,* on the other hand, collectivism describes *societies in which people from birth onwards are integrated into strong, cohesive ingoups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty* (Hofstede, 1991). The word collectivism in this sense has no political meaning: it refers to the group, not to the state. Again, the issue addressed by this dimension is an extremely fundamental one, regarding all societies in the world.

Masculinity versus its opposite, ***femininity***, refers to the distribution of emotional roles between the genders which is another fundamental issue for any society to which a range of solutions are found (Hofstede 1991). Masculinity as a model of behaviour of average

citizen is more prevalent in societies with strictly defined roles for men and women (Naumov and Puffer, 2000). Masculine cultures show a strong preference for outputs and emphasise performance; feminine cultures show preference for processes and aesthetics (Haiss, 1990; Schneider, 1989; Hofstede, 1980). Masculinity applies to societies where social gender roles are certainly distinct (toughness as characteristic for men and tenderness for women); and femininity applies to societies where these roles overlap (Hofstede, 1991).

Long-Term Orientation - a society's "time horizon," or the importance attached to the future versus the past and present. In long term oriented societies, people value actions and attitudes that affect the future: persistence/perseverance, thrift, and shame. Long- term oriented societies have virtues oriented towards future rewards, in particular saving, persistence, and adapting to changing circumstances. Short-term oriented societies foster virtues related to the past and present such as immediate stability, respect to traditions, national pride, respect for tradition, preservation of "face", and fulfilling social obligations (Hofstede et al. 2010)

3. CULTURAL CHALLENGES TO OPEN INNOVATION

3.1. Not Invented Here

A key idea of open innovation is the notion that “not all the smart people work for you”. Instead, beneficial technologies can be found anywhere in the world within companies of any size. Increasing cost and speed of R&D lead to situation, when the effect of economies of scale in R&D decreases substantially (Chesbrough, 2006). In the distributed environment, where organizations of every size have valuable technologies, firms benefit more from trade in technology. However, the change is rapid and companies meet certain challenges on the way to higher level of openness (Chesbrough, 2006). Besides the challenges of finding, evaluating, negotiating, transferring and integrating the external technology into own product, companies must face the internal resistance to external innovations, known as Not Invented Here syndrome (Clagett, 1967; Katz and Allen, 1982; Chesbrough, 2003; van de Vrande, 2007). It refers to a negative attitude to knowledge that originates from a source outside the own institution. The NIH syndrome is partly based on an attitude of xenophobia (Chesbrough, 2006) – fear and rejection of something different from us, something coming from outside. The NIH syndrome has been widely studied in

the literature (for review see Lichtenthaler and Ernst, 2006) to describe the consequences that it may have in companies.

Explaining the shift to open innovation paradigm, Chesbrough (2006) offers following reasons for NIH syndrome coming into view: (1) fear to fail in selecting the right external technology, especially when time for project is limited and (2) fear to succeed with integrating external technology, since it may lead in long term to decrease in R&D personnel in the company. The solution he offers deals mainly with corporate reorganization as a way of fighting employees hostility: in case of new enterprises, solution will be in fast growth without building unnecessary research units – not hiring extra people in the first place; for old incumbents, reassigning functions of service, development, and technology market screening to existing R&D personnel or restructuring R&D department and putting its personnel in front of the need for external technology.

The change companies have to undergo to successfully participate in knowledge transactions require not only new operating routines and dynamic capabilities (Zollo and Winter, 2002), but also involve considerable changes into company's vision, strategy and culture (Kanter, 1983). However, the resistance to external ideas may be not only a result of business model of the company, but of each and every employee's values and beliefs, which may be a result of their national culture. But why do beliefs matter? People have formed those over time, mentally validated and are slow to shift substantially. Beliefs must be taken into account in order to figure out the potential for conflict, hidden resistance and improve organizational awareness and development potential. Bennett (1993) explains the tendency to filter the external information by ethnocentrism – the assumption that your own culture is central to all reality. Hence, unwillingness to accept anything created out of the culture. In open innovation context, the situation where this could happen is the international collaboration projects of acquisition of technology from foreign country. According to Rosinksi (1999) ethnocentrism emerges in three forms: ignoring difference (not noticing the superiority of external technology), evaluating them negatively ("we can do it better") and downplaying their importance.

Hence, certain cultural values common for one whole nation might be reflected in their attitude of using results of somebody else's intellectual activity. Therefore, the attitude of

not invented here will be higher in countries with high level of individualism than in collectivistic countries.

3.2. Not Sold Here

Leveraging external technologies is only half of open innovation practices. The other important part is to let others use your ideas. Here we encounter the Not Sold Here virus, which main reasoning is “if we are not selling it in our own sales channels, we won’t let anyone else sell it, either”. Hence, sales and marketing people are affected and do insist on exclusive use of own technology for own product (Chesbrough, 2003). NSH can be defined as protective attitudes towards external knowledge exploitation (Lichtenthaler et al. 2010). Because of it, firms may be unable to actively transfer the knowledge even though they may be strategically intending to (Chesbrough, 2006).

The experience of external knowledge exploitation is relatively limited (Teece, 1998; Lichthenthaler et al. 2010). Among possible barriers were mentioned market failures and risks (Silverman, 1999; Gans and Stern, 2003), intellectual property protection (Davis and Harrison, 2001; Teece, 2006) and others. NSH syndrome was seldom mentioned in the literature, mainly focused on analysing organisation and market dependent challenges. However, human factor should not stay ignored, and with favourable conditions given, the NSH can still restrain the external knowledge exploitation.

From a dynamic capabilities perspective, the competence and capability towards outward knowledge transfer was studied (Rivette and Kline, 2000; Lichthenthaler and Ernst, 2007). According to dynamic capability view, firms prior experience affects its capability level based on learning effects (Tripsas and Gavetti, 2000; Rothaermel and Deeds, 2006). Besides, path dependency has been used as an explanatory factor in many employees’ attitudes (Katz and Allen, 1982; Menon and Pfeffer, 2003) – a lack of prior experience may support protective attitudes.

However, the attitudes towards sharing own knowledge could be rooted more deep into every employees mindset, defined by national culture. This claim is developed further on in results section.

4. DATA COLLECTION AND METHODOLOGY

The assumptions on different level of barriers to acquisition and selling technology were derived from analyzing the data, collected through the set of international surveys in few countries: Finland, Russia and China. In Russia**,** the study is based on the survey of 158 R&D oriented Russian enterprises of different sizes (Table 1). The sample was based on expecting the firms to be innovation-oriented and emphasizing R&D as a source of their competitive advantage (Table 2). Survey of Russian companies was conducted in the regions having highest foreign direct investments and highest innovation sector development, mainly in St. Petersburg and Moscow. Data was collected by phone interviews.

In case of China, data was gathered through email and paper survey and also by phone in few cases. Around 800 target companies were selected from the firms operating in the Yunnan Province and of these 501 responded to the survey. The majority of responding firms belong to manufacturing sector, but the service sector also represents a significant industry segment (16.8%)

In order to explore open innovation practices in Finland, the data was collected through a web-based questionnaire. The firms were selected from the commercial business database by choosing the largest companies having their own R&D activities, so the survey was primarily aimed at large Finnish industrial companies. After a reminder e-mail, a total of 59 surveys were completed, for an overall response rate of 11.6%.

Table 1. The size distribution of the respondent firms

Size (employees)	Finland		Russia		China	
	No.	**%**	**No.**	**%**	**No.**	**%**
Micro (<10)	1	1,7	3	1,9	3	0,6
Small (<50)	7	12,1	38	24	146	29,1
Medium (50-250)	19	32,8	58	37	203	40,5
Large (>250)	31	53,4	59	37,1	148	29,5
Not defined	1	1,7	0	0	1	0,2
Total	**58**	**100**	**158**	**100**	**501**	**100**

Table 2. R&D intensity of the respondent firms

R&D intensity	Finland		Russia		China	
	No.	**%**	**No.**	**%**	**No.**	**%**
0-1,5%	23	39,8	14	8,9	116	23,2
1,5-3%	18	31	28	17,7	198	39,5
3%-5%	5	8,6	41	26	156	31,1
5%-10%	6	10,3	42	26,5	30	6,0
10% -	6	10,3	12	7,6	0	0,0
Not defined	0	0,0	21	13,3	1	0,2
Total	**58**	**100**	**158**	**100**	**501**	**100**

As explanatory factors for phenomena were used dimensions of national culture by Hofstede, which were introduced as a result of extensive analysis of survey data on people's values at IBM - 116,000 employees in 72 subsidiaries around the world (Hofstede 1990). The statistical analysis revealed common problems, but different solutions from country to country in the following areas:

- Social inequality, including relationship with authority
- The relationship between the individuals in the group
- Concepts of masculinity or femininity: the social implications of having been born a boy or a girl
- Ways of dealing with uncertainty

For more detailed description on data collection and analysis methods see Hofstede (1980, 1984, 1991). Research by Bond and colleagues among students in 23 countries let him in 1991 adding a fifth dimension called Long- versus Short-Term Orientation (Hofstede et al, 2010).

5. RESULTS

To analyze the popularity of certain barriers to open innovation, the sample was extracted based on few conditions: firms who answered positively to the questions of acquiring external technologies randomly or regularly and companies having the research surplus for sale. Further on, this sample was analyses for the barriers they face, and the popularity of NIH and NSH syndromes was calculated (Table 3).

Table 3. China, Finland Russia comparison for NIH and NSH

	NIH	NSH
	As % of respondents who acquire external ideas etc.	*As % of respondents who sells internal ideas etc.*
Finland	**37,5%**	**27%**
Russia	**2,1%**	**1,5%**
China	**18%**	**44%**

As we can see, the numbers differ substantially from country to country. With highest resistance to buy in Finland and highest resistance to share in China; Russia scores low on both barriers. As one of approaches to understand the difference, the cultural dimensions of Hofstede are applied to explain them. The cultural indicators for each country are represented in Figures 1,2,3. The dimensions used are Power Distrance (pdi), Individualism vs Collectivism (idv), Masculinity vs Femininity (mas), Uncertainty avoidance (uai), Long-term orientation (ltowvs), Indulgence vs Restraint (ivr) (Hofstede, 2010).

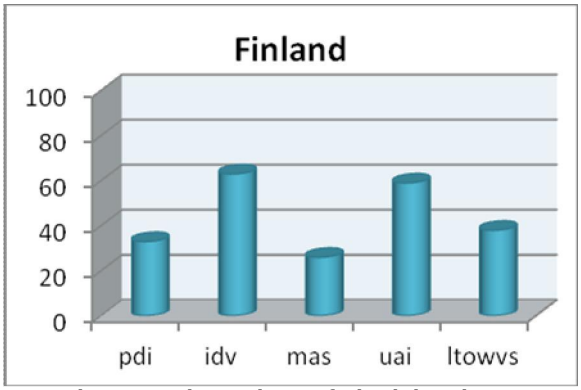

Figure 1. Dimensions of Finnish culture

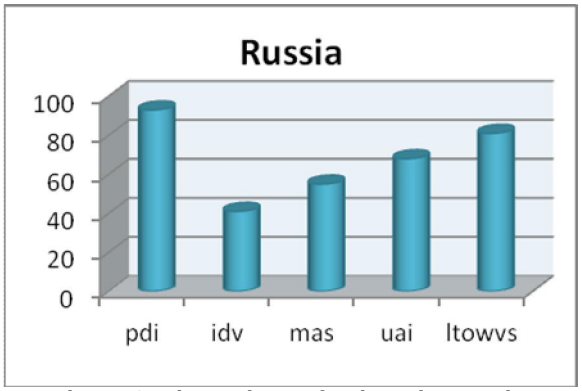

Figure 2. Dimensions of culture in Russia

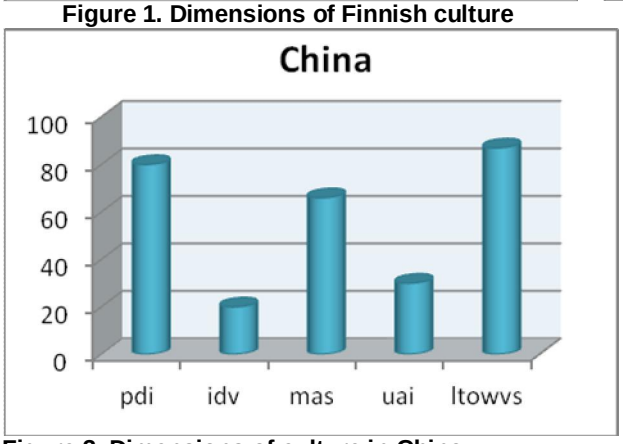

Figure 3. Dimensions of culture in China

Power distance scores highest in Russia, followed by China and is low in Finland. This is very much reflected in organisational structures, with Russia having linear and Finland more matrix organisations. High power distance demonstrates strong position of management in company and implies stronger following the procedures and obeying the

orders from the top. Hence, in Russia, the NIH and NSH syndromes would not be a problem in this case, since the opinion of the superior will not be questioned.

Finland scores highest on individualism versus collectivism scale, demonstrating that there is not need in group support for decision taking, and this mean that individuals must exploit their own potential. Hence the resistance to adopting something, created by others – "I can do it myself". China scores lowest on individualism, supporting its culture of imitation, rather than innovation. The common understanding of group responsibility decreases the fear failure in case of sourcing external technology. For the sell side, the group decision making results in difficulties to distinguish the owner of idea and hence sell it. Russia is exactly in the middle on individualism among sample countries, and in general it is debated whether Russia is more individualistic or collectivistic (Naumov and Puffer, 2000). It in general has no negative attitudes towards adopting something external, and as a consequence of long communism history, the habit of sharing is very common in the country, however the business and social behaviour may differ.

Uncertainty avoidance scored high in Russia in 1989 (Hofstede, 1991), however, the later research showed the decrease of uncertainty avoidance to 68 points, justified by switch to market-oriented economy (Naumov and Puffer, 2000). Nevertheless, Russia is still having highest uncertainty avoidance in our sample, with China scoring the least. The implication for NIH is that high uncertainty avoidance will characterise country as less risk-taking, hence the attitudes towards everything new and hence risky will be strong. However, this contradicts low scores of Russia in facing NIH and NSH syndromes, but supports openness of China to adopting external innovations. Finland scoring high on uncertainty avoidance also supports the claim, that adopting external technologies is considered to be risky.

Finland scores as the most feminine society of the three analysed; masculinity in Russian increased from 40 to 55 (Naumov and Puffer, 2000) and China has the strongest gap in male and female values. This dimension do not explain the different levels of NIH and NSH barriers, but can provide incentives for motivation and reward in each country to fight the syndromes. For instance, in Finland, the motivation for both men and women will be rather similar, with offering them social, related to family values, benefits to motivate them into higher R&D performance and hence external technology acquisition.

Finland score least on long-term orientation, which characterises their attitude towards time – the obstacles should be overcome now, and not with time flow. They value stability today, which might be coming from the social system in the country – stability today guarantees stability in future. In China situation is different, they have uncertainty in their future, so they have to plan it, make savings already today. The reluctance towards active knowledge exchange in Finland may be explained by unwillingness to endanger today's stability. It is also directly connected to willingness to take risk now. For Russians, everything is worth trying to reach the big goal in future. Hence, the attitude towards what is considered to be risky in business is lighter.

6. CONCLUSIONS

The role of national culture to shaping barriers to open innovation was described in this study. Of course the explanations of NIH and NSH viruses through dimensions of national culture is not straightforward and can be argued, but it can help finding the approaches to fighting knowledge adoption and sharing hostility in different countries.

The paper contributes to academic debates on challenges of shift to more open innovation management, introducing new point of view on understanding the root of some challenges, as NSH and NIH viruses, and with understanding, finding the ways to overcome them. Certainly, cultures do evolve, but the change happens not rapidly and under the influence of strong external incentive. Regarding dimensions used as explanatory factors, the country scores on these dimensions are relative - societies are compared to other societies. These relative scores have demonstrated to be quite stable over decades. The forces that cause cultures to shift tend to be global or continent-wide - they affect many countries at the same time, so that if their cultures shift, they shift together, and their relative positions remain the same.

The analysis presented in this paper lead to few managerial implications of understanding culture of the country, one is operating in:

1) If the country scores high on power distance dimension, the solution to overcome the resistance of personnel is to introduce stronger hierarchy, assigning certain leader, empowered by strong authority. Employees in high power distance countries do not usually question the managerial decisions from higher authority. In low power distance context, employees might be

motivated to do what management needs after they are explained that the company is a team with common goals and they all work equally to reach them.

2) In case of high uncertainty avoidance, to avoid barriers to certain practices, these practices should be codified and put to rules, procedures and internal regulations. Uncertainty avoiding culture will rather follow rules, than face unexpected. If uncertainty avoidance is low, the situation is already favourable for risk taking.

3) Individualists have to feel their own control on what they are doing. Hence, the roles and responsibilities of each and every employee should be defined. The will gladly fulfil the task having individual responsibility for it. Collectivists, on the other hand need to be assigned into teams with shared responsibility – identification of themselves as a part of group will allow sharing responsibility and increase willingness to take risks. In case of overcoming mental models through education and training, individualists should be taught separately, for collectivists – informal leader should become knowledgeable on the need/benefit of taken actions.

4) In masculine society, the men and women should be treated differently. You might not find a lot of women on high positions though. In feminine culture the emphasis on difference between male and female employee should be avoided.

5) Long term oriented cultures are motivated by the goals, which will bring them piece in future (e.g. working through whole life for one company to get the high position by the retirement). Short-term oriented cultures like to have benefits of society immediately as they start to work. Hence, the motivation and reward system for employees should also follow their short or long term orientation.

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Developing non-core ideas into innovations – The obstacles for open knowledge sharing

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ABSTRACT

Collaboration on non-core ideas is much like collaboration in R&D in a sense that knowledge sharing is an essential thing in both types of collaboration and because the firms are separate entities, there is always risk of knowledge leak and chance for opportunism. Although the ideas are not core to the inventor, the motive to start the collaboration is still to capture value from the ideas by finding an alternative channel for commercialization. Thus, knowledge protection mechanisms are needed that can help to ease the relationship between the collaborating partners and enable safe transfer of technology and knowledge related to non-core technologies. This study will explore the knowledge sharing and knowledge protection related challenges in non-core idea collaboration context. As empirical data we will explore a network built to enable the commercialization of non-core ideas. We will present and evaluate a model that was built during a project for identifying and enhancing non-core ideas.

Keywords: Non-core; idea; innovation; knowledge sharing; knowledge protection; collaboration; commercialization; strategy; open innovation.

1. INTRODUCTION

In order to produce value to the markets firms have to constantly renew themselves and produce new innovations. Value creation is not the only challenge that these R&D intensive firms of today meet: they also need to capture value from these activities. There exists thus, a constant seek for balance between value creation and value capture especially when multiple firms are involved in a network.

Prior research shows that firms are challenged by creating, maintaining and enforcing intellectual property rights. The value capturing challenges are even more pronounced in networks, where everyone wants to have their slice of the pie. On the other hand, networks related to R&D for example, have been quite efficient in adapting open innovation type of collaboration model, where knowledge sharing related risks are perceived smaller than the actual gain from partnering. This type of model is useful in some situations but not all. For example, if the partners were to develop a common platform compatible with e.g. software

of each of the members, everyone will be likely to win. On the other hand, if the partners were not able to find a common interest, the problems related to value capturing arise. However, it has not been thoroughly empirically examined how networks related to commercializing inventions decide on their strategies related to innovation and non-core ideas and whether these strategies vary from firm to firm within the network. This study takes a rather fresh viewpoint of a network that was built to seek for network benefits in finding and commercializing non-core ideas (inventions that are outside the core of the inventor firm's business). R&D collaboration has been rather extensively studied from multiple viewpoints including knowledge protection issues (e.g. Faems et al., 2007; Poppo and Zenger, 2002). Spin-out innovations and the role of universities has been acknowledged to be important in the competitive situation of today and they have been examined in some studies (e.g. Lockett and Wright, 2005). However, the commercialization of non-core ideas benefiting from network model has not been empirically addressed in these studies.

The problematic related to benefiting from innovations can be more pronounced in collaboration that deals with non-core ideas. The fear of losing knowledge or inventions that perhaps could be used later on in the innovating firm's own business can hinder the firms' willingness to expose such knowledge and inventions. However, a fact is, that innovations that reside outside of the firms own area of business do come up on a regular basis in firms that invest in R&D. In a volatile economic situation firms in different industries have to be able to use multiple ways of bringing in return on investments.

The research question that this study tries to tackle is: "How can firms overcome the obstacles in knowledge sharing when dealing with non-core ideas, and when is it worthwhile for companies to open their non-core ideas for external commercialization?" We aim at finding out to what extent the protection of own ideas is preventing the actual utilization of inventions and how these problems may be solved and how the strategies of the firms could be set to better fit this type of a collaboration setting in innovation context.

The study is designed as follows: A literature review is conducted in order to find the relevant literature from intellectual assets (intangible knowledge assets, know-how, staff skills, intellectual property rights and so on) and innovation protection and management literatures to set the framework for the study. Empirically we take a qualitative case study

approach where we present a case project that enhances innovations from non-core ideas of large enterprises in Finnish forest industry sector. The case is an example of an activity of Finnish forest industry cluster -program, which is part of the Finnish innovation system.

The analysis aims at identifying the differences in the strategies that firms initially are using related to the commercialization of inventions, especially those of non-core ideas. Moreover, aim is to find if the model developed in the project has changed companies' attitudes towards open innovation ideology in a traditionally rather protection-oriented industry.

2. KNOWLEDGE SHARING AND VALUE CREATION IN COLLABORATION

Value creation is one of the most essential processes of a firm. This means producing new knowledge that enables production of new inventions and finally creating value to the markets by offering new products. Large emphasis on innovation, defined as development and deployment of new products, processes and business models, has a central role in the firms' shift towards relying on their comparative advantage, which lies mostly in the use of human capital and knowledge (Bismuth and Tojo, 2008). Firms today need to be more and more innovative in order to preserve their competitive advantage. A firm's competitive advantage derives from the core competencies of the firm which are based on the firm-specific knowledge created within the firm over time (Prahalad and Hamel, 1990). Knowledge embodied in intellectual assets is becoming crucial for firms' competitiveness and growth (Bismuth and Tojo, 2008). Since very few firms can be good at the same time in many different things, concentrating on core-competences and thus, increase in outsourcing and collaboration have been the trends of the last decades. Indeed, the fierce competition is forcing firms to seek to use their intellectual assets in an effective way to produce profitable innovation (Bismuth and Tojo, 2008). Collaborating with partners with complementary knowledge has been recognized as one means to do that and to react to the rapid development of the technologically based industries (Harrison et al., 2001; Norman, 2002). In order to produce value the partners' employees need to interact effectively in order to share and leverage those complementary resources (Sirmon and Lane, 2004). It has been noted that inefficient knowledge sharing can hinder or even prevent getting to results from collaboration.

As knowledge sharing is one of the most essential processes to enable value creation in collaboration, it is of value that the collaborating partners possess both overlapping knowledge and absorptive capacity (Cohen and Levinthal, 1990; Dyer and Singh, 1998). Similar set of skills, resources and capabilities enables best chance for learning and using the learnt knowledge (Khamseh and Jolly, 2008). When the partners are highly similar, it is easier for them to recognize the value of the knowledge and to transfer and use the knowledge in question (Norman, 2002 & 2004). Knowledge overlap thus enhances knowledge sharing and getting to results. This could imply that with technologically close organizations with extensive overlap in knowledge and resources collaboration could be hindered by the fear of losing core knowledge by partners learning ability. Thus, with firms that are not so similar it may be easier to share knowledge in relation to the perceived risk. On the other hand, different kinds of obstacles might restrict knowledge flows. Kelly et al. (2002) have noted that over 55 percent of the first year problems in international alliances are related to people and relationships. Out of these relationship problems, 50 percent are related to communications and 29,7 percent are related to culture. Physical distance and language differences were found remarkable in leading to difficulties in communication, and cultural differences, such as national cultures, small and large company cultures and differences in industry cultures, were found to inflict on problems (Kelly et al., 2002). Differences in organizational cultures and professional cultures were found to also inflict on problems with alliance partners (Sirmon and Lane, 2004). It is thus not only national language that can produce difficulties, but also professional language, the jargon that for example engineers may use might be difficult for business people to understand and vice versa.

When firms outsource or collaborate with external partners there is always a risk that valuable firm-specific knowledge can be leaked outside of the company. This of course, could be critical when it comes to sustaining the competitive advantage of the firm. However, since many firms, at least the larger ones, still have their own internal R&D units, they are still active players when it comes to inventions. These inventions are sometimes usable, but quite many of them are outside the scope of the business of the firm and derive as by-products, or spin-offs. In other words, these inventions are non-core to the firm. As firms need to constantly be seeking something new, venturing in unknown areas and seeking possibilities for collaboration from unexpected areas, also benefiting from non-core ideas has risen as one new business opportunity for value creation. Because non-

core ideas are not in the core of the business of the innovator, the risks related to the commercialization of new innovations exist and are perhaps even more pronounced than in the case of inventions that are in the core of their business and that they know better. These risks are related to the risks that are normal to internal innovation processes, since many R&D projects end unsuccessfully, the inventions do not work and so forth. Thus the risk related to costs may outrun the possible profits. The end result of the innovation project is not known to the innovator until in the very end. The reason for collaboration related to non-core ideas may be among one of the simplest as with many other R&D projects; sharing risk.

Research has shown that it is not easy managing collaboration: around half of the alliances formed end up as failures as noted in several studies (Bleeke and Ernst, 1993; Duysters et al., 1999; Spekman et al., 1996). According to Kelly et al. (2002) many of the barriers that may turn the collaboration into unsuccessful one develop in the early stages of the alliance. The initial context of collaboration hardly encourages cooperation (Doz and Hamel, 1998). The employees involved in the collaboration may find themselves in unfamiliar situation in which they have no clear frame or reference (Kelly et al., 2002).

Collaboration related to commercializing non-core ideas involves different kinds of risks than the traditional co-creation of new knowledge and innovations. Where as the risk related to the traditional collaboration has been the risk of strategic knowledge leak and the risk of losing ownership of the intellectual property, in collaboration related to non-core ideas the risks could be already perceived in the input phase of the collaboration and choosing which ideas are handed out. Also the collaboration partners might fear that they will expose the idea and someone will take advantage of it in opportunistic way without creating any returns for the inventor firm. This of course would damage the inventing firm and the relationship with the opportunistically behaving partner.

Collaboration with outside partners always involves some amount of uncertainty and the possibility of opportunism can be present. In order to the partners to be able to share knowledge freely enough in order to create new knowledge, ideas and innovations, these risks need to be somehow controlled. Knowledge and innovation protection mechanisms can be used for controlling for risks and opportunism.

3. ENABLING COLLABORATION AND CAPTURING VALUE FROM INNOVATIONS

As mentioned above, collaboration related to innovations produces certain risks. These risks can be managed using protection mechanisms that may enable stability and ground rules and enhance knowledge transfer essential to success of collaboration.

Different governance structures have been examined that have been used in order to reduce uncertainty and opportunism in collaboration. Previous research by Mowery et al., 1996 and Chen, 2004 note equity based governance as an important formal condition for mitigating abuse of the disclosed knowledge and thus controlling for opportunism. Non-equity based governance means all the other forms of organizing for collaboration (such as collaboration contract or informal non-contractual collaboration) (Faems et al., 2007). Equity based governance create a mutual hostage situation that is said to reduce incentive for opportunistic behavior (Williamson, 1991). However, many studies have argued that this argumentation does not include the effect of relational capital on inter-firm knowledge sharing (Kale et al., 2000). Thus, some studies argue that trust, for example, is a relational characteristic that motivates knowledge sharing between firms (Kale et al., 2000).

It has been noted in earlier studies that formal protection over contracting can bring stability and safety into the collaboration. Contracts concerning collaboration can provide with ground rules on the responsibilities and rights of the participating firms that may enhance the collaboration. Also non-disclosure agreements signed internally by the employees of the firm and between the collaborating firms on rules on what the employees are aloud to talk about in the collaboration relationship and for making sure the partners will remain silent on the issues discussed in the collaboration. These mechanisms may enable the safe knowledge transfer between the collaborating firms' employees. On the other hand, if formal control is used overly strictly, it has been noted that it may even decrease the willingness to share knowledge and thus endanger the collaboration (Olander et al., 2008). The use of intellectual property rights such as patents, trade marks and copyright may help to bring the intangible intellectual assets more tangible and manageable which may be of value especially in collaboration situation. Intellectual property rights may also help in capturing value from innovations as they enable protection

over the innovation and thus the patent owner for example may exclusively use and out-license the product.

On the other hand, informal protection mechanisms may help to govern risks related to uncertainty by reducing opportunism, for example. By informal protection mechanisms we refer to the protective means that are not legal in their nature, but base on the softer ways of managing knowledge and innovations. These means include the use of human resources management related mechanisms (e.g. Baughn et al. 1997), tacitness and complexity of knowledge, practical concealment or secrecy (e.g. Hannah, 2005) and lead time (keeping ahead of competitors) (Leiponen and Byma, 2009). Also creation and increasing trust may work as a protection mechanism, since it has been noted to decrease opportunism related to collaboration relationships (Blomqvist, 2002). The more complex the knowledge is, the difficult it is for rivals to utilize (Winter, 1987).

Firms have different strategies in how they proceed with their innovations. If the innovation has been developed to resolve a certain problem, the process of research and development related to intellectual property questions may be totally different in terms of the time used for example than if the innovation was a by-product that was not anyhow connected to the firm's actual business. Today, it seems that firms from traditional fields of industry such as the process industry have more pressure to innovate. They need new areas of business and it could be said that these industries are facing transition and have started to look for new business opportunities actively. For firms in IT industry the case might yet again be totally different. Many IT related large firms have patented many of their innovations and possess large patent pools that enable licensing and cross-licensing. Patents may have been applied also in order to guarantee future possibilities of operating in certain field, and also to tie competitors' hands in certain fields.

Firms that engage in R&D in order to find new solutions to existing problems or creating totally new knowledge and innovations have several possible strategies related to innovations. Firms might either decide to apply for intellectual property rights (for example, a patent) to protect the innovation from imitation or in order to license the right to use the innovation to other firms, or they might want to keep the innovation a secret to prevent knowledge about the innovation from spreading around, which might give them lead time in developing the innovation further. Some firms choose patenting for reasons of

ensuring future freedom of operation. Others might fear a failure in patenting process or that a competitor would be granted one before they had the chance, and thus decide to publish their innovations for defence.

These kinds of strategic decisions become even more difficult when there are several partners involved. In fact, there might be problems from the very beginning, starting from the identified problem of firms' unwillingness to share knowledge to each other because of possible competitive positioning. This problem might be especially pronounced in more traditional manufacturing industries such as the Finnish forest sector, where the collaborating firms are at the same time competing for the same customers, and where there is not that long tradition in open innovation models. In this kind of setting there is evidence that in addition to ideas valuable for the firms themselves, a great amount of non-core inventions go to waste for reasons of incapability (caused by lack of resources or knowledge for example) to take advantage of them. These non-utilized ideas could be capitalized by the network partners or e.g. by small firms as a starting point for new innovations and business areas in the same or different industry sectors.

4. METHODOLOGY AND DATA

4.1. Methods and data collection

Since our idea in this study is to explore how firms could benefit from non-core ideas and create value both to themselves and to the markets, and considering the fact that there was not much existing literature concerning the phenomenon in question, we take a qualitative approach. We examine a case project, where a network was built in order to commercialize non-core ideas of a group of companies active in forest or process industries. The project was established and funded by the Forest Industry Future programme, which is a fixed term governmental programme enhancing innovations and new business creation in Finnish forest sector. This project was one of the several activities run by the program. In the network there were companies of different sizes and product types. For the purposes of the research we considered the large firms to be of value after all the starting point was about commercializing their non-core ideas, and interviewed experts from two of the three firms that participated the pilot project for commercialization of non-core ideas. In addition, to get an objective opinion from the project facilitating intermediary organization, we interviewed the project manager. The Figure 1 describes the relationships between the

case project participating organizations relationships and demonstrates the location of the interviewees.

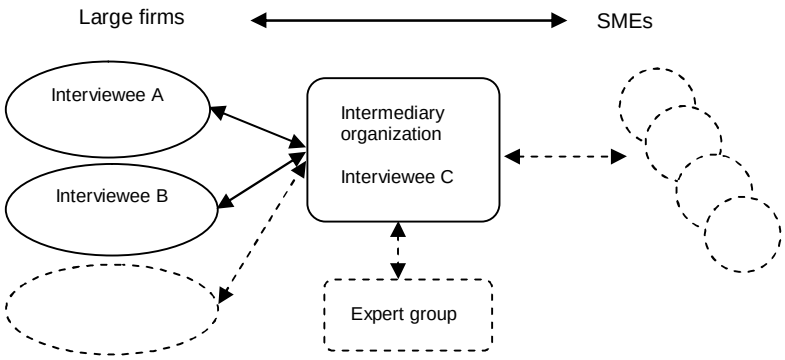

Figure 1 Case project participants and the interviewees

For the collection of data we used semi-structured theme interviews on knowledge sharing and knowledge protection, problems related to this kind of collaboration, risks, and the organization and management of collaboration. The interviews lasted up to one and a half hours and they were recorded and transcripted. There were two interviewers present in each interview in order to decrease the risk of single observer bias and one interviewee. The interviewees held positions as managers in research and development and new business creation or as project manager. The interviewees had good knowledge on the areas discussed in their respective firms. There was also a third large firm involved in the project, which we did not have access to at this time. However we feel that since we interviewed two of the three large firms, we have quite an adequate level of understanding related to the knowledge sharing problematics in the case project. Project documents were used in order to analyze the coherence of the data and thus improve the reliability of the data and also to get background knowledge of the case project.

4.2. Case study presentation: Enhancing the use of non-core innovations

The focal case in our study was a development program for forest cluster´s new and growth oriented companies. This was a pilot project to identify and document the unutilized ides from two angles:

- Ideas and prototypes that can be outsourced from companies' R&D portfolios, i.e. spin-off and outlicensing cases and sales possibilities or possible joint venture –cases.

- "Spin-in" –cases completing the product, technology and business with technologies from small and medium size (SME) companies, later also from research institutes and universities

As a result of this program a business model for collecting best ideas with business potential and developing the ideas into new business for SMEs was demonstrated. The goal was to test the willingness and potential of Finnish forest cluster to develop its innovation operations according to open innovation principles. The last part of the programme started in the beginning of October 2009 and lasted 4 months. There had been a preliminary project (pre-study) where the model was already developed on theoretical bases.

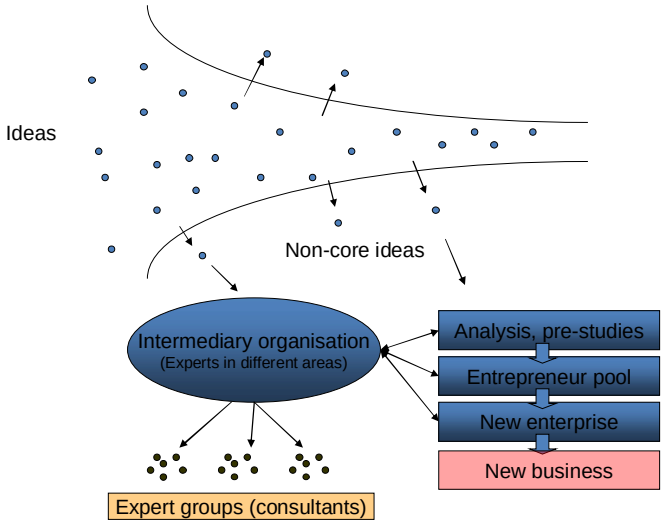

Figure 2 Illustration of the model for utilizing the non-core ideas

The model presented in the figure 1 describes how the ideas in the innovation funnel that are not going further in the developing organisation's process could be utilized. Ideas can be taken into the evaluation by an expert group and if seen potential for some other company the actor's in the Finnish forest industry cluster program could find a potential user (SME) for the idea. During the program a pool of SMEs who have interest in these ideas was collected. Also a pool of consultants who have experience in different areas in process industry was formed. These consultants may be used for idea evaluation and to conduct e.g. pre-studies of the market potential of the ideas. The forest industry cluster program was acting as financer and a support organisation for finding potential SMEs.

The ideas that were brought into this model were in different stages and they were basically classified in the starting point as follows: 1) Ideas which have only been preliminary studied. Market is still relatively unknown and the commercialisation potential is still unclear. 2) Market has been analysed and the pilot-customers are recognised. Partners and commercialisation model are still unclear. 3) The market potential is studied, but there is no strategic interest for the company to invest in the idea. The ideas also had different positions in relation to innovator company's strategy, business and imago.

The model was put into action and a group of ideas was evaluated, some of them were taken into closer studies and some ideas are still in the process of evaluation and negotiations are running between the idea generator company and potential utilizer.

After the project ended the conclusion was that the model demonstrated by the program was worth developing further. Though, the potential should not be overestimated. There were some obstacles for open innovation in this sector. E.g. some larger firms were not willing to act as "an idea incubator" for SMEs, but there were companies that had interest in outsourcing or "spinning out" the unutilized ideas. However, although at least some of the firms want to continue the development of a model for managing the commercialization of non-core ideas in collaboration, there were also many challenges and the collaboration was actually finished more or less without results. We will examine and evaluate the model used by examining the case project in terms of three actors in the collaboration network and try to find reasons and solutions for the challenges faced by the firms in collaboration.Analysis and themes

We analyzed the content of the interview data according to themes such as protection strategy, motivation and benefits, risks and problems in knowledge sharing, the effects of similarity of background of the firms to knowledge sharing, governance/management of the collaboration and the ways of extracting value from non-core ideas in the project. Analysis was done separately by two researchers at the first stage, and afterwards the viewpoints were compared and combined in the final form.

With this analysis we aim at finding out to what extent the protection of own ideas is preventing the actual utilization of ideas and how these problems may be solved and how

the strategies of the firms could be set to better fit this type of a collaboration setting in network of innovation context.

4.3. Company experiences from the non-core innovation project

Traditionally, companies in the forest sector have been quite innovative and the traditional collaboration models for R&D have quite often included some sort of buyer-supplier collaboration rather than collaboration between potential rivals. However, these new types of collaboration models have risen during the last years within this industry as well. Especially, non-core ideas have only recently risen as a potential value creation and capture factor in collaboration efforts of the studied firms. When regarding the case-companies' use of protection mechanisms and their strategies towards the use of IPRs, it seems that they apply multiple ways in protecting their ideas. Contracting and the use of non-disclosure agreements are typical in R&D cooperation projects, at least if the project is related to the core-business of the company, which was noted by both interviewees A and B. "These days we want to have certain contracts signed early on, and we try to be quite active in protecting everything that is from us in the collaboration," said the interviewee B. The interviewee also found that this might sometimes be contradictory to the idea of open innovation. As the interviewee A noted, the cooperation partners are also chosen so that risks related to knowledge sharing in collaboration, for example, are minimized. In this task, the reputation of a potential partnering firm was considered to play a more important role than the size of firm, according to interviewee A. Patenting is used to protect the inventions when possible and when considered needed and publishing the idea to prevent others from patenting it are used as means to protect ideas, said the interviewee A. As the interviewee C noted, the firms perhaps did not have that much experience of collaborating on innovations with their rivals. This, as the interviewee C continued, was not a problem for this kind of collaboration, but merely it meant that the ground rules should be clear and formed in such ways that would fit the operation models of the large firms. Also the interviewee A noted, that having a clear contract that discusses the rules and responsibilities of partners decreases problems, as it clears up the boundaries of the collaboration.

Even though all of the interviewees agreed that every firm had their unique reasons for engaging in to collaboration, one clear motivation noted by the firms for this kind of a cooperation model was quite pragmatic: Companies targeted growth in sales or license

incomes, in other words, returns on their non-core ideas alongside their core innovations. “Yes, sales growth. If it’s core-business, it means sales growth. But in new starts, we could think that it comes for example in machine business or licenses or so,” said the interviewee A. Companies may also look for new ideas and to have a suitable discussion forum for innovation. “Our goal is, in continuation, to get network of SMEs, and by that more ideas into to funnel’s starting end.” (Interviewee A) “We think quite pragmatically, what could bring new business. Also that we would know better our SMEs, create networks. Networks where we can discuss.” The role of organization C was considered important in this sense: “We need a catalyst that connects us to these SMEs, that could use the inventions or that may have inventions for us to use,” said the interviewee A about the role of organization C in the model. Also the general development of the business area was mentioned as a motivation and employing open innovation style of approach was found interesting in firm B. “We wanted to learn how to operate with non-core inventions that are of value. We wanted to find a channel for them,” said the interviewee B.

The risk of creating new businesses to compete with one’s own is seen as a main risk in this kind of activity, even though the benefits are seen bigger than risks. “Risk is that the collaboration will create competition. But you cannot live in fear. We are on the benefit side clearly.” (Interviewee A) The interviewee in organization C thought that it was easy to collaborate with the large firms on individual level. “We had nice discussions together with the firms. We considered all sorts of registers for identifying the suitable SMEs for the needs of the project and so on,” said the interviewee C. However, there was uncertainty during the process of choosing and communicating non-core innovations to the collaboration: “We had some cases, when an invention that had already been communicated to the collaboration project was withdrawn when the original inventor had gotten a clue of what could be done with the invention,” he said. As the interviewees B and C both recognized, the inventions were widely spread around the organizations, and it was difficult to get a clear sense of what was a non-core idea and what was not and what perhaps could be used in the collaboration. “We did not have a process for discussing and identifying non-core ideas. It hasn’t been an option before. So we didn’t have a bank of non-core inventions that we could have used. The missing of internal operational model is one reason why there were not that many invention in the funnel,” concluded the interviewee B. “Ideas are on different levels in their maturity. Some are just ideas, others are more advanced. There may exist patents and so on. However, an invention on the level

of an idea might be great for someone, while a patented invention might be really difficult to commercialize because of, for example, operational problems," noted the interviewee C. Interviewees B and C agreed that the existence of non-core ideas was not the problem with proceeding with the inventions, but the fact that not that many inventions were communicated to the collaboration model. Interviewee B found that "No matter what level the ideas are on, we need to know how the troop of ideas proceeds and under what conditions? We need to know what to expect, and when and how to act. We feel that these issues are not too simple," said the interviewee B.

If the cooperative company is a competitor at the same time, the cooperation was likely to stay on a very general level noted both the interviewees A and B. It seems to be easier to cooperate with the companies from other fields. "There may be a difference. It is quite difficult to think that we would do close cooperation with competitors in core areas. But if they are a bit aside then it becomes easier," said the interviewee A. The interviewee also said that there is better potential for new ideas if the network consists of people with different backgrounds.

5. DISCUSSION

In the interviews it came apparent that the open innovation type of activities is relatively new to companies in this sector, and that they are quite careful in giving their ideas into this kind of collaboration. This is the case even when the idea is not related to the company's core-business. This is a clear challenge for a project of this kind and to the functioning of this kind of operation model.

There seems to be a cultural change taking place also in the more traditional fields of business in relation to open innovation or network type innovation models. On the other hand, there are clear challenges in creation of open discussion and knowledge sharing atmosphere. Companies are quite cautious about spreading their ideas, even though they see also clear benefits in this kind of operation mode.

Collaboration with direct competitors was still considered challenging, although possible if the ideas did not concern the core of the partners businesses. However, if the ideas only touch the core areas of the partners business, it is easier to collaborate without the fear of losing important knowledge. In this sense, it may be even easier to collaborate with partner

whose background knowledge is very similar, since the partners then speak the same language and understand similar technical issues. During the process, both partners felt at ease when sharing knowledge about their processes and this way helped each other in building the processes of dealing internally with non-core ideas.

According to some of the comments of the large firms and of the project manager, the collaboration may have suffered some from lack of explicitness in some areas such as the play ground and the different players. The missing of clear boundaries and knowledge of all of the collaborating partners (the SMEs) was found to be a deficiency. This was because the firms were used to operating in tight collaboration with suppliers for example under clearly known play ground and clear agreements on what the collaboration is about, the responsibilities and ownership issues etc. After all, the firms did not want to give out knowledge to potential rivals and thus the unfamiliarity of the SMEs may have also led to the large firms being careful with their ideas. In this kind of collaboration project on non-core ideas the bunch of collaboration partners is more undefined and thus uneasily managed which makes contracting more difficult.

It seems that by negotiating a contract that would benefit all participants would be good for a collaboration like this, as one interviewee mentioned that there were no clear rules and roles for the network firms and thus it was difficult to know what was expected from them. The results of the empirical examination enlighten the possibilities to overcome the concrete problems that are hindering the utilization of ideas in innovation networks. Seemingly, it is important to find a win-win solution for the involved parties. A proper potential financial compensation may be the key to open up the innovation network, i.e. it is of upmost importance to find suitable business models for the utilized innovations. The results indicate that also the traditional manufacturing industries are starting to recognize the value of knowledge sharing and openness in their innovation activities.

Collaboration on non-core ideas takes flinging oneself to an unknown and more or less undefined environment where open knowledge sharing and communication is needed for the project to succeed, which takes a lot of courage from firms taking part as the results are not known and risks are potential. Still, there exist a lot of unused ideas that are not needed by the firm itself. The need for commercializing these kinds of ideas thus exists, and the importance is acknowledged by the firms. They want to be able to develop a model that

would fit the needs of the larger firms that might actually provide profit to the firms, but also in the name of corporate social responsibility.

6. CONCLUSIONS

This study furthers the research on the simultaneous knowledge sharing and knowledge protection paradox in an innovation network and open innovation model context. The study looks for ways to allow for freer knowledge sharing and thus, enable more efficiency in innovation practices. There were many lessons learned in the participating large firms. One of the lessons is the absence of a clear model for identifying and managing non-core ideas internally within the firms. After the project has ended the firms have managed to design and implement internal models that are of value in further endeavours related to non-core ideas.

This study was conducted as a case study, and the data was limited only in handful of interviews from the actors in the project. These viewpoints are not necessarily reflecting the opinion of the total company, even though it gives a picture what are the challenges in this kind of operating model. Further studies could include more interviews from actors in this case project, and it might be also worthwhile to examine similar models in other contexts.

The study has value for several actors in the field of innovations. Managers that are acting in innovation networks can recognize the potential problem areas in knowledge sharing. Knowledge about value creation from non-core inventions is beneficial to small firms as well as larger companies. One of the major findings in this study is that there is a real potential for development of this kind of innovation model in businesses which are facing major challenges in restructuring of their industry and having a need for new innovations. Much needed start ups may be build on these non-core ideas and inventions. This is also in the interest of governmental innovation activities and serving the national interests of small open economies that strongly rely on innovations and new technologies.

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Genesis of the cross-border regional innovation systems interactions: context of Finnish-Russian border

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ABSTRACT

The globalization processes play the crucial role in evolution of the innovation development process. The modern innovations are developing in the conditions of the open global economy characterized by the open market, high level of competition, global communication system and increasing the speed of innovation creation and diffusion. In spite of the globalization influence the regional innovation systems still could feel the influence of the territorial aspects as cross-border location. In this paper the process of cross-border cooperation in innovation sphere at Finnish-Russian border is observed from the point of the cross-border cooperation genesis, based on the macro processes like European integration or the collapse of the USSR. Those macro processes are also made the significant influence at the regional economies especially at the economies of the border regions of EU and Russia, and mostly presuppose the specific of the policy, business processes, readiness for innovation acceptance in the sphere of cross-border cooperation from the both sides. It is also even the difference in the approaches to analysis of the cross-border issues from the sides of European and Russian researches, so the part of the paper is aimed to show and explain the nature of this difference. Then the logic is moving to the concept issues of the regional innovation systems interaction, the background of cross-border cooperation, and then there is attempt to describe the interaction strategies and the stage of regional innovation interaction process at the Finnish-Russian border.

Keywords: Cross-border cooperation, integration process, regional innovation system, innovation development.

1. INTRODUCTION

In the modern global world the innovations and competences become the crucial factors for the regional economic development. Due to the worldwide communication system the information, knowledge and innovations have a high speed of dissemination which is not limited by geographical distance between the actors of communication. Globalization processes are rapidly increasing the international interactions between countries, companies, communities in all spheres of economic and public life.

The globalization has changed the paradigm of the regional development rapidly increasing the role of regions in the world economy. The modern regional economy should be ready to meet the globalization challenges as open economy, active labor migration, high level of competitiveness and crucial role of knowledge and innovations. Innovation

development becomes the essential part of the modern regional economy and the role of that sector is permanently increasing.

The border regions meet all challenges of globalization at the same time playing the role of ground for cross-border interregional interactions which are knitting the border regions by the links in the different spheres from economic to personal contacts. The intensity and effectiveness of cross-border cooperation are depended on many different factors, political situation, legislation aspects, level of tolerance and cross-cultural differences - all those and many other factors have the meaning. Also the genesis of cross-border interactions and the influence of the macro level processes as globalization, integration processes and others have an important role and help to understand the specific of cross-border processes at the concrete border.

The quality of the cross-border cooperation at the concrete border is determined the general framework of the interregional interactions across the border. Quality of cross-border cooperation has a lot of characteristics as the level of institutional support, political framework, and intensity of the business contacts, volume and structure of direct investments, success of joint initiatives, cultural contacts and many others. The level of cross-border cooperation development also determines the framework of cross-border interactions in innovation sphere, in this case the interactions of regional innovation systems is understood as the complex of interactions between its actors.

In spite of globalization effects as for example the global communication network, high level of the labor mobility, increasing the importance of the knowledge and innovations and others, the cross-border interactions in the innovation sphere still have its own specific and play the significant role for the innovation development of the border regions.

2. GLOBALIZATION AND INNOVATION DEVELOPMENT

The process of globalization could be determined as the scope of all processes leading to incorporation of Earth population into the united world community and all economies into the global economy (J. Baylis, St. Smith. 1997).

Due to enhancing the influence of globalization to the development of the regions the evolution of regionalism is becoming the separate object for researches. It is interesting to

mention the classification of the special features for old and new regionalism proposed by Hettne (1999). Some of the special features of new regionalism is determining the environment for the development of the regional innovation systems that particularly interesting in the context of open innovations concept.

New regionalism is characterized by decreasing the role of the protectionism measures in economic policy and focusing at vector of open economy including the high level of economics interdependency. Open economy presupposes that the interregional interactions are taking a place in conditions of open communications which means that all actors have own interests, aiming to active inclusion in world economy, they are independent and free in their decisions to interact across the border and have the possibility for such interactions. There is also forming the specific open innovation environment where the innovation solutions and technologies are becoming available for actors and open for different kind of interactions and co-operating.

Globalization processes have had a very strong influence at the innovation process at the last 20 years and still this influence is fundamental. For example one of the main tendencies in evolution of innovation process is still the speeding-up. The period for the new product launching becomes much shorter as also the life cycle of product itself (including not only high technical production). The key role in this process belongs to ICT and communication technologies development which contributing in developing of the open innovation space creating the worldwide networks for the information distribution, searching and processing.

Business becomes much more active in their interactions and networks, that tendency is also spreading at innovation sphere, so the companies relevant to innovation process are also intensify their interactions and acquisitions, participation in network structures. There is also the strengthening of the links between the companies and the knowledge think-tanks as the universities, laboratories, academic and applied science centres. In the context of internationalization of the innovation process it is also increasing the role of international quality standards and quality management approach, which create the common game rules and make the international interactions in innovation sphere more effective from the time and costs points.

It is important to notice that in the modern open economy the role of “knowledge” transfer in general volume of international trade is stably increasing. To hold the competitiveness positions the companies should be very fast and looking for new opportunities including innovation solutions and technologies. That is creating the conditions for development of the open market for innovation production including not only ready products, but concrete innovation solutions and outsourcing services. Gradually the old self-centralized business model is transforming to new open business model where the network approach and outsourcing models are using as an efficient form of economic activity.

So due to globalization influence the innovation development process is not more the close internal process for companies, as this process now could be separated for different stages, and each of them is realized at the place, conditions and by the team which could bring the most value contribution for the whole innovation development process. That approach lets to increase the competitiveness of the companies due to using much more wide resource panel (outsourcing) and at the end increases the economic effectiveness of the innovation development process.

3. GENESIS OF CROSS-BORDER INTERACTIONS: FINLAND – RUSSIA

The meaning of the term “interregional interaction” is arising from the impossibility of the modern region development without the involving into the external interactions system. The modern region is the open system which is included in the complex of multilevel interactions. One of the tasks for the regional governance is to support the interregional interactions using them as the resource for development, for the border region this task is more complicated. The border region has its own priorities of the regional development and independent regional policy to reach the aims and objectives but at the same time the border region should play the role of translator of the national policy in the cross-border interactions. If the cross-border cooperation is developing as the policy and has its own national \ regional targets and priorities, it could become the efficient mechanism for the regional development. Otherwise if it is developing on case-by case basis it is making the challenge for border regions to balance the interests of different governance levels and realize the cross-border cooperation initiatives in the effective way to bring the value as for the concrete border municipality, region and for country in the whole. That is why the macro context as the national policy of cross-border cooperation is very important and determines the vector of cross-border interactions.

According to the economic-theoretical approach one of the main reasons of integration processes is economic interest of participated sides, and integration policy is the derivative from the original aspiration to the open market (Molle, 1994). Border regions are assigned to play the crucial role in that process. Opposite to protectionism measures which is aiming to provide the sustainability of regional system from the external influences, the growth of interregional interactions, knitting of the economic relations and links including the moving of the capital, labor force, creating joint ventures and so on, is strengthening the sustainability of the joint cross-border system including both border regions. In spite of that the effect of such interaction could be no similar for involved regions but this model is still bringing the value to both participants.

Cross-border interactions are knitting the different regional parts establishing the network of cooperation and stimulating the interaction of regional economies. Opposite to protectionism measures which is aiming to provide the sustainability of regional system from the external influences, the growth of interregional interactions, knitting of the economic relations and links including the moving of the capital, labor force, creating joint ventures and so on, is strengthening the sustainability of the joint cross-border system including both border regions. In spite of that the effect of such interaction could be no similar for involved regions but this model is still bringing the value to both participants.

Supporting by the resources and political will the cross-border cooperation in European Union became the effective mechanism of the regional policy targeting as the interests of European Union as integration union and also the involved countries, border regions and local territories. Enlargement of European Union has brought the new tasks for European integration as the old external border becomes the new internal border and then need more active integration in all spheres of economic and public life. The policy for the external borders of European Union is continuing the ideology of European integration and realized in more soft integration focusing mostly at creating safe environment and sustainable policy cooperation as the basis for more intensive economic cooperation in future.

Integration as the model of interregional interactions could be named as the general vector of European regional development, and firstly for the border regions where integration processes becomes the mechanism to overcome the economic isolation and decrease the disparities and the social tension. The existing of such dominants as the level of the large-

scale integration unions determines the general context for integration interactions at the level of macro regions, interactions of the lower level objects as the cross-border regions or local border areas develope in the frame of that context. Development of international law and relevant regulating norms lets municipalities and its groups to initiate and develop the cross-border interregional interactions on their own so they are quite independent but still influenced by the macro factors.

Due to strengthening of the external influence, economic interregional links, growth of informational transparency and forming the united communication space the border regions forced to take the conscious active position at the managing of the process, risks and consequences of the interregional interactions as a necessary condition to save and increase their global competitiveness. It should be said that this feature is mostly actual for internal EU borders but even at the borders of different integration unions there is already understanding that cross-border interregional relations is the basis for safe environment and additional opportunity for economic development.

Finland as the adopter of the European Union neighbouring policy follows that vector and at the same time actively using the opportunities of cross-border interactions for the regional development. Finland has rather clear strategy for interactions with Russia and especially in the part of the cross-border cooperation policy.

As for Russia, during the last 20 years Russia was going through the difficult period of different institutional changes and economic transformations. The external interregional interactions were the new experience for the Russian border regions and cross-border interactions were the real challenge. Those interactions were developed very intensively but not always successfully. There were (much less but also still now) some opinions that intensive cross-border interactions could bring deformation to the local economy, and there is even a risk of economic separatism of some border areas which become involved in cross-border interactions more than in internal economic links and the interactions in the frame of the region and country (Sigov, 2001). That point of view is very rare now, but it is important to mention here for better understanding of the background of cross-border cooperation from Russian side. At the current time Russia is trying to develop the conscious consistent policy of cross-border cooperation, but it is a lot of to do in that direction.

It could be said that cross-border cooperation at Finland-Russia border is understood now as an essential part of the successful strategic partnership between the European Union and the Russian Federation. Each side has their own background, motivation and priorities in cross-border cooperation. Therefore the context of border ideology is very important for the understanding the nature of cross-border cooperation policy at external borders of EU, particularly at Russian-Finnish border.

4. SOME ASPECTS OF THE CROSS-BORDER TERMINOLOGY

The main factor which determines the specific of cross-border interregional interactions is the border itself. The term “border” has not only the meaning the border of state but more the border of economic and social space homogeneity. The borderline of two countries is the place of contiguity of two systems each of those has differ features and characteristics. Borderline is the kind of buffer which realizes its barrier function when one of the systems tries to transfer its qualities outside the system limits. Border also realizes the filter function accepting and adopting just such qualities which is bringing value for the accepting system (Vardomskiy, Golicina, Samburova, 1989).

It is important to underline that the cross-border cooperation as a process has own specific depending on the historical genesis of the concrete borders. The science vision of the European researcher at cross-border cooperation process is inseparably knitted with the concept of the modern European regionalism, which finds the reflection at regional policy, cross-border cooperation policy and others spheres. The specific of European regionalism is reflecting in targeting the high level of economic integration and sustainable political union. So it could be said that ideology of European cross-border cooperation is based on integration process and the contact function of the border in that process is prevalent. That approach is reflecting in the policy of European Union, so the Council of Europe declare that cross-border regions are ‘characterised by homogenous features and functional interdependencies because otherwise there is no need for cross-border co-operation’ (CoE, 1972). And another definition has camee after the period of integration process when the integration links became stronger and participated border regions could be evaluated as the potential region described by the term “transfrontier region” - a ‘transfrontier region is a potential region, inherent in geography, history, ecology, ethnic groups, economic possibilities and so on, but disrupted by the sovereignty of the governments ruling on each side of the frontier’ (CoE, 1995).

In science works of Russian researchers the most common term is “border region” that in the most of definitions is determined with mentioning as administrative and territorial generality. So the size of border region is determined by two main factors: by the state border as the political and economic borderline and by the size of territory which is equal to the area of authority area of responsibility as regional or municipal level (political influence) (Mezhevich, 2002). The ideology of cross-border cooperation from Russian side is based more on the concept of cooperation of two border regions than on the concept of potential region. The European understanding of cross-border region in Russian researches is explained by separate term “transboundary region” which is more close to the concept of joint potential region, and along the Russian external borders it is describing the experience of Euroregions which are aimed to realize the concept of joint integrate development.

Interregional interactions are not always could be determined by the factor of geographical border. There is a set of formal and informal borders, where formal borders are the usual administrative borders and frames of legislation, policy, national identity, and informal borders are the spaces of economic influence, shares of markets, labor mobility, cognitive changes and etc. As the result of interregional interactions the formal and informal borders become less and less equal creating the different layers of borders (Neclessa, 2001). In case if both sides are interested in active interaction and could give the contribution to each other and get value, there is the conditions for realizing of win-win model of cooperation – it is the best way to go for real integration when informal borders bit by bit disappear and differences between interacting systems are mostly smooth and even new qualities appear as the result of systems interaction. The phenomena of “moving” borders in the context of open innovation concept and the growth of international investments is becoming more and more actual for researches aimed to analyze the cross-border interregional interaction in innovation sphere.

In the context of innovation activity cross-border space could be viewed as the institutional environment, which determins the specific of innovation process in cross-border interactions where the different kinds of actors from both sides are involved. Specific of institutional environment is certainly influenced at features of innovation process itself, communication and processes architecture in the frame of regional innovation system.

5. REGIONAL INNOVATION SYSTEM AS THE ACTOR OF THE CROSS-BORDER INTERREGIONAL INTERACTION

The regional innovation system of the border region is simultaneously the part of national innovation system and acceptor of its ideology, priorities, norms and models of interaction. At the same time it is the self-sufficient actor which also based on its own specific, resources and influenced factors, creates the priorities, institutional environment, mechanism of development for innovation sphere etc. Modern regional innovation system is open system and interested in attracting the resources and expending of activities through international interactions. For border regions that factor has the specific when the interactions with the border region is looked as more attractive due to presence of the differences which provoke the business interest and also due to geographical closeness which reduces the transaction costs - functional proximity, and more close knowledge of business and cognitive specific which increase the level of trust and openness - relational proximity (Torre and Gilly, 2000). So for the border regions the cross-border interactions of the regional innovation systems have a strong potential, the effectiveness of such interaction is depending on the number of influenced external and internal factors.

The Finnish policy for a long period has been oriented to strengthening of the national innovation system (which in the frame of current topic could be understood as border regional innovation system). The main goals of that policy are to strength the knowledge branch and increase the level of international importance for Finnish science researches. The priority is given to researches which let to make the breakthrough at international level. In the frame of technological and innovation policy the priorities are in improving of the network interaction with countries and regions leading in technological development. Cross-border cooperation in innovation sphere is also in agenda list as the direction having the strategic prospective. So at the Finnish side there is clear vector of internationalization of innovation activity which confirmed at national level and which is also are in the context of general EU policy as in innovation sphere as also in cross-border cooperation priorities.

Regional innovation policy is very young in Russia as the regional policy itself, so the Russian regions is doing their first steps in forming the regional innovation strategies supported with the relevant norms and political documents. As for the Russian national

innovation policy – it is making attempt to reanimate the national innovation system which is now mostly mosaic of the regional innovation systems based on the background of the core research think tanks. But the new wave of innovation actors is developing, the universities become more active in adopting the educational innovations and also in international cooperation. It is strong vector now for strengthening the science researches in universities and supporting the integration with the academic research institutes. Modernization is sounded as the priority of the national development and the topic of innovations is now has very high political level. That is the good sign for the future and it could be expected that the additional resources for innovation development including the more open policy in the sphere of international innovation cooperation could be allocated. So it is expecting that this goal will be supported by relevant stimulation mechanisms which will create the real conditions for innovation development. That is also supported the interest of Russian border regions to the cross-border interactions which could support the adoption of the best practice of innovation development support and integrate the principles of open innovation concept into the regional innovation system.

Each of the regional innovation systems has its own interaction strategy based on its own priorities, resources, strengths and weakness. Basically it could be described two main types of such strategies:

- Active strategy when more developed regional innovation system has the internationalization as one of priorities and tries to create the sustainable system of interactions aiming to expand its activity and also get a value from interactions with the bordering regional innovation system. That strategy is usually supported by national, regional funds, and also realized not only by companies but also through support institutions, universities, knowledge think tanks, etc. So the cross-border cooperation in innovation sphere becomes the part of the national innovation strategy. As the most radical stage it could be named aggressive strategy, when more developed player is trying to reduce the transaction costs and use the resources of weaker player or aggressively buying the innovation solutions and businesses, and not aiming at sustainable development of prospective cooperation. The aggressive strategy is more close to transnational company's strategy and mostly realized by large international companies.

- Adaptation strategy, when the regional innovation system which has no enough resources for active internationalization is becoming a target object of more active strategy of

neighbouring regional innovation system and experiencing strong external influence. The most radical form of that could be called defending strategy when player chooses the close model and trying to avoid any external interactions. In a modern world the close model is very rare at the level of regional innovation systems because it needs specific political regime (but could be clear imagine from the USSR planned economy experience). So in the system of cross-border interactions there are the elements of spontaneity and mass psychology which are influenced at the level of intensity of cross-border interactions. In global economy political power (not at national or regional or local level) can't control all international interactions, it creates the conditions which could help or hamper the interaction process, but actors are interacting as independent players. Realizing the adaptation strategy the regional innovation system is trying to adopt proposed initiatives, game rules and norms in the most efficient way, increasing its own competence and knowledge and receiving additional resources and opportunities for development.

Those kinds of strategies could be varied for different sectors of economic activities and more effective in case of interaction between economically active partners with the certain number of differences creating the space for mutual interest. At the same time each of the systems is trying to find the new opportunities for development in external interactions and trying to expand its qualities to cover the cross-border space to create the environment which will be recognized by its stakeholders as habitual and stimulate them for more active external interactions.

It is important to notice that strategy means not only the algorithm of development as the task for regional authorities but also the scope of all patterns of behavior realized by all actors involved, the joint vector of such behaviors could be called as unconscious strategy.

If we are talking about the Russian and Finnish interactions in innovation sphere it is more close to the combination of active strategy from the Finnish side and adaptation strategy from the Russian side. That conclusion is going from analyzing the general context of cross-border cooperation above and also based on review of development documents of regions in innovation sphere which is confirmed the priorities and objectives for the regional innovation system.

In spite of the positive tendency it could be said that the regional innovation systems in Russia now is more self-centralized systems which is concentrating mostly at internal problems and tasks. The innovation actors become more and more open for international and cross-border interactions but it is mostly the experience of separate players than a mainstream tendency. So if we are talking about the strategy of interregional interactions in innovation sphere it could be said that the Russian regional innovation systems is now more close to the adaptation strategy than to active strategy. Some separate companies could have the strategies with another vector but it is not relevant to regional innovation system as the complex.

The effective combination of active and adaptation strategies is very close to win-win model of interactions. And if both sides have the clear goals and interest in interacting, it creates great preconditions for realization of open innovation concept.

6. CONCLUSIONS

The present period of cross-border cooperation at Finnish-Russian border is the especially logical and actual moment to strength the cooperation in innovation sphere between Russian and Finland border regions. This conclusion is going through the analysis of cross-border evolution at Russian-Finnish border. The first stage – is the stage of started contacts, establishing relations between the political bodies, arising interest to cross-border trade. Then it is developed to the next stage when due to favourable economical and political conditions the transport and cross-border infrastructure (firstly border-crossing points) starting to develop very actively that lead to the intensification of business communications. It is the stage of gradual coalescence_of economics, establishing the institutions supported the cross-border business interactions, improving the communication and transport infrastructures.

That stage is also important because it is forming the level of trust between not only concrete actors but also the general level of trust based on the balance of successful stories and lessons learnt. That trust factor is the important marker for business and becoming the factor which could influence on the decisions about initiating of cross-border interactions. Finnish-Russian border have not so long history of cooperation but it could be said that it has already reached the certain level of trust at all levels: between political bodies, between businesses and of course between intermediates and expert community who are mostly

driving new ideas and initiatives in the cross-border cooperation. That stage could be characterized by higher level of openness and readiness to more deep cooperation and sharing the knowledge and the competences. What could be expected as the next stage?

In terms of strong political will to support innovation development as in Finland as in Russia and having the preferable conditions for support such initiatives in cross-border area it could be expected the enhancing and more deep cooperation, increasing number of acquisitions, forming the cross-border innovation clusters in some specific innovation areas. Looking in the future the strategic prospective is the more deep integration which will be characterized by interlinks of resources, investments, competences and knowledge and could lead to creation of joint ventures using the most advantages of both sides and produced the innovation product for the third countries. But the logic of development has its own stages, integration process has its logical steps and it is important not to spoil the previous success and efficiently use the current conjuncture and opportunities for mutual fruitful cooperation.

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