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 make it difficult to regulate open innovation with intellectual property law, that in open innovation (1) there are always multiple claim holders who have heterogeneous interests and that open innovation requires (2) openness in the communication and 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 does regulate the question of co-inventor, co-creator, and co-owner but does 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, the fluid 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 suggests law and policy makers to explore a creation of particular defence for joint collaborators against the claims of infringement in patent law.

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

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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 are 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*

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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. Ashish 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 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. 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

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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 is 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, that are relevant to 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.

	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 /

[Table 1. Modalities of Open Innovation]

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)

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

[Table 2. IP Strategies and Open Innovation]

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 methods 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 whom among the multiple actors would be able to mediate the various IP claims (to acquire, manage and assert the rights) and 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.

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

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

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.

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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