

In Search of a Useful Theory of the Productive Potential of Intellectual Property Rights

Birgitte Andersen and Sue Konzelmann

- Birgitte Andersen is *Reader in the Economics and Management of Innovation* at Birkbeck College, University of London.
- Sue Konzelmann is *Reader in Management* at Birkbeck College, University of London and *Associate Research Fellow* in the ESRC Centre for Business Research at the University of Cambridge.
- Correspondence to both authors: Department of Management, Birkbeck, University of London, Malet Street Bloomsbury, London WC1E 7HX, United Kingdom, e-mail: b.andersen@bbk.ac.uk and s.konzelmann@bbk.ac.uk.

Abstract

It is a problem that mainstream theory, which has informed the belief systems regarding the operation as well as the predicted social and economic effects of IPR systems, cannot explain why the IPR system generates different performance results and varying potential for growth across the firms, sectors and nations participating in the IPR system. This paper sketches a theory of the ‘Productive Potential of Intellectual Property Rights’ which is able to do just that. Focusing on the ‘rules of the game’ embedded in the institutional IPR environment and the ‘play of the game’ within the alternative institutions of IPR governance, the paper emphasizes the importance of the nature or quality of the relationships among IPR stakeholders and the contribution of such relationships to the processes of financial and non-financial value creation and distribution from IPRs. The central role of cooperation, asymmetric relationships, and the effective resolution of conflicting interests amongst stakeholders is addressed. It is suggested that the proposed framework provides a better starting point for the design of IPR policy and management.

Key words: Intellectual property rights, productive systems, governance, value creation and distribution, conflict.

JEL classification: D23, L14, O34, Z13

1. Introduction

In most mature economies, the exploitation of intellectual property (IP) is legally protected through the use of intellectual property rights (IPRs), which evolved alongside property rights on land, capital and labour. IPRs take the form of patents (in the case of knowledge embedded in novel ideas), trade secrets (where there is no requirement of ‘novelty’), copyrights and trademarks (in the case of knowledge embedded in original expressions or effort) and other rights. Because control over the use of an intellectual property right (IPR) requires ownership or a license, the growing

importance of knowledge-based assets and creative expressions in recent years has been accompanied by recognition that patents and copyrights represent strategic assets for those who own and control them. It is therefore not surprising that the pace at which individuals, firms and the public sector are using IPRs to privatise knowledge-based assets and creative expressions has been accelerating. This trend has been promoted by a growing number in industry, government and international agencies who argue that the privatisation of the intellectual capital and knowledge-based assets of individuals and firms offers many advantages. Large firms have reported extraordinary corporate results from using the IPR system, and policy makers report great *expectations* regarding the contribution of the IPR system to performance in the knowledge based economy.

As a result, we have seen an increased enforcement of IPR regimes worldwide. Such initiatives include: The Trade Related Aspects of the Intellectual Property Section (TRIPS) of the World Trade Organization (WTO); patent protection even beyond science based principles (for example business methods and other computer implemented inventions); exclusive rights also on fundamental inventions (for example university science and procedures to obtain genetic codes); exclusive rights on traditional knowledge and traditional cultural expressions; increased privatisation of the public domain; increased period of protection historically; protection on trivial knowledge with very little inventive step; and other.

Nevertheless, IPR policy encouraging increased enforcement has been largely based on the *vision* of policy makers rather than on the findings of solid empirical research; and within the IPR research community, the social and economic effects of tightening the IPR system are not considered obvious.

1.1 The need for a useful theory of IPRs

Even with substantive improvements in research on patents and copyrights, it is important not to overlook the fact that *our tools for understanding the dynamics of IPR systems remain blunt*. Managers and policy makers tend to emphasize success stories associated with IPRs. And while it is important to celebrate the enabling effects of the IPR system, it is also important to recognize that patents and copyrights may not be able to solve *all* corporate and economic problems. Rather, they may create problems of their own. When the IPR system does not perform in accordance with expectations, the reason put forward by policy makers, industrialists, IPR offices and most lawyers is that this is due to mis-management and lack of IPR protection in many small and medium sized firms and in most countries in the world. Thus, they conclude that the institutional framework must be strengthened or adjusted in order to generate the expected advantages. By contrast, we suggest that even with optimal IPR legislation and enforcement in most firms and countries, the IPR system may not always perform as expected.

Because received analytical frameworks are constructed and advanced by mainstream academics inspired by neoclassical economics, or written by companies wanting to demonstrate their success, they do not usually spell out the limitations of the tools for analyzing the dynamics of the IPR system. However, because significant management and policy decisions are based on these frameworks, it is important to understand and communicate the limitations as well as the strengths.

A central test for theory is if it is useful. In Nelson and Winter's (1977: 36) search for a useful theory of innovation, we learned that for "theory to be useful ... [it] must organize knowledge and guide research regarding what lies behind the different performance of the different economic sectors". This leads to the question of whether prevailing IPR theory is useful in explaining why the IPR system generates different performance results and varying potential for growth across firms, sectors and nations participating in the IPR system. At present, the answer would be 'no'.

By ignoring a wide range of real life elements, prevailing mainstream IPR theory assumes that the interaction of micro-level units (e.g. firms and individuals) within IPR systems maximises social and economic welfare at the sectoral, national and global (meso and macro) levels. IPR regimes designed at the national and international (macro) levels are also assumed to deliver maximum welfare for each (micro and meso-level) participant within the IPR system. Yet while defenders of this perspective argue that IPR regimes bring convergence and close income and technology gaps, there is growing concern that strong IPR regimes may cause the very opposite. This is because the increasing privatization and harmonization of knowledge based assets, also associated with the more robust IPR regimes, has led to asymmetrical results across countries, regions, sectors and firms within sectors with respect to meeting the originally intended objectives of stimulating innovation-based competition; facilitating spill-over and expansion of knowledge based ideas and creative expressions of ideas; rewarding inventiveness and creativity throughout the economic system; and in terms of facilitating sustainable development of firms and industries.

There is therefore a need to better understand the challenging (or difficult) role of IPR regulation in contributing to improved economic performance, growth and sustainable development at the corporate, sectoral and global levels, while at the same time providing a higher quality of life for society in all regions of the world.

In this context, the theoretical logic of mainstream theory of IPRs has been challenged. For example, Andersen (2004) critically reviewed the assumptions underpinning mainstream theory of IPRs and argued that: (i) Even if IPRs signal prospect for reward, this may not always stimulate incentives to invest in invention and innovation, which in turn should stimulates innovation-based competition. (ii) Even if IPRs facilitate markets for ideas and knowledge as well as creative expressions of ideas, by adjusting for the inherent problems of market failure normally attached to knowledge and intangible expressions of ideas, this may not always facilitate the spill-over of such knowledge based ideas and creative expressions of ideas. (iii) Even if IPRs temporarily protect (or offer market privileges to) entrepreneurial talent from imitation, or for market entry of products or services embodying their novel ideas and original creative expressions, this may not always facilitate sustainable development of firms and industries. (iv) There is also a natural rights and moral rationale that can be attached to IPRs. Even if IPRs should in principle guard the natural right to claim an intellectual property, and the moral right to compensation and reward if someone else exploits another's idea or expression of an idea, individuals and firms inventing ideas and creative expressions may not always find their rights protected due to lack of the institutional capabilities and resources required.

The basic argument is that the belief systems in the ‘law and economics’ mainstream literature are inherently flawed because their analysis is built upon theoretical logic and the assumption that all inventors are autonomous, rational, profit-maximizing agents whose collective behaviour maximizes both their own and the society’s general welfare. The very real effects of technological and creative inter-dependence, strategic interaction and collaboration in competitive IPR markets are largely ignored. This is problematic because, for example, the specific and rigid nature of productive knowledge applied in technological ideas can affect the efficiency of patent systems. The effectiveness of copyright systems can also be influenced by predominant norms, values and beliefs embedded in cultural expressions or ideas. Also, institutional capabilities and power-relationships in IPR-related bargaining situations can have important impacts on behaviour and outcomes; and there are substantial opportunity costs associated with using the IPR system as a business strategy or political instrument. Finally, whereas the current law and economics approach to IPRs equates competition with perfect competition and monopoly with pure monopoly, the actual architecture of the IPR system is a hybrid structure with both competitive and monopolistic dimensions. (See Andersen 2004 for a critical overview).

Furthermore, we argue that social science research should be oriented towards providing theories that enhance knowledge and understanding useful for the resolution of practical problems. Theoretical knowledge in social science should be concerned with achieving practical ends for management or policy purposes, rather than merely generating knowledge based upon theoretical logic for its own sake. In this respect we argue that an aim for IPR research should be to develop theories that work in this respect, or work better than existing theories. Better understanding of why existing theories do not work in practice, and why other theories may work better, is a strong motivation in our research. We argue that the practical application of theory in policy and management should be central in the definition of a field of intellectual property rights. Thus, another test for the usefulness of theory is if it can help to solve practical problems. We could then ask: Is prevailing IPR theory useful for the solution of practical problems? Again, the answer would be ‘no’ because as explained above, the existing literature examining the objectives, operation and performance of IPR systems bases its analysis on the theoretical logic of mainstream law and economic theory rather than on real life situations. This is a problem because when designing IPR policy, it is this literature that has informed belief systems regarding the operation and social and economic effects associated with IPR systems.

1.2 Aims and Objectives

The aim of this paper is therefore to develop a theoretical framework that incorporates the real life elements we believe have a fundamental influence on why the IPR system generates different performance results and varying potential for growth across the firms, sectors and nations participating in the IPR system. When real life elements are considered, it becomes apparent that the interaction of micro-level units within IPR systems may not necessarily maximise social and economic welfare at the macro level; and IPR regimes (designed at the macro level) may not guarantee welfare for each (micro-level) participant within the IPR system. Thus, the proposed framework provides a guide for the design of better IPR policy at the national level and at the level of international conventions; the development of better IPR strategy at the level

of the individual or firm; and the implementation of better IPR organization at the corporate, sectoral, national and international level.

The paper sketches out an alternative to the mainstream framework by merging literature from productive systems, new institutional economics, corporate governance and IPRs (patents and copyrights).

In particular we examine the way in which the IPR system underpins sectors for financial and non-financial value creation from IPRs, as well as the processes of cooperation and conflicts throughout the economic system in appropriating that rent. Focus is on the (i) ‘institutional environment’ with respect to the IPR system setting the rules of the game; and (ii) the ‘institutions of governance’ with respect to the specific institutional mechanisms in organizing the creation and distribution of value from IPRs. When investigating the dynamic performance of the IPR system we build upon ‘productive systems’ theory which argues that the requirements for operational and dynamic efficiencies, and hence, system performance, depends upon the ability to secure effective cooperation among stakeholders within the system during the processes of creating and distributing value from IPRs (see for example Wilkinson (1983, 2002) and Birecree, Konzelmann and Wilkinson (1997)).

Our sketching of a theoretical structure explaining the performance of IPR systems incorporates several building blocks. They will be described in the following sections: Section two defines the institutions underpinning IPR systems. Section three examines the performance of these institutions, applying a ‘productive systems’ framework. Section four discusses the important elements of productive IPR systems, which secure system effectiveness. Section five concludes.

2. The institutions underpinning IPR systems

The boundary between the ‘institutional IPR environment’ and the ‘institutions of IPR governance’ is blurred in prevailing IPR literature. However, definitions of the ‘institutional IPR environment’ and ‘IPR governing institutions’ are useful, as they provide a common platform for communication. They also enable us to separate various elements of the IPR system for analytical purposes. Thus, we believe that Williamson’s (1998) distinction between, and description of, the ‘institutional environment’ and ‘institutions of governance’ is very useful when examining the institutions underpinning IPR systems, despite the fact that it was developed for a different purpose. Within New Institutional Economics the ‘institutional environment’ is defined as the ‘rules of the game’ and the ‘institutions of governance’ are the structures in which the ‘play of the game’ is carried out.

Given these definitions, the following section 2 identifies the institutions underpinning IPR systems; the ‘productive systems’ framework will then in section 3 be used to explain the dynamic performance of these institutions.

The ‘institutional IPR environment’ setting ‘rules of the game’

IPRs form a central part of the ‘institutional IPR environment’ in setting the ‘rules of the game’ for the commercial exploitation of novel technical or technological inventions and creative original expressions. The rules of the game rooted in IPR

legislation affect the design of IPR law. Design issues include: (i) length of IPR protection obtained, (ii) type of invention or creative expression protected (e.g. should and non-technical business methods or traditional knowledge be protected?), (iii) scope of knowledge protected (e.g. should we allow or encourage patent protection on fundamental inventions in universities with huge technological scope or should basic procedures to obtain DNA codes be protected), (iv) size of inventive step (e.g. how significant inventive step is needed for patent protection and how big originality is needed for copyright protection?), (v) licensing law (e.g. should we allow the opportunity to block competition or should we opt for compulsory licensing?), (vi) costs and procedures of obtaining and holding a right, (vii) type and costs of the remedies available for infringement. The design of IPR systems, in terms of the law setting rules, depends of course on what we want (i.e. rationales and objectives) from IPR regulation.

The ‘institutional IPR environment’ also includes the rules, norms and routines regarding IPR management in IPR offices and the patenting processes involving IPR offices and patentees. For example, an IPR office in a smaller country like Denmark has been found to be very effective in creating knowledge-spill over and organisational learning with respect to the effective use of the patent system (Christensen 2006). By contrast, the US system has been criticized for the unfair competition caused by its ‘continuation patent scheme’ (Graham 2006). In the recent software hearings in the European Parliament, many of the problems regarding practices of the European Patent Office (EPO) were revealed, particularly in relation to their granting of patents with very little or no inventive step and non-science based patents (see section 3.1.1 for elaboration); they were also criticised for not taking responsibility for the results of their patenting practices, but instead relying on private court cases between the companies participating in the patent system to sort out the problems. In short, the norms and standards of IPR offices vary across countries and make a difference to the performance of the IPR system.

‘Institutions of IPR governance’ organizing the ‘play of the game’

The players in the game of commercial exploitation of scientific and technological inventions and creative expressions of cultural ideas include both public and private sector organizations and firms as well as individuals. The play of the game encompasses the interaction between the various players seeking revenue and rent creation and distribution from IPRs. Each interaction is conducted within a particular structure of contracts, or ‘institution of governance’ which may be market-based (such as the buying and selling of IPRs) or non-market relationship-based (such as patent pools or cross-licensing agreements) (See Figure 1 for an overview). In effect, the ‘institutions of IPR governance’ are the contracting structures within which the ‘play of the game’ is carried out.

IPR System

The ‘IPR system’ includes both the institutional IPR environment and the institutions of IPR governance.

The conceptual separation of the ‘institutional IPR environment’ and the ‘institutions of IPR governance’ is not only useful for analytical purposes. It is also helpful when designing IPR policy, IPR business strategy and IPR organization at the sector level.

In particular, it helps us to understand which institutions to target when designing policy aimed at fostering the new economy and actors best situated to improve performance of these institutions. For example, complex collective action by means of government intervention may be required to change the ‘rules of the game’, whereas less complex individual action between the sectoral players (i.e. public and private sector organizations and firms as well as individuals) may be necessary for changing the ‘play of the game’. However, the nature of the ‘play of the game’ can of course also be regulated by rules placed by government.

The following section focuses on the performance of the IPR system and the institutions underpinning the system.

3. Understanding the performance of IPR systems adopting a ‘productive systems’ framework

As reviewed in section 1, mainstream theory is unable to explain why the IPR system generates different levels of performance and potentials for growth across the participant firms, sectors and nations. Nor does it provide useful insight into the reasons for differences in the performance of the various participants in the institutions of IPR governance.

In the following sections, the ‘productive systems’ framework is used to understand and explain the performance of (i) an entire institution of IPR governance (e.g. the performance of a patent pool or a cross licensing agreement) and (ii) the performance of the individual partners participating in the IPR governing institutions (e.g. the performance of each of the partners participating in a patent pool or in a cross licensing agreement). Further, the performance of (i) and (ii) does not occur independently of the performance of (iii) the institutional IPR environment setting the rules of the game.

Sections 3.1 and 3.2 illustrate the processes by which financial and non-financial value is created from IPRs. Section 4 uses the framework to describe how the distribution of this value generates different performance and potentials for growth across all firms, sectors and nations.

Central to our approach is the assumption that the nature of stakeholder behaviour and interaction is essential for understanding the organization and performance of entire IPR systems and their various constituent parts. This is because stakeholder behaviour and interaction reveals the *underlying incentives* for individuals and firms to participate in IPR systems. Thus, to understand the performance of IPR systems, it is necessary to identify who the stakeholders are in the evolution of IPR regimes and in the institutions of IPR governance, how they interact, and what their respective roles and interests might be. It is also important to understand the mechanisms by which stakeholder interests are prioritised and the influence this might have on their ability to fully exploit the productive potential of the protected IPRs.

3.1. Stakeholder interaction shaping the performance of the institutional IPR environment

Applying a stakeholder perspective to understanding the performance of the institutional IPR environment, we maintain the view that IPR regulation or law is not value-neutral with respect to setting the rules of the game. In other words, it may not be based upon rational criteria (of the kind we find in theory, see Andersen 2004 for an overview) with respect to optimising legislation for society. Rather, the design of an IPR system at any one time is based upon a particular constellation of political power; and when power relations change, the IPR arrangements become contested and open to amendment through political engagement. This was demonstrated by critical theorists, Sell and May (2001), who identified a number of key ‘moments’ in the history of IPRs that eventually led to particular IPR agreements (TRIPS being one of them). Similarly, Machlup and Penrose (1950) maintained that the term ‘intellectual property right,’ based on the origin of a natural or moral right (as opposed to intellectual monopoly privilege), was a very deliberate choice on the part of politicians working for the adoption of a patent law in the nineteenth century. During this period, liberty and equality were prioritised over privileges and monopolies of any sort. More recently, the EU’s initiative for policy harmonization with respect to patents on computer implemented inventions and business methods patents can be considered a key moment in history. This is further elaborated in Section 3.1.1 below.

Thus, the processes by which IPR legislation emerges and evolves are a determining factor in the dynamics of the institutional environment. In this, we take a positive (as opposed to normative) theory approach, because we assume that government does not create or enforce IPRs without some reference to what is considered right and wrong, just and unjust. As a result, examining the behaviour and interaction of stakeholders participating in the shaping of the institutional IPR environment is useful in explaining the dynamics of IPR systems. Sened (1997), an advocate of positive theory, also takes a critical view, arguing that it is important to pay greater attention to how social contracts (through which governments protect the individual rights of their citizens) emerge and evolve because governments reflect the interests of various social groups.

IPR stakeholders at the level of the institutional IPR environment include those individuals, public and private sector organisations and firms as well as other groups (for example government, IPR offices, industry associations and activists) that have both an interest in how IPR regulation is designed and how the IPR offices manage the patenting process or copyright process. They also include those firms and consumers who aspire to become users of the IP, or of the goods and services protected by IPRs. The dominant stakeholders are those who hold the rights associated with potential ownership; they are therefore those with the most direct relationship to these processes.

We will now describe these stakeholders in further detail in relation to the design of the IPR-rules of the game, their primary objectives, the role of IPRs in achieving those objectives and the outcomes that are expected. These necessarily involve ‘suppositions,’ particularly in the case where the government is the stakeholder with the objective of best serving society’s interests, because the IPR regime may not perform in accordance with the objectives it is designed to achieve. A summary of the discussion below is provided in Table 1.

Table 1. Stakeholders in the institutional IPR environment and their objectives (belief scheme).

Institutional environment	Dominant stakeholder	Stakeholder objectives	Role of IPR in strategic approaches	Expected outcomes
IPR law setting the rules of the game	(i) Society and government	Investment, invention and innovation activities	IPRs to stimulate economic incentives	Economic growth and social welfare
		Increased competition and market development	IPRs to ‘protect of entrepreneurial talent’	Economic growth and social welfare
		Knowledge spillover	IPRs to organize science, technology and creativity	Economic growth and social welfare
	(ii) IPR offices per se (e.g. EPO)	Processing IPR applications. Granting and maintaining IPRs	IPRs sustain the importance of the IPR office	IPRs generate income
	(iii) IPR career people: IPR agents and IPR lawyers working in IPR offices, IPR agencies and IPR divisions within firms.	Job, salaries and careers	IPRs sustain the importance of the IPR agents and IPR lawyers working in IPR offices and IPR agencies.	Maximize personal welfare.
	(iv) The individuals or firms who have been excluded from above IPR systems	To gain control over the use of IPRs	No value from IPR is recognized	Maximize personal or corporate welfare
(v) Consumers	Maximize access to, and minimize price on, products and services	Value from IPR regime is not obvious.	Maximize personal welfare	

(i) Society and government: Perhaps the most obvious stakeholder in an IPR regime is the society in which it is embedded. If government in principle should represent the interests of society, a spectrum of IPR system policy goals can be identified. The IPR policy goals are underpinned by theories or economic rationales explaining the influence of IPRs on economic behaviour and hence the mechanisms by which they contribute to the achievement of societal level welfare goals. As reviewed in Andersen (2004), IPRs are assumed to provide economic incentives to invest in invention and innovation activities. They are said to stimulate competition and market development through the ‘protection of entrepreneurial talent;’ and they play an important role in organising science, technology and creativity which are believed to stimulate knowledge spillovers. However, as reviewed in section 1 above (and reviewed in detail in Andersen 2004), the social contract and political expediency rationales are problematic as the expected outcomes of the IPR institution rely on flawed assumptions. Thus, they are indeed speculative. Also, as mentioned previously, the fact that various groups within society experience the effects of the IPR regime in different ways is not a matter of consideration in the mainstream IPR literature. However, it is particularly apparent when national and international

negotiations with respect to the design of the IPR regime are considered. The EU's hearings on software patents (see section 3.1.1) provides a useful illustration of this.

(ii) IPR offices: Most IPR offices (but not all) express an uncompromising and uncritical view with respect to the importance of the IPR regime. Their position is that because patents generate growth and benefit to society, firms and individuals should accept that the IPR regime plays a positive role in promoting general economic welfare. (Presentation by David Sant, European Patent Office (EPO), Brussels Liaison Bureau, in the European Parliament April 14th 2004.). The reason for this perspective might be that IPR offices are often poorly informed regarding the economics of the IPR system. However, it could also be argued that IPR offices are biased in their view because they have vested interests in the maintenance and growth of the IPR system. The more patents the IPR offices grant, the higher their income from patenting and from patent enforcement; and because subsequent court costs associated with cases based upon decisions taken by IPR offices are paid by the IPR holders, the IPR offices do not assume the risk from their granting procedures.

(iii) IPR career people: IPR agents and IPR lawyers working in IPR offices, IPR agencies and IPR divisions within firms: Because IPR offices are an important part of the machinery granting and enforcing IPRs, they employ an enormous number of people whose jobs, salaries and careers depends upon the continued existence of the IPR system. There are thus strong incentives for the officials and employees working within IPR Offices to support both the granting of patents and the existence of the IPR regime. There are also many private lawyers and managers working in firms engaged in the administration, maintenance and enforcement of the IPR system, whose jobs, incomes and careers are based on the existence of the IPR system.

(iv) The individuals or firms who have been excluded from above IPR systems: Other stakeholders in the IPR systems include those individuals and firms who have an interest in how the IPR is used and how the value from it is distributed, but who may not have control over the IPRs or an influence on these processes. For example, because an IPR is an exclusive right, many firms and individuals are either excluded from access to the knowledge base they protect or cannot afford the licensing fees required to access the knowledge base. As a result, they are unable to access the stream of benefits associated with using the IPR protected inventions.

(iv) Consumers: In mainstream theory, consumers are assumed to benefit from the existence of the IPR regime. (This is for all of the reasons mentioned above in section "(i) Society and government".) However, for many industries there is little or no evidence that the IPR system has been able to stimulate production of a 'wide variety' of products at a 'high quality' and 'low price'. This is particularly true for the creative industries, and to some extent for the software industry. For consumers in a capitalist economy, the objectives of variety, quality and price are central; and they are often cited as the rationale for 'privatization' of goods and services. Furthermore, critics of the IPR regime, however, argue that IPRs increase the costs of production, and therefore also price, which in turn reduces direct welfare for consumers, and that this welfare loss is not offset by the benefits of the system. This welfare loss is accentuated by the fact that the IPR owner pays a registration and maintenance fee to the IPR Office and the manufacturer pays royalties to the inventor of the knowledge imbedded in the product they produce. As a result, the price of the good exceeds the marginal costs of production, which from an economic perspective is inefficient and damaging

to social welfare. To this we can also add a lot the indirect costs of the system. The productive role of IPRs for the consumer is thus controversial, and the situation is of course complex and not black or white.

3.1.1. EU hearings on ‘rights’ and ‘design of rights’ on computer implemented inventions and business methods

Applying the productive systems framework to the problem of harmonizing ‘patent rights’ and the ‘design of patent rights’ regarding computer implemented inventions and business methods in the European Union (EU) provides a useful explanation of the performance of ‘the institutional IPR environment.’ This has been a matter of discussion since 2002, and the final hearing was in July 2005. In this context, we do *not* (as in Table 1) merely look at the importance of stakeholders’ interests in the sense of whether they are *for or against* IPRs. In reality, setting the ‘rules of the game’ is about the roles and interactions of stakeholders with respect to *the design* of a particular piece of IPR legislation.

The creation of the rules of the game

The EU has different options with regard to protection of computer implemented inventions and business methods. These are summarized in Table 2.

Table 2. Options for protection of computer implemented inventions and business methods

Option	Patent scope	Criteria
Option 1: Technical progress patents. (Most European countries & Japan)	A business process can be patented if it reflects a technical advancement. In this sense, it is protected as computer programs.	The digital idea embedded in the computer implemented invention has to be new and inventive, i.e. novel and non-obvious
Option 2: Technological patents. (US)	Computer implemented inventions can be patented as long as they are ‘in the technological arts’, that is, the computer implemented invention may not necessarily be of technical character or a technical advancement, but it must be implemented via computers to get the protection. (This meets the UN’s definition of technology: ‘a combination of equipment and knowledge’.)	The computer implemented invention or business method idea must be useful and concrete; and tangible results must be provided.
Option 3: Unlimited patents. (US considerations)	There should be no technical or technological restrictions on the patentability of business methods. Any new concept of doing business or business method can be patented	The business method idea must be useful and concrete
Option 4: Open source patents. (Open Source Software Community)	Computer implemented inventions and business methods should be allowed to be patented (in accordance with option 1 above) so long as the source code is explained.	The digital idea embedded in the computer implemented invention must be new and inventive, i.e. novel and non-obvious, and the source code must be open for examination.
Option 5: No patents. (Free Software Community)	Computer implemented inventions should not be patented.	A ‘Free Software Community’ cannot co-exist with another system granting patents on computer implemented inventions

		and business methods. The problem is that the EPO grants patents for ideas with very little inventive step (if any) so large firms are able to adopt free software, develop it slightly and patent it. This kills off the free software community.
--	--	--

At the EU hearings of 2002-2005, it became clear that firms' views on the proposed software acts do not differ with respect to industry and country; however, there is a sharp division between large firms and small firms.

The majority of large firms argued for options 1 or 2. They maintained that without patents, their inventions would not be protected and they would consequently lose competitiveness, which would be bad for the future of Europe. The question of whether option 1 or 2 or 3 is the right appropriation model became the issue for the large firms. The advantage of option 1 is that a technical progress criteria would impose a strict novelty criteria, making it difficult to imitate the protected idea. However, if Option 2 or 3 is adopted instead of relying on EU patent law, this would result in a fundamental change in the nature of patent law, making an informal exemption of the criteria of novelty, because it would be impractical to judge what is novel when there is no criteria of technical progress. Option 3 goes beyond the basic principles of current patent law, which is based upon a science-based principle of a technical or technological criteria. Experts, and most firms in Europe, argue that option 3, and to some extent also option 2, are too broadly defined and are therefore not operational in practice. Without any technical criteria, it is very difficult for the patent offices to judge whether a business method should be patented. With a vague novelty criteria, too many trivial inventions can be patented and the IPR system becomes inefficient. These are the concerns raised against the US system.

Yet when discussing the various options, there is no conceptual reason why a business method should be technical. Many large knowledge-based firms from finance, insurance and other business services, such as IT services, operating in the EU argue for implementing option 2. Navision, for example, at the meeting on the harmonization of EU's policy on computer implemented inventions in the Danish Parliament in February 2002, argued that many of their inventions related to new ways of doing business are very resource demanding and therefore need protection. Further, the competitive advantage from many of their inventions is in the way they do business (i.e. their business methods). Navision therefore saw no reason why such ideas should result in technical progress, although in this case, they are implemented via technology. Hence Navision supported Option 2.

A matter for the knowledge intensive business services is also that the technical progress criteria on the legal protection of business methods (as defined in Option 1) puts many knowledge-based business services in unfair competition with software firms. Software firms then end up controlling the rights to all business methods because they master the technical part. This latter point is interesting, because since the 2002 Danish Parliament meeting on harmonization of computer implemented inventions (mentioned above), Navision, who strongly disagreed with the views of

IBM (arguing for option 1), has since been bought by Microsoft Corporation and is now part of the corporate group ‘Microsoft Business Solutions’.

However, in reality, there is not a clear distinction between (i) when a business method is a technical advancement and (ii) when the method is of non-technical character but still an invention in the technological art as it uses computers to be implemented. As became clear during the EU software hearings, many of the US patented software and business methods inventions implemented via computers have been considered to be of a sufficient technical character to be patented by the EPO. This includes for example (see <http://webshop.ffii.de/index.en.html> for overview):

- Selling things over a network using a server, client and payment processor, or using a client and a server - [EP803105](#) and [EP738446](#)
- Selling over a mobile phone network - [EP1090494](#)
- Electronic shopping cart - [EP807891](#) and [EP784279](#)
- Audio compression format, covered by numerous patents, e.g. [EP287578](#)
- Pay using credit card via the Internet - [EP820620](#) and [EP779587](#)
- Order a gift for someone via the Internet by providing his/her email address - [EP927945](#)
- Automated loan application - [EP715740](#)
- Digital signature in graphic (e.g. for receiving VISA payments) - [EP798657](#)
- Reroute incoming orders to a vendor - [EP217308](#)
- Material reproduction of information stored at remote location - [EP195098](#)
- and many other...

However, the majority of small and medium sized enterprises (SMEs) generally supported option 4 or 5. They argued that while they are not opposed to patents as such, they are against patents on computer implemented inventions because these inventions are fundamental to their business. Many said that they do not have the resources or institutional capabilities to participate in the IPR system. Another problem they highlighted is the fact that there are so many software patents that companies do not know if they have violated software solutions when writing software codes. As a result, they do not know what to answer when asked by customers to guarantee that they have not broken or violated any software patents before handing over bespoke solutions. Thus, in their experience, software patents and patents on computer implemented solutions are counter-productive and counter-innovative, with court-cases and financial resources becoming increasingly important to the industry.

Advocators of options 1 and 2 argued that there are no rules requiring SMEs to participate in the patent system and that they could participate in other software communities such as the ‘free software’ communities. MySQL, for example, had built its business very successfully by participating in such communities. Many large firms such as Siemens also reported that they participated in both patent communities and free software communities.

However, the Foundation for Free Information Infrastructure (FFII) expressed a concern that the co-existence of multiple appropriation models is not feasible because the EPO allows the patenting of inventions with very little (or no) inventive step. Thus, there is a danger that software solutions within the free software community

will subsequently become patented because large firms can obtain the free software, develop it slightly and patent it. Such practices will kill off the free software community and eliminate its productive outcomes.

When it comes to industry associations, several large national IT-industry associations (including PRO from Poland, ATI from Spain, ASSOFT from Portugal; ISZV from Hungary, SEPE from Greece and KODA from Slovenia) expressed significant concerns about patents on computer implemented inventions. Several of these countries were worried about 'knowledge imperialism'. For example, Microsoft files several patents per day in many European countries, and 50% of all patents filed in Poland by the 10 largest firms since 2004 belong to Microsoft (EPO data obtained by FFII). At the EU hearing, the US Computer & Communications Industry Association (CCIA) also reported that the industry in the US is in a mess and that the EU should not replicate US IPR policies on software and computer implemented inventions. (10th May 2004: Ed Black (President and CEO of CCIA) for the European Parliament, Brussels)

As 'knowledge imperialism' becomes the central theme of the discussion, it is important to recognize that firms' accountability and way of behaving along side the rules set by patent policy has the potential to change the effect of the law. For example, Irving Wladawsky-Berger who the Vice President of Technical Strategy and Innovation of the IBM Corporation (and responsible for identifying emerging technologies and marketplace developments that are critical to the future of the IT industry, and then organizing activities in and outside IBM in order to capitalize on them.) in a blog posting: "Building Open, Collaborative Health Care and Education Platforms", made a royalty-free pledge on all IBM patents relating to health and education projects aimed at interoperability and information access issues. The pledge is primarily for software that supports standards in three areas: Web services, open documents, and electronic forms. Like IBM's previous pledge to the open source community, their intent is to stimulate innovation and growth by removing a potential hurdle in IP issues. (October 24, 2005 by Irving Wladawsky-Berger in Innovation and Society and Culture.

Representatives from the EPO and many of the expert lawyers advising the parliament expressed no concerns about options 1 and 2. They argued that the reason SMEs do not do well under the IPR regime is that they are not protected enough. The EPO expressed the belief that history has shown that there is an automatic and direct relationship between patents and growth in Europe, if we just get the organization right. They felt that they were doing a good job for Europe with respect to their granting procedures, although they took no direct responsibility for these procedures. Any problems which might occur as a result of their granting procedures (e.g. if they grant two patents with very close or similar inventive step) are dealt with by the individual companies in private court cases. Such a low level of responsibility does not provide incentives for the EPO to improve their granting procedures. As a result, the EU hearing revealed some of the problems for subsequent review.

If we analyze the situation in terms of direct stakeholders' power, it can be argued that a few large firms supporting patents on computer implemented inventions have the financial majority in terms of investment and jobs. In comparison, the democratic majority of about 90% of companies (mainly SMEs) are opposed to strong patents

(option 2 or 3); and most are against patents on software implemented inventions altogether (i.e. option 1, 2 and 3). However, whereas The Council of Ministers favored the financial majority as opposed to the democratic majority in the first hearing in 2002 (voted for option 2), after the re-hearing in July 2005, they took into account the European Parliaments' and most firms' unconvinced view on patents on computer implemented inventions and business methods. In July 2005 the EU Council of Ministers argued (after 3 years of hearings and a lot of money and time spent by lobbyists) that the situation was very complex and that they had to respect the democratic majority. They concluded that no harmonization on such policies would take place unless they were asked start another hearing, which is unlikely in near future. The fact that 'The Council of Ministers' were not able to take a final decision on the harmonization of rights policy on computer implemented inventions is a clear indication of the complexity of the situation.

An important aspect was the EU mainly consists of SMEs, and that SMEs in Europe are the crucial providers of path-breaking innovations in Europe. However, these are the same companies that would be most adversely affected by any patentability of computer implemented inventions and business methods (Deutsche Bank Research in background material prepared for *Conference for Patent Policy Making*, European Parliament, by the Foundation for Free Information Infrastructure at www.economic-majority.com)

While this empirical example provides an illustration of the setting of the 'rules of the game', it does not examine in detail the 'institutions of governance' in which the play of the game is carried out in terms of realising and distribution value from computer implemented inventions. It is nonetheless not difficult to imagine how the corporate stakeholders (individuals and firms) participating in alternative institutions of IPR governance (patent pools, cross licensing agreements etc.) or other governance structures (such as the free software community, which have their own objectives and dynamics) are also centres of different interests and power-relationships which come together in a very complex fashion. The next section examines the processes by which value is created in the institutions of IPR governance.

3.2. Stakeholder interaction shaping value creation within the institutions of IPR governance

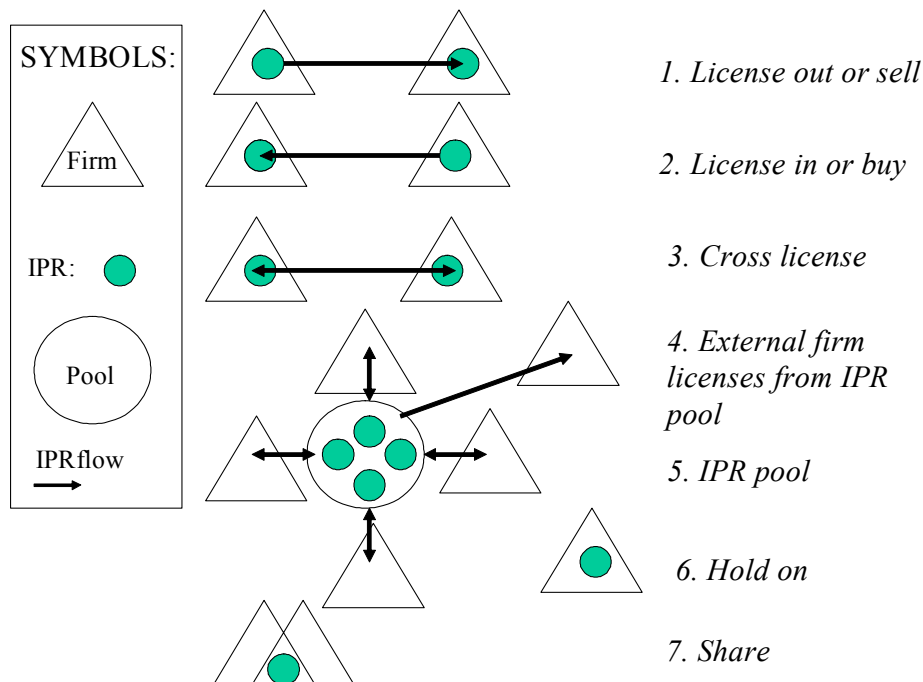
In a productive system involving IPRs, individuals and firms come together with the objective of exchanging rights to own or control IPRs, which can then be used to generate various types of financial and non-financial value. Once that value is realized and created, it is available for distribution among the various stakeholder groups within the system.

IPR stakeholders at the level of the institutions of IPR governance include those individuals, public and private sector organisations and firms as well as other groups that have both an interest in how the IPRs is being used and how the value from the IPR is being distributed. They also include those who aspire to become users of the IP, or goods and services protected by IPRs. The dominant stakeholders are those who hold the rights associated with ownership and control and therefore those with the most direct relationship to these processes.

Value realization happens in various forms of institutions of IPR governance. In this context, mainstream institutional economics (Williamson 1975) provides insight into some of the transaction cost rationales regarding why actors decide to internalise value creation relationships with partners rather than contracting in the market. Similar arguments can be made concerning why firms internalize relationships with regard to the creation of value from IPRs in long term collaborative governance structures. However, new institutional economics does not help when it comes to explain why firms internalise these sorts of relationships in *particular forms* of governance structure (e.g. cross licensing or patent pools) *rather than others*. For this, an incentive argument is useful. We suggest that the choice of governance structure is not random. Rather, it depends upon the type of financial and non-financial value the stakeholders seek to realize in their collaborative contractual agreements. If firms decide not to collaborate within long term collaborative contractual agreements but instead to realize the value from their IPRs in market-based short-term buying and selling activities, then this is because they seek to realize certain types of financial or non-financial value. In other words, there is a relationship between the choice of IPR governance institution and the value firms seek to realize from their IPRs. Thus, the governance structures within which an IPR is located depends upon the particular opportunities the IPR offers with respect to value realization.

Consequently, the stakeholders in the institutions of IPR governance, their relationship and the mechanisms by which their interests are prioritised can be analysed by investigating the variety of forms that the ownership and control of IPRs might assume. These range from simple buying and selling, licensing out or in, holding or sharing the IPR to more complex arrangements such as cross licensing and pooling of IPRs. (See Figure 1). The stakeholders include those individuals and firms who are directly participating in them; and these do not necessarily include the inventors or authors of creative expressions after the rights have been sold. The interests and roles of the stakeholders vary according to the institution of IPR governance in which they participate. Institutions of IPR governance are not exclusive; rather, most firms participate in several different types depending on the IPRs they hold and need and the type of financial and non-financial value they hope to generate from their IPRs. However, whereas all alternative forms of governance are equally common within patent systems, copyright systems tend to be biased towards the alternative forms 1 and 2 (see Figure 1).

Figure 1. Alternative Institutions of IPR Governance



We will now briefly identify the stakeholders in the various institutions of IPR governance, their main objectives, the role of IPRs in achieving those objectives and the individual value they hope to secure from participation in the various institutions. An overview is provided in Table 3. As with table 1, this is a belief scheme because stakeholders may not realize the value they hope for. Further, the objectives and expected outcomes are based upon our judgement and rational speculation which can be tested with empirical research.

Table 3. Stakeholders in the institutions of IPR governance and their objectives (belief scheme).

Institution of governance	Dominant stakeholders	Stakeholder objectives	Role of IPR approaches in achievement of expected IPR outcomes
(i) Sell and buy	Seller and buyer	Short term contractual market relationship	<ul style="list-style-type: none"> • Seller: Maximise one off income • Buyer: Access to ownership of productive knowledge, market power, venture capital, income from subsequent licensing agreements, or other
(ii) Licence out and in	Licensor and licensee	Longer-term contractual market relationship	<ul style="list-style-type: none"> • Licensor: Control on markets and maximise income from licensing agreements. • Licensee: Access to a broader knowledge base
(iii) Cross licence	The firms engaging in a cross licensing agreement. All firms can be considered as both licensor and licensee.	Longer-term exclusive contractual non-market relationship	<ul style="list-style-type: none"> • Increased access to productive knowledge on a royalty free bases. • Cost cutting making the engaged firms price competitive. • Setting territories (i.e. market power) though exclusive cross-licensing agreements. • To enable a strategic evolution on common standards.

(iv) IPR Pool	The firms engaging in an IPR pool. All firms can be considered as both licensor and licensee.	Longer-term non-exclusive contractual non-market relationship	<ul style="list-style-type: none"> • Increased access to productive knowledge on a royalty free bases. • Cost cutting making the engaged firms price competitive. • To enable a natural evolution of common standards.
(v) External Firm Licenses from IPR Pool	Licensor (the IPR pool) and licensee	Longer-term contractual market relationship	<ul style="list-style-type: none"> • Licensor: Control on markets and maximise income from licensing agreements. • Licensee: Access to a broader knowledge base
(vi) Hold On	The IPR owner.	Market prevention.	<ul style="list-style-type: none"> • Exclusively use its own invention (setting territories), or prevention of other to use an invention.
(vii) Share	The IPR shareholders.	Non-market share-holding relationship.	<ul style="list-style-type: none"> • The IPRs which are shareholder-based can enter all sorts of IPR arrangements for value creation, as identified above.
(viii) Any of the above forms of IPR governance	IPR career people: IPR agents and IPR lawyers working in IPR offices, IPR agencies and IPR divisions within firms.	Job, salaries and careers	<ul style="list-style-type: none"> • IPRs sustain the importance of the IPR agents and IPR lawyers working in IPR offices and IPR agencies. • Maximize personal welfare
(ix) Any of the above forms of IPR governance	The individual and firms who have been excluded from above IPR systems	To gain control over the use of IPRs	<ul style="list-style-type: none"> • No value from various of the IPR systems are recognized. • Maximize personal or corporate welfare
(x)	Consumers	Maximize access to, and minimize price on, products and services	<ul style="list-style-type: none"> • Value from IPR regime is not obvious. • Maximize personal welfare

(i) Sell or Buy or (ii) License Out and License In: A firm with sole ownership of the IPR can sell it to another firm and thereby relinquish its rights to control the use of the IPR. Or it can license the IPR to another firm, maintaining the right to use the IPR while at the same time receiving licensing revenues from the firm to which the IPR is licensed. Alternatively, a firm can buy the IPR from the firm that owns it, thereby assuming exclusive control over the IPR. Or it can license the IPR and in exchange for a licensing fee, gain control of the IPR.

The direct stakeholders in a seller or buyer relationship are the seller and the buyer who engage in a contractual market relationship. Since the seller is selling, the seller's interest is in making as much money as possible from the single transaction. The buyer's objectives may be manifold. For example, the buyer may be interested in some combination of gaining access to ownership of productive knowledge, improving market power, securing venture capital or making money from subsequent licensing agreements. Because seller and buyer interests conflict with respect to negotiating the price of the IPR, bargaining power plays an important role in this type of IPR system.

In simple licensing relationships, the stakeholders are the licensor and licensee, who engage in a longer-term contractual market relationship, in which ownership is not transferred. Rather, the use-right is temporarily transferred. The decision of the IPR owner not to sell could be a reflection of the seller's desire to maintain control of markets and to maximize income streams from licensing agreements. Hence, the exclusiveness of the licensing agreement is an issue for both the licensor and licensee when licensing contracts are written. The licensee's objective is likely to be gaining access to a broader knowledge base that is important for production or sale. Because market advantages will be greatest in the case of exclusive licensing agreements, there is the possibility for conflict when setting the licensing fee or rules for exclusivity. A potential licensee may also be in a situation where they would prefer to buy but are unable to by virtue of the owner's unwillingness to sell.

(iii) Cross License: A firm with exclusive ownership of an IPR can choose to cross-license the IPR with another firm that has ownership of a different IPR. In this case, in exchange for the waiving of licensing fees, both firms gain control over the use of the IPR of the other. The cross-licensing stakeholders are the firms engaging in the cross licensing agreement. Because the licensing fees are waived between the cross licensing partners, they benefit from increased access to productive knowledge on a royalty free basis. Furthermore, if the IPRs entering into cross licensing agreements are licensed exclusive, the exclusive cross licensing agreements can also be a means of setting strategic territories and securing market power. While a cross licensing agreement can be beneficial for both partners, not all cross-licensing agreements are mutually beneficial to the parties involved because the particulars of the agreement are determined by relative bargaining power and not all patents carry equal weight.

Cross licensing agreements are very common in the pharmaceutical sector, but other sectors also use such practices. Dell Computers, for example, has a cross-licensing agreement with IBM which frees Dell from paying IBM millions of dollars in royalties, thereby making Dell more price competitive (Rivette and Kline, 2000). In this way, collateral licensing agreements between parties can provide firms with lower cost components making them more competitive. The Dell and IBM agreement serves as a useful illustration of how IPRs allow companies to develop very favourable partnerships and licensing relationships. Another objective of cross licensing is to establish agreement regarding common standards such that all involved parties invent around the same technological trajectory.

(iv) IPR Pool: A number of different firms, each in possession of one or more IPRs can choose to form an IPR pool, in which royalty free access to the IPRs contained in the pool is gained by contributing IPRs to the pool by some agreed-upon contribution formula. The IPR pool is similar to a cross-licensing agreement in the sense that the objective of the stakeholders is the gaining of access to IPR-protected knowledge on a royalty-free basis. However, the IPR pool differs from a cross-licensing agreement in that it is non-exclusive and anyone able to make a contribution to the pool's development trajectory can join. This serves to facilitate natural and open standard-setting within industries, discouraging the co-evolution of competitive standards. Patent pools have increased in popularity in markets for complex products and technologies that require input from many different specialized contributors; examples include digital television and digital video systems (e.g., MPEC-LA). The value of the patent pool is similar to that of the cross-licensing agreement; however

participation in a patent pool is less concerned about market power or the setting of individual territories.

However, as in the case of cross-licensing agreements, patent pools do not equally benefit all parties to the relationship. The specific agreement upon which a new contributor is permitted to join the pool is based on individual bargaining power; and each patent in the pool may not carry the same weight. The effectiveness of the patent pool depends to an important degree upon trust relations among the members. For example, a company can choose to include both 'bad' patents and 'good' patents in the pool, but not inform the pool's members which patents are the good ones. A company can also include all of its 'bad' patents in the pool in order to appear innovative and thereby to bargain a better deal for itself. In these cases, the pool will under-perform because of the failure of one of its members to effectively cooperate with the others.

(v) External Firm Licenses from IPR Pool: Firms outside the pool can obtain access to IPRs in an IPR pool by means of licensing arrangements. In this case, in exchange for a licensing fee, the outside firm gains access to the IPRs. As in the case of general licensing agreements (discussed in (ii) above), the stakeholders in a licensing relationship are the licensor (i.e. the IPR pool in this case) and the licensee who engage in a contractual market relationship, with the interests and objectives described above.

(vi) Hold On: A firm with ownership of the IPR can choose to hold on to that right, excluding all others from access to the IPR. In this case, the stakeholder is the company that holds on to its IPRs and thereby prevents market entry by others. In such cases (although not all), the company's objective is either the exclusive use of its own invention or the prevention of other companies from using it in an effort to set territories in markets. In many respects, this strategy is reminiscent of the Shumpeterian entrepreneur that keeps his idea to himself and gains market share through the application of a new invention.

(vii) Share: More than one firm can choose to share ownership and access to the IPR. In this case, the stakeholders are the individuals and firms who hold shares in the relationship. Shareholder IPR relationships come about for a variety of reasons. Most often, they result from the co-development of inventions. They can also be the outcome of a court settlement where both parties decide to co-own the invention rather than spending excessive amounts of money on a risky court case; however, it is not uncommon for large companies to approach smaller inventors with insufficient resources to cover the costs of a court case and to 'bully' the inventor into the shareholder relationship. Share-holder relationships can also be the result of one firm selling off a share of their IPR to other firms. Share-holder based IPRs can subsequently be entered into other IPR arrangements, as described above.

(viii), (xi) and (x) Stakeholders beyond the Boundaries of a Specific institution of IPR governance: For all IPR systems there are other parties that directly benefit and can therefore be viewed as stakeholders in the system. However, as these stakeholders do not have any particular preference for particular institutions of IPR governance, but are more just interested in the existence of an IPR regime underpinning the institutional environment, they are discussed in relation to Table 1.

4. System effectiveness: Securing the critical role of productive social relations

We are interested in the ways by which IPRs contribute to both the best use of IPR resources and performance effectiveness in terms of the achievement of IPR-related individual, corporate and societal objectives.

In the ‘productive systems’ framework, productive systems are defined as those systems where the *forces* (i.e. input components) of production combine in the *process* of production. Productive activities are conducted within a social structure in which individuals or groups come together for the purpose of jointly creating something and distributing the surplus value among themselves (Birecree, Konzelmann and Wilkinson 1997; Wilkinson, 1983, 2002). In the institutions of IPR governance, individuals and firms come together with the objective of exchanging rights to own, use or control IPRs. The purpose is to create and distribute value from such IPRs.

The effectiveness of a productive system is determined by the ability and willingness of participants to satisfactorily perform their productive role; and in the context of the IPR system, this has an influence on the dynamics of the system and thereby shapes the welfare gains from IPRs as well as the direct and indirect costs associated with participating in the system. In this context, a productive role of a potential participant is to participate in the creation of as large value pie from IPRs as possible. It should *in principle* be in both the individual and the collective interest to fully cooperate in such value creation processes. This is because of the mutual relationship-dependence inherent in institutions of IPR governance and the operational and dynamic efficiencies (e.g. through knowledge sharing, standard setting, royalty free agreements etc.) that are generated by cooperation.

However, as we saw in sections 3.1 and 3.2, the centrality of collaboration in securing effective IPR system performance does not imply that all interests are shared because individuals and groups may see different value in IPRs. Some, for example, may cooperate as they look for financial gains from licensing while others may look for gains through access to knowledge. This means that the total gain from collaboration is not a strait forward sum, but includes both quantitative and qualitative elements.

In some cases, firms realize the same type of value from their particular choice of institution of governance. In a cross licensing agreement, for example, both parties can gain access to knowledge on a royalty free basis (so both firms experience a gain in their knowledge base and a reduction in royalty costs relative to other firms). Thus, the total value realized could be ‘knowledge’ plus ‘royalty savings’. In this context, distribution issues are both qualitative and quantitative matters. Issues concern how many patents to include in the agreement and how important those patents are for the other firm. In the specific contractual agreement, the bargaining power of parties making the agreement is important in the exchange. In other cases, firms realize different types of value from their choice of governance institution. For example, in a simple licensing agreement, one firm gains access to knowledge and the other firm gains financial income. This means that the total value realized consists of ‘knowledge’ plus ‘money’. Here, too, the distribution issues are both quantitative and qualitative matters. How much knowledge is realized for one firm and at what financial gain for the other firm depends upon the quality of the knowledge embedded

in the patent and the individual bargaining power of the firms. Similar examples of value realization and distribution can be identified for the different types of institution of IPR governance.

Competition amongst the parties comes into the analysis when they compete over distributional shares of the value that is jointly produced. In this, one party tries to gain as much access to knowledge as possible, at minimum cost, while the other tries to earn maximum amounts of money from IPR licensing. Other conflicts can be envisioned, such as one party claiming that the other has infringed their rights. In short, there are potential conflicts of interest among parties with respect to 'relative shares of the pie'. There may also be conflicts when it comes to the longer-term collective interest in the 'size of the pie.' This is because, many of the IPR system participants are more interested in the size of their individual share of the value-pie (or total value created from IPRs) than they are in collaborating to create a larger pie in which they may be given a smaller share; and the main reason is likely to be the perceived importance of maintaining dominance or relative power. Basically, there are potential conflicts of interest among parties with respect to 'relative shares of the value-pie' and there may also be conflicts when it comes to the longer-term collective interest in the 'size of the pie.' This is because some firms prefer a larger size of a small value-pie now than a smaller size of a large pie later, primarily to maintain a strong power position.

In short, institutions of IPR governance are *not based upon a criteria of optimising* the value realized from IPRs. Rather, they are based upon a particular constellation of interests and power which may secure their share of the value-pie.

However, an important point in our theory of the productive potential of IPRs is that the more value that is realized in total within the institutions of IPR governance, the more productive the IPRs have become. On the other hand, if the total value realized is less than that of the 'productive potential' of the IPR, the IPRs are not performing productively.

It is also evident from the earlier discussion that the institutional IPR environment is not neutral but that the design of IPR law favours certain players or firms rather than others. The reason IPR law is not neutral is that it shapes or affects the power of the individual firms when they participate in the 'play of the game' regarding value creation as well as the distribution of such value, which is of no less importance.

Thus, in virtually all of the dimensions of IPR systems, relationships are characterized by differences in relative power and the potential for those with advantage to use it to the disadvantage of others within the system. For IPR theory to be a useful guide for policy, it needs to incorporate these sorts of issues into our theoretical understanding. However, while certain individuals or firms may be relatively weaker than others, mutual dependence means that they have bargaining power and effective system performance requires that differences in relative power are not exploited in such a way as to precipitate a retaliatory withdrawal of cooperation on the part of the weaker party to the relationship. As a result, whilst individual short-term benefits may be secured by relative power advantages, they are likely to be at the expense of collective long-term interests in performance effectiveness. The issue is essentially that of short-term gain but long-term system decline.

It is also possible to imagine a situation where cooperation continues even if one of the parties is constantly losing out in being rewarded for their value added. This continued cooperation could be due to a one-way dependency in their collaboration, where, for example, one party is in a situation where they are locked into using a certain type of technology embodying a certain type of patent owned by the other party. Examples include situations in which fundamental inventions with large patent scope, and trivial inventions with very little inventive step, have been patented. Here the institution of governance can become unproductive as the total costs for some to participate in the IPR system easily exceed the overall or total value created.

Within IPR systems, the social relations among participants are of central importance for the effectiveness of the system. This is because value from IPRs is not created in isolation (except for the '(vi) hold on' scenario in section 3.2) but is created jointly with other firms. So productive collaboration is essential. In this sense, the social relations have the dual role of securing co-operation in meeting the objectives of the system regarding value creation and agreement over distribution of the outcome from those relations. Productive collaboration is important for performance and efficiency because failure to secure agreement has the potential to set off a retaliatory withdrawal of co-operation, which serves to reduce both efficiency and the ability to perform effectively over the long-term. In this way, system effectiveness has the potential for setting off a virtuous cycle, as it can be seen to generate additional resources for distribution that increase the prospects for increased co-operation and operational and dynamic efficiencies over the longer-term. System decline risks the opposite, setting off a degenerative cycle of conflict, withdrawal from co-operation in productive activities and deteriorating economic performance.

Because of the potential for conflicts to undermine cooperation, mechanisms for resolving conflicts are important for the system's long-term performance viability. Such mechanisms can be legal, but they can also be informal and integrated in the daily routines of cooperation. Within institutions of IPR governance, relations have both technical and social dimensions (for an overview see table 4). The *technical relations* are the functional inter-linkages between the various agents within the institution. They encompass the technical elements of contractual relationships between the buyer and seller of an IPR, the licensor and licensee of an IPR, or the participants of a patent pool, or other. They are objective and impersonal associations, shaped by the technicalities of the system. By contrast, the *social relations* are the subjective and personal associations among the human agents within the institutions. They form the social structure within which the objectives of the institutions are jointly pursued. By directing, co-ordinating and controlling the relations among the participants, the social relations of value creation play a central role in determining the effectiveness of co-operation and hence the operational and dynamic efficiency of the system as a whole. Social relations of value creation are important for getting things done efficiently and effectively. Within IPR systems this could include business practices and routines, such as routines for setting price or setting standards in technological development, for making IPR contracts, for solving conflicts, for making IPR applications, and for negotiating IPR-related agreements.

Table 4. Elements of relations within institutions of IPR governance

Productive system stakeholders	System relations contributing to operational and dynamic efficiencies.	Sources of conflicts of interest among stakeholders
Firms and individuals	Technical relations <ul style="list-style-type: none"> • Functional & impersonal relationships • Contractual • Division of roles or functions 	<ul style="list-style-type: none"> • Individual interests in relative shares versus collective interests in 'size of the pie' • Short- versus long-term objectives • Divergent interests & objectives • Power asymmetries
	Social relations <ul style="list-style-type: none"> • Subjective and personal relationships • Institutions as social technologies: modes of coordination and routines. • Social capital embedded in strategic networks • Social capital embedded in rules norms, values and trust sourcing social communities 	

The importance of the social relations in the IPR productive system can be likened to Nelson and Sampat (2001)'s notion of 'institutions as social technologies'. Nelson and Sampat argue that organization and efficiency of production or value generation should not only be based on a theory of the technological efficiency of physical technologies (or a theory of the technical elements of the IPR system in our case, see above). It should also be based on a recognition that the *way in which* relations within the processes of value creation are organized and managed has an important influence on the achievement of corporate IPR goals. As a result, it is necessary to have a theory of the production or value creation that incorporates both a division of labour (or division of roles and functions) and a *mode of coordination*, the latter being what Nelson and Sampat describe as 'institutions social technologies.'

Recognising the critical role of the social relations of value creation in the institutions IPR governance also highlights the importance of 'social capital,' - an asset that is both based on social relationships (c.f. social) and provides economic benefits (c.f. capital). It includes assets embedded in 'networks' (Bourdieu 1983) and 'social communities' (Putnam 2000, Dasgupta and Serageldin 2000), where networks are the formal or structural relationships (for example the various institutions of governance in our case), and social communities reflect the quality of those relationships, taking the form of norms, values, trust and shared understanding. Because economics has an *under-socialized* perception of human action and sociology has an *over-socialized* perception of human action, Granovetter (1985) argues that actors should be viewed as being 'embedded' in networks and social communities. The network and social community perspectives on social capital are essentially complementary. The network view of social capital emphasises the *individual benefits* associated with the solving of individual problems (such as access to knowledge or income from licensing markets) attached to the memberships in networks or social structures (associated with the share of the IPR value-pie); while the social community view highlights the *collective benefits* (such as the creation of a bigger IPR value-pie) attached to coordinated actions to solve collective problems. In this respect, trust creates 'good' relationships and provides incentives for collaboration and collectiveness. Trust also helps to reduce the cost of agreement layers and anti-trust actions (e.g. money spend on lawyers checking for patent infringement is enormous). Social communities here

serve to coordinate behaviour and more efficiently arrive at mutually acceptable solutions. A healthy IPR system brings the members together around a common set of norms and values. In this way, the social community functions as an asset to accomplish the mission of the institution of IPR governance.

Thus, taking a productive systems approach provides insight into both the role of the social relations in IPR systems and the role of networks and social communities in this context. It can be argued that social capital embedded in networks and social communities supports the establishment and efficiency of stable inter-organizational ties or bonds (formal or informal) that structure joint ventures such as cross-licensing agreements, patent pools, long-term buyer-supplier partnerships, and other ties. Hence, social capital is a critically important determinant of the collaborative efficiency of the IPR system.

5 Conclusion

This paper has sketched a framework for understanding (i) how the total value realized from IPRs may be below its potential, (ii) how the value realized may not be distributed among the participants in the IPR system in proportion to each of their value added, breaking down potentially productive relationships and (iii) how the value realized may not exceed the direct and indirect costs of upholding and participating in the IPR system. In all such cases, the IPR system becomes unproductive for all or most participants as the system merely function as a mean of taking knowledge and creative expressions out of productive use without creating and distributing any substantial surplus value for the achievement of IPR-related individual, corporate and societal objectives.

It is a problem that most IPR policy initiatives and patent offices' granting procedures, as well as in some cases even corporate management, are more concerned with the privatization of knowledge bases and creative expressions in the form of IPRs than they are on understanding how the value from IPRs is realized and distributed. This is assumed automatic. However, as shown in this paper, value from IPRs is not created in isolation but through productive collaboration between stakeholders seeking different types of value from IPRs. Productive problem solving of legitimate and predictable conflicts of interest among the participants, especially over distributional shares of the value created, is important for the realisation of the productive potential of the IPRs.

In this context, the institutional IPR environment is not necessarily shaped by a rational criteria (of the kind we find in mainstream theory) with respect to optimising legislation for society. Also, IPR governance is not necessarily based upon a criteria of optimising the value realized from IPRs. Rather, the organization of an IPR system at any one time is based upon a particular constellation of interests and power structures.

The productive systems approach offers an alternative framework for the analysis of economic relationships and outcomes. It is a framework in which there is no real difference between micro and macro economic analysis. IPR systems performance is determined by the interaction between the two: (i) the performance of the IPR environment and (ii) the performance of the institutions of IPR governance. Given the

interaction between the two, an important aspect of the nature of the 'play of the game' is the influence of the 'rules of the game' on the quality of relationships among the players and IPR systems stakeholders. The 'rules of the game' influence the ways in which firms and individuals create financial and non-financial value from IPRs, and how this value is distributed. The players within the institutions of IPR governance in turn evolve within and interact as stakeholders within the IPR environment in a co-evolutionary process when setting the rules of the game.

Thus, the social and economic effects of the IPR system do not represent the aggregate or disaggregate of behaviour. Instead, outcomes are the result of a dynamic process characterized by complicated and interactive stakeholder relationships, with interaction and feedback effects across the various levels of analysis. To make a general point, the 'institutional IPR environment' and the 'institutions of IPR governance', as well as their interaction, have implications for the performance of IPR systems, at the levels of individuals, firms, sectors, countries and global economies.

We propose that the framework sketched in this paper provides a better starting point for policy makers and strategic management with regard to the solving of practical IPR performance related problems. To test and refine the analytical framework proposed here, further detailed empirical research examining the institutions underpinning the IPR system in different organisational, industry and national contexts is essential.

References

- Andersen, B. (2004) 'If 'Intellectual Property Rights' is the Answer, What is the Question? Revisiting the Patent Controversies.' *Economics of Innovation and New Technology*, vol 13(5), 417-442 .
- Birecree, A., S. Konzelmann and F. Wilkinson. (1997) 'Productive systems, competitive pressures, strategic choices and work organisation: an introduction,' *International Contributions to Labour Studies*, vol. 7: pp. 3-17.
- Bourdieu, P. (1983) 'The Form of Capital,' in J.G. Richardson, *Handbook of Theory and Research for the Sociology of Education*, Westport, C.T.: Greenwood Press.
- Christensen, J.L. (2006). Knowledge Spillovers from the Patenting Process. In Andersen, B. (ed.) *Intellectual Property Rights: Innovation, Governance and the Institutional Environment*. Cheltenham: Edward Elgar Publ.
- Dasgupta, P. and I. Serageldin (2000) *Social Capital: A Multifaceted Perspective*, Washington, D.C.: The World Bank.
- Graham, S. (2006). The Determinants of Patentees' Use of 'Continuation' Applications in the United States Patent and Trademark Office, 1980-99. In Andersen, B. (ed.) *Intellectual Property Rights: Innovation, Governance and the Institutional Environment*. Cheltenham: Edward Elgar Publ.

Granovetter, M. (1985) 'Economic Action and Social Structure: The Problem of Embeddedness.' *American Journal of Sociology*: 91. 481-510.

Machlup, F. and Penrose, E. (1950) 'The patent controversy in the nineteenth century', *Journal of Economic History*, 10 (1), pp. 1-29.

Nelson R. and Sampat, B. (2001) 'Making sense of institutions as a factor shaping economic performance.' *Journal of Economic Behaviour and Organization*, vol. 44 (2001), 31-54.

Nelson, Richard R. and Winter, Sidney (1977): 'In Search of a Useful Theory of Innovation', *Research Policy*, vol. 6. pp.36-76.

Putnam, R. (2000) *Bowling along: The Collapse And Revival Of American Community*, New York: Simon and Schuster.

Rivette, K. and Kline, D. (2000) *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*. Cambridge, Mass: Harvard Business School University Press.

Sell, S. and May, C. (2001). Moments in law: Contestation and settlement in the history of intellectual property. 8 (3), 467-500.

Sened, I. (1997). *The Political Institution of Private Property*. Cambridge: Cambridge University Press

Wilkinson, F. (1983) 'Productive Systems', *Cambridge Journal of Economics*, vol 7, pp.413-429.

Wilkinson, F. (2002) 'Productive Systems and the Structuring Role of Economic and Social Theories', in J. Michie (ed), *Systems of Production: Markets, Organisations and Performance*, London, Routledge.

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

Williamson, O.E. (1998) Transaction Cost Economics: How It Works; Where It Is Headed, *De Economist* 146, pp. 23-58 (1998).