

# **Knowledge sharing and the idea of public domain**

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New technologies change the ways in which information and knowledge are used and created. This has economic impacts that have led to extensive discussions on the need to revise and adapt intellectual property rights in the knowledge society. Access to information and knowledge has also political consequences, as societal development and the possibilities to participate in development crucially depend on it. This paper revisits the theoretical justifications for intellectual property rights, discusses their empirical validity in the knowledge society, the challenge of balancing exclusive rights and societal needs, and points out that knowledge creation and innovation may require new ideas about public domain.

### **Introduction**

During the last decade, intellectual property rights and their implications for innovation and social participation have been discussed extensively. Management scholars have emphasized that knowledge and intellectual capital have become key sources for strategic advantage.<sup>1</sup> Legal professionals, including Lessig (2001; 1999), Boyle (2003) and Samuelson (1996; 2003) have pointed out that intellectual property rights are bound with fundamental challenges in the environments created by new information and communication technologies. Recent extensions to intellectual property rights have also produced widespread critique on the current intellectual property regimes, and proposals for alternative intellectual property models; Free Software Foundation<sup>2</sup>, Creative Commons<sup>3</sup> movement, and Open Source Initiative<sup>4</sup> being among prominent examples.

As societies and economies have rapidly become informationalized, rights and responsibilities related to information, knowledge and other intangible goods have become central locations for social and economic struggles. In this hotly contested arena, concepts such as property and fairness have been widely used, and implicit theories of knowledge creation, learning, and social progress have sometimes provided the foundation for claims for the optimal structure and functioning of intellectual rights. It is therefore useful to revisit some of the conceptual, historical, and theoretical foundations of intellectual rights, and to analyze their relevance both in the current environment and in the emerging networked knowledge society.

The role of knowledge sharing in technical and social innovation becomes particularly visible when innovation is understood as a process of social learning (Tuomi, 2002). Societal development comprises of co-evolution of social practices and technologies, and knowledge sharing and institutionalized public domain provide critical foundations for such development. The structure and evolution of intellectual rights therefore provide major constraints and resources for social development in the knowledge-based world.

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<sup>1</sup> E.g. Drucker, 1993; Sveiby, 1997; Stewart, 1997; Edvinsson & Malone, 1997; Sullivan, 2000; Teece, 1998, Rivette & Kline, 2000.

<sup>2</sup> <http://www.fsf.org/>

<sup>3</sup> <http://creativecommons.org>

<sup>4</sup> <http://www.opensource.org/>

## The origins and sources of intellectual rights

In Europe, the moral rights for artistic and creative reputation have been demanded since the Antiquity. Yet, the idea that an individual author would “own” or control the economic uses of his or her work are relatively new. In fact, Rembrandt is often noted to be one of the first European artists to systematically sign his works<sup>5</sup>, and authors became specifically defined as the owners of copyrights only in the 18<sup>th</sup> century, two centuries after copyrights become economically important.

The reasons why intellectual rights were not important during the first millennium in Europe can be understood from social, economic, technological, and cultural points of view. Medieval societies were stratified societies where creative authors usually worked for local kings and mesenates, or as popular artists. The works, their quality, and the authors were widely known in the communities where the authors operated, and there was little reason to explicitly attach author rights to creative works. Efficient economic markets for intellectual works and copying technologies did not exist. The content was often produced in religious contexts where creative expressions were understood to be expressions collective experience and gifts of God. In Medieval Europe, art was an act of entertainment, customized production of cultural symbols, and a form of prayer. It was a service, and not a good for which someone could claim rights.

The movable type printing press changed the situation. The low cost of copying books created both economic opportunities for book printers and threats to the social order. Venice granted the first printing monopoly to John of Speyer, the exclusive right to “print letters,” in 1469. In the second half of the 15<sup>th</sup> century, Roman Catholic Church began to ban books, and printing monopolies were granted in England and France.

The original goals of the copyright rules were to limit competition among printers and to control the content of texts that became available. The first full expression of these ideas was the 1662 Licensing Act of England. It established a register of licensed books and required that a copy was deposited by the Stationers’ Company. The Company, which consisted of the printers or “stationers,” was given the powers to seize books that were suspected to contain matter hostile to the Church or Government. At the same time the Licensing Act gave the members of the Stationers’ Company the exclusive right to copy and print books for sale. The stationers were the members of the Stationers’ Company, and the authors had no copyrights to the works they created.

The Licensing Act expired in 1692, after surviving the civil war and restitution of the crown in England. The House of Commons, however, refused to renew the law, arguing that the Stationers had abused their monopoly. Although the Stationers tried to manage the new situation by self-regulation, the entry of new publishers who did not belong to the Stationers’ Company led to rapid erosion of publishers’ profits. To address the chaotic situation in the printing business, the printers petitioned

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<sup>5</sup> In 1625-6, Rembrandt signed his works with ‘R f’ or ‘R H’, the first meaning “Rembrandt made this” and the second “Rembrandt Harmenszoon,” indicating his initials. The first signed work with Rembrandt’s name is an etching from 1626. He also often signed his works as RHL, Rembrandt Harmen’s son of Leiden. Rembrandt, however, also signed works of others, which has recently led to rather spectacular decreases in the number of paintings associated with him (cf. Alpers, 1988).

Parliament for relief, and the Parliament responded by enacting the Statute of Anne in 1710. This act is commonly viewed as the foundation for modern copyrights. It stated that the copyright belonged to the author of the work, or to the assignee of the author, and that copyrights were granted only for a limited time, after which the works became freely available for the public.

The concept of public domain was implicitly established in the Statute of Anne. The Statute was introduced as “An Act for the Encouragement of Learning,” and it tried to balance two elements that were supposed to lead to Learning. It gave a limited monopoly to the authors so that they would have an incentive to create original new knowledge, “for the encouragement of learned men to compose and write useful books,” but it also required that after the copyright term expired, the work would become freely available. The copyright term was fixed at fourteen years, which could be extended by another fourteen years if the author was alive when the original copyright expired. The Statute did not imply any restrictions beyond copying. Once the book was bought, the copyright owner did not have any control of its use.

The copyright law granted limited monopolies because it was perceived that cheap and uncontrolled copying was leading to a situation where rampant piracy would make it impossible for authors and printers to make a profitable business. The Statute noted that it was needed as frequent copying without the consent of authors or proprietors had led to their “great detriment, and too often to the ruin of them and their families.” On the other hand, the monopoly was limited, as monopolies were considered to be harmful. The Statute also included a clause that enabled anyone to make a complaint if the price of the book seemed to be artificially high.

The limitations in the exclusive rights were partly a product of bad experiences in granting patents during the previous two centuries. *Litterae patentes*, open letters that gave privileges, were first incorporated in the Venetian Patent Ordinance in 1473. The purpose of the law was to entice “men of great genius, apt to invent and discuss ingenious devices” to relocate in Venice, perhaps as Venice had lost most of its trading empire in the war with Turks, and as it tried to focus on manufacture rather than trade.<sup>6</sup> The law granted a limited monopoly for ten years, and it required newness and ingenuity from the patented devices or methods. Since the second half of the 15<sup>th</sup> century, the English Crown had granted similar letters patents that gave monopoly rights, often to persons who were favored or willing to pay.<sup>7</sup> From 1561 to 1590, Elizabeth I granted about 50 patents whereby the recipients were enabled to exercise monopolies in the manufacture and sale of commodities such as salt, soap, leather, knives, iron, and paper. The patents also included monopolies for selling products based on new inventions. Not all inventions, however, were granted patents; for example, in 1596 Sir John Harrington’s patent request on water closet was refused on the grounds of propriety.<sup>8</sup>

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<sup>6</sup> Ladas & Parry, A Brief History of U.S. Patent Law. <http://www.ladas.com>

<sup>7</sup> The patents were not only for devices and methods, but also, for example, for discovering new countries and islands. For example, a patent granted by Henry the Seventh in 1498 to John Cabot and his three sons basically said that the Cabots had the full rights to conquer any country, region, province, castle and village unknown to the Christians and inhabited by infidels of any kind, under the English flag, and keep the benefits of such voyages in the Seas of the East, West, and North. The patent text is available through the Avalon Project, at <http://www.yale.edu/lawweb/avalon/cabot01.htm>.

<sup>8</sup> The UK Patent Office: 500 hundred years of patents. <http://www.patent.gov.uk/patent/whatis/fivehundred/tudors.htm>

Patent monopolies were often granted for businesses that already existed. Patents were also granted simply to fill the Royal coffers and to pay back services. This created protests, and in 1610 King James I was forced to revoke all previous patents. In his “Book of Bounty” James stated that “monopolies are things contrary to our laws,” and that such grants had been a problem, as “upon misinformation and untrue pretences of public good many such grants have been unduly obtained and unlawfully put in execution, to the great grievance and inconvenience” of the Majesty’s subjects. At the same time, James declared, however, an exception for “projects of new invention so they be not contrary to the law, nor mischievous to the State.” The words were incorporated into the Statute of Monopolies of 1623. The Statute rendered illegal all monopolies and grants of privilege except those “for the term of fourteen years or under, hereafter to be made, of the sole working or making of any manner of new manufactures within this Realm to the true and first inventor and inventors of such manufactures, which others at the time of making such letters patents and grants shall not use.”<sup>9</sup> The Statute further required that such monopolies should not be “contrary to the law nor mischievous to the State by raising prices of commodities at home, or hurt of trade, or generally inconvenient.” A century later, in the reign of Queen Anne, the officers of the Crown further established the condition that the patentee must describe the invention in writing. This description later became known as the patent “specification.”

In the U.S., the concept of intellectual rights was introduced in the U.S. Constitution in 1787. Specifically, the Constitution stated: “the Congress shall have the power...to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.” The First Congress used this power in the 1790 Copyright Act, “An Act for the Encouragement of Learning, by Securing the Copies of Maps, Charts, and Books to the Authors and Proprietors of Such Copies.” The law itself was essentially copied from the Statute of Anne. The U.S. Constitution, therefore, specifically allowed the granting of exclusive rights, but only for a limited time and only when such exclusive rights would promote science and useful arts.

Intellectual rights became known as intellectual property rights to a large extent as publishers started to argue that authors have “natural rights” to the ownership of their works (Ewing, 2003). Using the analogue of property, publishers tried to convince lawmakers that intellectual rights should be perpetual. This view was particularly influential in France, where copyrights are even today known as “droit d’auteur,” or author’s right.<sup>10</sup> The Paris Book Guild hired the famed encyclopedist Denis Diderot to write a treatise that would promote the Guild’s interests in literary rights. Diderot did this by arguing that intellectual property was the highest form of property, noting: “What form of wealth *could* belong to a man, if not a work of the mind...if not his own thoughts...the most precious part of himself, that will never perish, that will

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<sup>9</sup> The 1623 Statute of Monopolies also made an exception for the existing privileges and monopolies of cities, and “any corporations, companies, or fellowships of any art, trade, occupation, or mystery, or to any companies, or societies of merchants within this Realm erected for the maintenance, enlargement, or ordering of any trade or merchandise.”

<sup>10</sup> The European continental tradition therefore also today distinguishes moral author rights and economic rights. Inventors and artists retain their moral rights even when they give away the economic rights to their works. Moral rights restrict uses that could hurt the reputation of the author.

immortalize him?”<sup>11</sup> This idea of the creator’s natural right to the works that he produced also gained support from the new European romantic movements that emphasized the uniqueness of the individuals and the view that the human nature is most purely expressed in authentic creative acts. In the 19<sup>th</sup> century, these ideas become combined with economic arguments and the idea of fairness. The French patent law of 1844, for example, was justified by arguing that:

“Every useful discovery is, in Kant's words ‘the presentation of a service rendered to Society’. It is, therefore, just that he who has rendered this service should be compensated by Society that received it. This is an equitable result, a veritable contract or exchange that operates between the authors of a new discovery and Society. The former supply the noble products of their intelligence, and Society grants to them in return the advantages of an exclusive exploitation of their discovery for a limited period”.

### **Public domain**

One of the driving forces in the development of legal frameworks for intellectual products has been the idea that new knowledge leads to social benefits when knowledge is widely shared. This perspective has been particularly closely related to the Western enlightenment tradition. Indeed, Denis Diderot himself became famous for his *Encyclopédie* that systematically described and published existing technologies and useful arts. When Diderot published the first volume of his encyclopedia in the 1751, this idea was quite controversial. Earlier mercantilist ideas of protecting national trade were still dominant, and many people believed that the publication of knowledge about useful technologies would undermine the national economy.

It was in this climate that Diderot proposed to systematize, describe, and publish knowledge of all the mechanical arts, thus promoting a new ideology of wide and open diffusion of the arts. In regard to technology, Diderot had three main goals: to reach a large public; to encourage research at all stages of production; and to publish all the secrets of manufacturing. He also sought to promote an ideology of progress, undermine craft guild control of knowledge, and encourage technical research, especially in regard to better quality materials, production speed, and better products (Pannabecker, 1994). In this sense, Diderot was following the logic of “enhancement of learning” of the Statute of Anne, but this time turning the printing press into a medium of systematical diffusion of knowledge across the society. In Diderot’s thought, social and human progress resulted from the sharing and creation of knowledge.

The concept of public domain is often understood in its legal and economic sense. Public domain is, then, interpreted to consist of those intellectual products for which no-one has exclusive or privileged claims. Often it is assumed that this domain consists of “ownerless” entities and resources. The concept of public domain, however, is a broader concept than its modern legal interpretation indicates. Strictly speaking, public domain underlies the operation of law. It is a precondition for social life.

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<sup>11</sup> Diderot in Hesse, 1991, p. 101, quoted in Ewing, 2003.

This political concept of public domain is closely related to the historical development of modern states, as analyzed by Hannah Arendt (1998), and the role of modern media in this process, as highlighted by Jürgen Habermas (1989). Arendt used the concept *public space* to describe the arena where individual citizens become political members of the society. Habermas, in turn, developed this concept to the influential idea of *public sphere*. The availability of knowledge in the public domain is a necessary requisite for the operation of both public space and public sphere.

A historical analysis of the evolution of the state and political forms of citizenship formed the core of Arendt's work. Starting from a key distinction between private and public life and an analysis of the Greek city states, or polis, she argued that politics is the arena where autonomous individuals truly express themselves, as members of society. This political expression was collective in the sense that it was only possible as a debate among equals and as it required dialogue and communication. At the same time, individuals became truly individuals only through participation in a collective social process. This arena of shared communication, therefore, was the foundation of uniquely human forms of life.

Habermas, in turn, showed the close links between the birth of modern nation states and the wide circulation of knowledge that was facilitated by printed media. The availability of information was the prerequisite for the formation of political ideas and opinions. Without it social progress could not be possible. Habermas' later theory of communicative action highlighted the role of public sphere as the foundation of social justice in the modern world where multiple and incompatible values exist. Habermas argued that an effectively operating public sphere, where differences can be transparently discussed and argued, is the only way to organize just societies in a world where universal values are difficult to find.

In this view, the participation in social development, therefore, fundamentally requires societal transparency that allows the citizens to form their opinions and find ways in which they can contribute in the collective process of development. In other words, public domain, in this political sense, is both a condition for progress and a domain where this progress becomes articulated and realized. In this sense, public domain is also a domain where the members of society can express their opinions and views.

### **The need for balance**

It is clear that in the increasingly informationalized and knowledge-intensive world the boundary between private and public is changing. According to Arendt's analysis, in Ancient Greece—from where the Western models of politics and governance draw their central ideas—this boundary was drawn between the arena of political participation and the household. The household was the unit of production and reproduction of life and its necessities. When free men crossed the boundaries of the household and entered the public arena of shared political discourse and debate, they left their private lives behind and become full members of the polis. In this political arena, individual interests were negotiated and collective good was advanced. The private space of the household, in turn, was private because it had no political relevance. Social contracts did not enter the household, and the head of the household, therefore, had both total rights and total responsibility of its well-being.

The development of nation states in Europe changed this division. As states became increasingly central for warfare and security, they also required increasing resources, and became economically important. According to Arendt, this increasing role of nation states meant that the state gradually started to acquire functions that historically belonged to the private domain of the household. The Greek *oecconomy*, the art of good management of households, became a public matter. Thus, in the modern state, private matters such as education of children, rights of slaves, health, sickness, and death all become areas where the state intervenes. Modern state, in this sense, becomes a service provider whose role is not anymore restricted to the political arena, but which enters previously private areas of citizens' lives. Previously private domains of life, therefore, become increasingly part of the public domain.

The diffusion of information and communication technologies is redefining the traditional boundaries between private and public domain in the political sense. This has important consequences for the operation of states and economy, also because information flows cross national and cultural boundaries. In addition to these social and political dimensions of the knowledge society, there are, however, also important consequences for the traditional concepts of intellectual rights.

Information and communication technologies change the way knowledge is shared and learned. It is therefore interesting the check to what extent the traditional assumptions that underlie the current system of intellectual rights are still valid.

### **Do exclusive intellectual rights promote innovation?**

Since the Statute of Anne, exclusive rights for intellectual products have been justified with the assumption that without such rights the authors would produce new knowledge less than is socially optimal. It is not easy to exactly locate the historical origins of this idea. Empirically, of course, it would have been difficult to validate as a general truth, as it was essentially a counterfactual claim. Basically, the claim was that something would not happen without lawmakers' intervention. This negative existence of something innovative and new, of course, could not be exactly described, and therefore it remained unclear what, strictly speaking, we would have missed without lawmaker intervention. From a philosophical point of view, the correctness of this fundamental assumption, therefore, will always remain outside positive proof.

In general, during the early history of exclusive intellectual rights they can often be understood as social privileges granted to those rather exceptional members of the society who had the capabilities to generate useful knowledge. It is clear that individual inventors and perhaps also some artists have been motivated to increase their creative output as a result of these privileges. The importance and impact of exclusive intellectual rights on aggregate knowledge creation, however, are not very clear.<sup>12</sup> One could also expect that the impact of intellectual rights is somewhat

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<sup>12</sup> The impact of intellectual rights on the production of new knowledge and new products is a very complex issue that has been extensively been discussed by economists, including researchers working in the Schumpeterian tradition that has emphasized innovative disequilibrium and entrepreneurship as the main drivers for economic growth, endogenous growth theorists that have included knowledge production as one of the factors that generate growth, and game theorists who incorporate informational asymmetries in their models. In general, economic models of knowledge generation,



different in the early industrial and the modern knowledge-intensive societies, where knowledge less frequently is a scarce resource.

The alternative claim that intellectual works are produced also when exclusive rights are not granted, however, has quite substantial support. Many intellectual products, new technologies, and economically important innovations have been created without exclusive rights. Classical works in science and art are obvious examples here. More modern examples include such technological innovations as packet-switching networks, the Internet, the World Wide Web, email, and open source software. In fact, the rapid development of the Linux open source operating system has indicated that sometimes technology may develop faster without exclusive rights than with them.

The Statute of Anne pointed out that rampant copying without the consent of authors had often ruined the authors and their families. In contrast to the assumed impact on increased aggregate production of intellectual works, the detrimental effects of lawless copying are, at least in theory, positively visible. In principle, the claim about positive impact of exclusive rights on the creation of new intellectual products and knowledge is quite different from the claim that copyrights would alleviate the pains of the victims of unlawful copying. The latter we can observe by studying the harm and pains actual authors suffer under different intellectual rights regimes; the former should be analyzed by studying how knowledge production processes change under such regimes.

The potential interventions and remedies would also be different. If individual authors are unable to have a decent life because they can not appropriate the returns of their investments in creative work, the society can, for example, provide them with grants and funding that solves the problem. If, on the other hand, the problem is in the inadequate aggregate volume of intellectual outputs, we could try, for example, to reorganize institutions and remove constraints so that knowledge creation becomes easier. One possibility is to set up a specific intellectual property regime, where authors have exclusive rights. Such a concept will look natural if we think that ownership—in the sense of control or the uses and appropriation of economic services—is the most efficient way to produce knowledge and intellectual work. This, of course, is often assumed to be the case in the modern capitalistic and industrial societies.

The question about intellectual property, however, can also be addressed from the empirical point of view. We can ask, under what conditions, and for which types of intellectual products, the concept of ownership leads to the expected positive results.

For example, we could ask the empirical question whether the authors and their families really are better off because intellectual works are covered by copyrights. If the goal of the copyright was to guarantee that authors do not get ruined as the benefits of their creations are appropriated by others, we could simply check the income that authors get, and count those authors who have a decent life and those who are effectively ruined. Although artists probably are only relatively infrequently ruined in the modern world, we could use simple proxies, for example, by checking

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however, have been quite loosely connected to realistic models of knowledge generation, simply because the conceptual basis for modelling knowledge generation has itself been relatively unknown, and because we have been lacking good models of knowledge generation (Tuomi, 1999).

how often they live below the local poverty lines, or how often they have to earn their living by secondary occupations.

This very practical point of view is sometimes confused by our somewhat ideological views on intellectual property, which tend to mix ethical assumptions about fairness with functional arguments. We easily believe that intellectual property is important because authors such as Rembrandt, Picasso, and Michael Jackson are associated with great wealth. It is, however, easy to see that in most cases authors are not associated with great wealth. The history is full of artists, innovators, and scientists who have been socially important but who have not greatly benefited from their works. The modern world probably is not very different in this sense.

Another empirical way to study intellectual property regimes would be to check who appropriates the benefits when the regimes are changed. For example, a well-known recent U.S. copyright case is *New York Times v. Tasini*, where a group of freelance journalists sued the New York Times and some other newspapers because these had reused without permission freelancer articles in electronic databases. The Supreme Court of United States agreed with the journalists and concluded in June 2001 that the newspapers had infringed the authors' copyright. The New York Times responded by lamenting the huge social costs and loss to advancement of knowledge and culture created by the Supreme Court's decision, and announcing that it would remove 115,000 freelance articles from the Lexis-Nexis news database, written by some 27,000 authors. Arthur Sulzberger, Jr., publisher of *The Times* and chairman of The New York Times Company, commented the decision:

Unfortunately, today's decision means that everyone loses. *The Times* has lost this case and will now undertake the difficult and sad process of removing significant portions from its electronic historical archive. That is a loss for freelance writers because their articles will be removed from the historical record. Historians, scholars and the public lose because of the holes in history created by the removal of these articles from electronic issues of newspapers such as *The Times*.

The Times then published phone numbers and a web-address which freelancers could use to waive their copyrights if they wanted to have their articles restored to the electronic databases. The Times web page explains:<sup>13</sup>

Should you opt to have your work restored, you agree that you will not be compensated and that you will release The Times from any claims relating to your work appearing in electronic archives such as Nexis.

In general, the intellectual property rights have constantly been extended during the last century. Some critics have pointed out that recent extensions apparently coincide with the imminent release to the public domain important commercial rights, such as those owned by Disney.<sup>14</sup> The U.S. copyrights, for example, have been stretched from the original fourteen to beyond hundred years. In this context, the recent copyright extensions have sometimes been called "Mickey Mouse laws."

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<sup>13</sup> <http://survey.nytimes.com/survey/restore/>

<sup>14</sup> Cf. Sprigman, 2002.

One might therefore conclude that it is not necessarily obvious that authors would be the main benefactors of intellectual property laws. The issue is, however, more complicated than this. If we study the history of particular artistic works or innovations, it becomes clear that also our concept of authorship may require rethinking. The idea of “encouragement of learning” implies that there is learning. Learning, in turn, is inherently cumulative. We learn by modifying existing concepts and knowledge. Learning, therefore, is only possible in the context of earlier knowledge.

This is why Bernard of Chartres said in the 12<sup>th</sup> century that in comparison with the ancients we stand like dwarves on the shoulders of giants. The statement became later widely known, as Newton used it in a somewhat modified form to insult his competitor Robert Hooke, who claimed that Newton had stolen his theory of light from Hooke’s *Micrographia*. Newton, in turn, argued that Hooke had stolen the idea from Descartes, who according to Newton, in turn took it from Marcantonio de Dominis and Ariotto. In general, one might note that it is a well-known historical fact that many of the most important artistic works, scientific discoveries, and technical and social innovations have been based on creative borrowing of earlier work, ranging from major religious texts to Shakespeare’s main works, gunpowder, money, the Arpanet, Apple MacIntosh, Microsoft Windows, and the World Wide Web.

Social forces have always played an important role in the attribution of authorship. This was noted by the founder of sociology of science, Robert Merton, who formulated it as the “Matthew Effect”. According to Merton, “rich are likely to get richer,” and scientific reputation and authorship are predominantly allocated to those scientists who already have reputation. A variation of this observation is known as Stigler’s Law of Eponymy (Tuomi, 2002: 154). In its simplest and strongest form it says: “No scientific discovery is named after its original discoverer.”

This problem of allocating authorship of scientific and technical advances was widely discussed in the 19<sup>th</sup> century. It was one of the main arguments in the great patent controversy that eventually led to the abolition of patent system in the Netherlands and Switzerland in the second half of the century. In essence, the argument was that because new knowledge always builds on earlier knowledge, it would be unfair to give monopolies to someone in this continuous chain of improvement.<sup>15</sup>

This problem of allocating authorship has become particularly challenging, as innovations have increasingly become systemic and cumulative innovations that combine multiple elements. In particular, innovations related to the Internet, software, and communication technologies have this cumulative and combinatorial character. Although technical advances in these areas are socially extremely important, new innovative products often result from engineering efforts where existing technologies are recombined so that they provide new functionality. Conventional models of inventive insights rarely work well in such environments. Instead, new technologies are produced by relatively straightforward design work that is organized around problem-specific knowledge (Kodama, 1995), and where the principles for design are commonly shared by competent engineers. Such innovations, therefore, rarely strictly

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<sup>15</sup> Another important argument was that patents were against free trade, cf. Machlup & Penrose, 1950.

speaking fulfill the requirement of non-obviousness, which has traditionally been a criterion for patentable inventions.

Furthermore, as such system patents are often essentially system integration solutions to non-technical but currently visible problems—for example generic models of “doing business”—multiple “inventors” tend to come up with the same “inventions” in parallel. In such an environment, the first “inventor” to file a patent is often in a position to create considerable barriers for technical development. This has been a problem in particular in the U.S., where patents are presumed to be valid as soon as they are granted, and where relatively obvious patents have been granted for business methods and software-related inventions.<sup>16</sup>

Empirically, it is therefore a somewhat open issue to what extent authors really become incentivized by intellectual property rights, and the concept of author is also conceptually ambiguous. This problem does not go away when we attribute authorship to organizations. On the contrary, a set of new problems emerge when the legal concept of corporation is mixed with the social concept of innovation. This has become particularly visible in recent studies on social learning and organizational knowledge creation (Tuomi, 1999).

An important remaining question is, however, whether intellectual property rights actually increase the societal production of knowledge and progress. This idea of “promotion of progress in sciences and useful arts” has been the central justification for granting exclusive rights for intellectual works and, therefore, also for the creation of the complementary “public domain” of intellectual products.

The impact of intellectual property rights on innovative activity has been actively studied by innovation researchers. The results seem to indicate that there are no simple connections between the strength of intellectual property regimes and the intensity of innovation.<sup>17</sup> Although, for example, patenting activity has increased considerably in the semiconductor industry in the U.S. during the last two decades, this apparently has not been associated with increasing research and development or with increasing returns from patents (Hall & Ziedonis, 2001). This empirical result is known as the “patent paradox.”

In practice, firms have often created patents to increase the number of patents available for cross-licensing, to increase capability to influence competitor strategies and public policies, and to avoid expensive and time-consuming litigations. Firms

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<sup>16</sup> Cf. Samuelson, 2004.

<sup>17</sup> WIPO and others have argued that the number of patent applications and the income per capita are associated, and suggested that this would imply that strong intellectual property regimes would somehow be related with economic growth. One should, however, note that the fact that high-income countries patent more than low-income countries does not imply that there is causal connection between patenting intensity and economic growth. Patenting intensity can grow also because high-income countries have more money available for patenting their inventions and, for example, because of patent races among industries in high-income countries. Shapiro, 2001 and Hall & Ziedonis, 2001 discuss the empirically known reasons for patenting intensity, and include references to many of the key studies. WIPO’s economic arguments have been problematic also as the benefits of patents have, for example, been justified by the neoclassical growth theory, which strictly speaking is conceptually incompatible with monopolies. On the theoretical capability of macroeconomic neoclassical models to describe innovation, see Tuomi, 2004.

have therefore also often invested in patent portfolios as defensive investments (cf. Shapiro, 2001). This strategy has also actively been promoted by venture capitalists, who often require that start-up companies develop a big enough patent portfolio for cross-licensing, so that its limited managerial resources cannot be distracted by competitors when the start-up enters the market and needs all its resources for rapid growth.

The historical limitations of intellectual rights were to an important extent based on the assumption that monopolies tend to be harmful for development. Researchers have noted that existing intellectual property regimes have at least some similar costs. For example, Hall and Ziedonis (2001:110) quote an estimate that a new semiconductor manufacturer would need to spend \$100 to \$200 million of revenues to license what are now considered basic manufacturing principles but which do not transfer any currently useful technologies. This, in practice, makes entry impossible for firms who do not extensive patent portfolios with which they can bargain.

The situation was different in the early phases of development in the semiconductor industry. To quote Gordon Moore, one of the early employees of Shockley Semiconductor Laboratories, and a founder of Fairchild Semiconductors and Intel:

Well, it was probably a different attitude about patents. One thing that happened in the semiconductor industry... semiconductor processes are a long series of steps and the patents had gotten pretty broadly spread because all of the people working on the technology had some of them. And the net result was in order for any of us to operate we had to be cross-licensed so the participants tended to all cross-license one another. So, there was not a tremendous advantage to having more patents... with a couple of exceptions, there wasn't much net benefit from it.

...Well, you ask about patenting on the microprocessor and frankly, we didn't think the microprocessor *per se* was that patentable. What we had done was take a computer architecture and make it all on one chip instead of on several chips. And that was kind of the direction that the integrated circuit technology was pushing in anyhow, always putting more and more of the system on a chip. What TI did was then start saying: 'Well, a microprocessor with a keyboard is an 'invention,' and I'll admit, I never would have thought of filing patents on those things that TI got issued patents for. (Moore, 1995)

### **Finding the balance**

If we study closely the history of the semiconductor industry, for example, it becomes clear that knowledge sharing has been a critical factor for its growth and development. The early phases of the industry in Silicon Valley are characterized by highly connected social networks, and spin-offs that were built around ideas developed in existing companies. Silicon Valley, in the 1960s, can well be characterized as a special version of public domain, a geographical region where new ideas and technological arts flowed across firm boundaries without much resistance.

The Silicon Valley example also highlights the fact that technical knowledge is often specialized and associated with specific social practices. As Brown and Duguid (cf.

Duguid, 2003) have noted, many innovative ideas created at Xerox PARC—including the computer mouse, graphical user interfaces, and local area networks—became important businesses outside Xerox. Yet it proved to be very difficult to move such knowledge from Xerox PARC’s laboratories to the manufacturing divisions of Xerox. In this sense, knowledge can be simultaneously “sticky” and “fluid.”

From a more philosophical point of view, the idea that knowledge can be associated with “an author” is also quite challenging. Knowledge and other cultural products are fundamentally social phenomena. Knowledge can only be expressed through communication, or—perhaps—indirectly, by embedding it in technological artefacts that become part of social practices. Expression of the outputs of intellectual work, therefore, necessarily makes these outputs visible to others. In this sense, knowledge exists when it is given away.

Expressions of knowledge, in other words, occur by making knowledge available for others. This communicative nature of knowledge has during the human history lead to multiple ways to externalize and articulate knowledge as languages, conceptual systems, text, and, for example, technical designs. These methods to externalize knowledge and to make it independent of the present context have been extremely successful, and they have provided the basis for cultural accumulation.

When expressions of knowledge are externalized as knowledge artefacts, such as documents, they become mobile, and the original creator may lose control over them. Historically, this became a problem with the printing press. The low cost of reproducing knowledge artefacts meant that multiple copies could be easily created and that the original author had potentially major problems in controlling their distribution and use. At the same time, the low cost of copying and reproducing knowledge artefacts has made rapid accumulation of knowledge and culture possible.

It is, however, important to note that knowledge artefacts do not in any trivial sense contain knowledge. They are elements in a process of interpersonal communication and knowing, where knowledge is actively created by all participants. Knowledge artefacts would remain meaningless without users who make them meaningful. Without creative audiences, artists and artworks could not exist. Similarly, innovators can only do their work by relying on the innovative capabilities of the potential users. Sometimes they do this rather naively, failing miserably when the world does not match their expectations. The heroic models of innovation sometimes make the creative role of users difficult to see, as they more or less by definition allocate all creativity to a “creator” who, in actual historical fact, is as difficult to find from the history of science and technology as in the present world.

Knowledge creation is a deeply social and cultural phenomenon. Individual’s learn by becoming engaged in socially embedded practices where cultural and historical stocks of knowledge provide the basis for the emergence of new knowledge. Historically, the limits of knowledge creation have been defined by social boundaries that allowed some members of the society to become members of the specific social practice in question, at the same time defining others as outsiders. Public domains of knowledge, therefore, are not only abstract legal constructs but also socially structured.

Historically, most knowledge has been embedded in communities of practice and thought styles that were controlled by the members of the community (Lave & Wenger, 1991; Fleck, 1979). Outside these communities the specific knowledge did not make sense. In that arena, people became political animals, defining a common domain of activity where artists, traders, generals, and philosophers joined the common ground where the collective process of *polis* was conducted.

In the modern capitalist societies, this social structure of specialization is complemented with economic organizations. Modern economic organizations are possible because they rest on a social foundation where knowledge is created and where it becomes socially meaningful. Too simplified concepts about the nature of knowledge and intellectual products, therefore, easily lose their connection with that concrete reality where knowledge is created. Ownership of intellectual production is difficult because intellectual products cannot be owned in any traditional sense. The value of intellectual output can only be realized after they become public, in the social sense. As knowledge is becoming increasingly important societally and economically, we therefore need to learn new ways to structure the domains of public action and public knowing. This structuring happens through communication, and therefore the new information and communication technologies are fundamentally revolutionary technologies. The challenge is to turn such revolutions into progress and advancement of learning, culture, and useful arts.

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