The Transaction Cost Benefits of Electronic Patent Licensing Platforms: A Discussion at the Example of the PatentBooks Model

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List of Abbreviations

IP	Intellectual property
IPRs	Intellectual property rights
NPE	Non-practicing entity
R&D	Research and development
TGL	TAEUS Global Licensing
TRIPS	Trade-related aspects of intellectual property rights
WTO	World Trade Organization

Abstract

Current mechanisms to compensate inventors and improve legal access to their inventions remain ineffective. Manufacturers encounter significant transaction costs in the process of licensing the multitude of patent rights implicated in their products. High-technology product manufacturing requires access to a diverse pool of technologies that are owned by different organizations all over the world. The transaction costs of licensing these disparate rights are inhibiting unlicensed manufacturers in emerging economies from entering important markets and simultaneously limiting the revenue patent owners can generate from non-exclusive licenses. As communications technologies improve, innovative licensing mechanisms are emerging that can help firms avoid many of these transaction costs. Search and information costs, bargaining and decision costs, enforcement costs and adjustment costs all limit the value generated from licensing transactions. These costs are particularly severe for smaller firms that lack complementary assets to develop their products, lack experience with licensing and do not have large human and financial resources to invest in negotiation outcomes. The transaction costs of licensed manufacturing increase exponentially when having to license multiple rights among disparate rightsholders in a global market. By identifying, grouping, and valuing different rights into a single license, PatentBooks, an illustration of an electronic patent licensing platform, reduces search and information transaction costs. Firms instantaneously identify appropriate license rights from all over the globe without investing considerable resources in hundreds of discrete negotiations. Patent owners are able to generate greater non-exclusive licensing revenue from manufacturers than they could by licensing their rights in isolation. In doing so, they permit firms of all sizes and nationalities to generate more returns from technology and accelerate innovation by facilitating access to valuable inventions.

Introduction

"The pen and paper system of transacting IP will not scale to meet the needs of the global marketplace." – Hank Barry (former Napster CEO)

As communications technologies proliferate around the globe and actors in knowledge-based economies turn to intellectual property rights (IPRs) to generate revenue from innovations, licensing is becoming increasingly important. Annual revenue from IPR transactions witnessed phenomenal growth worldwide with the diffusion of digital communications, growing from $10 billion in 1990 to over $200 billion in 2007 (McClure). Patents are the most widely licensed of IPRs and are an integral component of the global innovation system. Trade in technology is progressively more common and studies suggest there are now greater opportunities for licensing and increasing revenue from patents (Arora, Fosfuri, et Gambardella 2001).

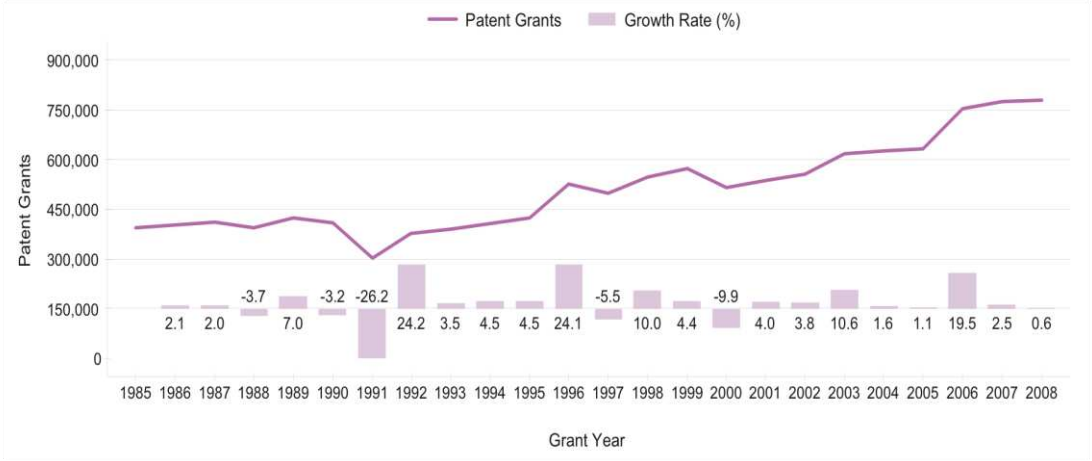
Companies are relying on patents more and more in order to generate revenue. Monetizing patents and integrating new technologies into product manufacturing is increasingly important. The majority of R&D, and consequently patents, originates from the US, Europe, Japan and Korea. The majority of manufacturing is done in China, India and the rest of the developing world. Yet, manufacturers need access to a wide range of patents in order to manufacture technological products. Patent owners also need access to a large network of manufacturers if they wish to monetize their patent rights effectively. Though communications technologies have helped foster an unprecedented rise in patent licensing, there are still ample opportunities to leverage new aggregation methods and digital networks to reduce transaction costs associated with this process. Aggregating patent rights into useful product bundles and creating a one-stop licensing platform will enable both small and large firms to generate greater value from patents.

This paper outlines the transaction cost benefits of a specific type of aggregated patent license called the PatentBook. First, the growing value of intangible assets is briefly reviewed. The shift in perceiving IPRs as intangible assets that should be proactively managed to enhance business value and the various motivations for licensing are then discussed. The second section of the report introduces the theory of transaction cost economics and outlines the characteristics of the TAEUS PatentBook. Finally, transaction costs associated with bilateral licensing are descriptively compared to those experienced under the PatentBook model. Arguing that PatentBook licensing capitalizes on the advantages of bundling patent rights, economies of scale, communications technologies, and specialized expertise, we posit that firms can use PatentBooks to monetize their patent rights or access much need technologies while simultaneously limiting transaction costs associated with patent licensing.

Licensing as a Form of Patent Management

Approximately 6.7 million patents were in force around the world in 2008 (WIPO 2010). Another 5.94 million patents were at some stage of the application process in the same year. The volume of patents granted around the world has grown steadily over the past 25 years, despite fluctuating year-on-year growth rates.

Figure 1. Patent Grants Worldwide



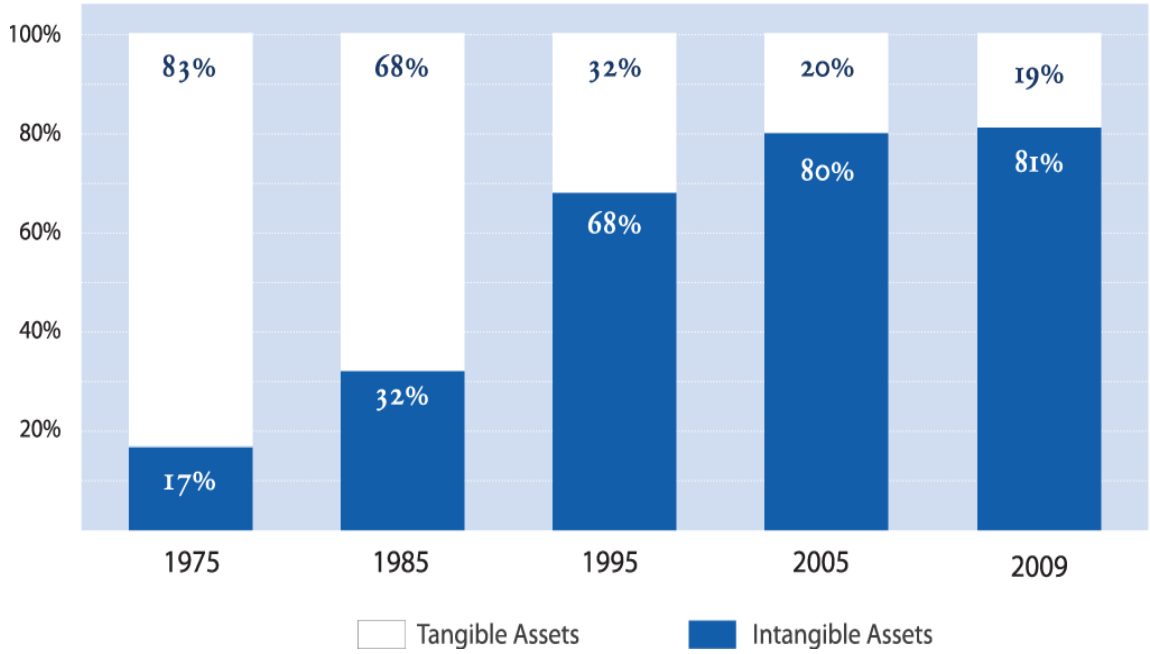
(Source: WIPO 2010)

Though these trends suggest the growing importance of patents to business value, managers are often reluctant or unable to incorporate this knowledge into viable strategy alternatives. Traditional defensive approaches to patents have led to the under-management of valuable assets (Borod 2005) and patent management is increasingly important to many different types of firms (Arora, Fosfuri, et Gambardella 2001). Canadian technology giant Nortel Networks is a prime example of how companies can lose out on value if they use their patents only as defensive tools. Unable to generate sufficient revenue to continue operations, Nortel Networks filed for bankruptcy protection in 2009. Nortel's patent assets were then bought in 2011 during bankruptcy proceedings for $4.5 billion by a consortium led by Apple, Microsoft, Sony and Research in Motion.[1] Kodak is encountering similar problems from its defensive approach to patents. MDB Capital Group estimated in August 2011 that Kodak's digital-imaging patents - which comprise only 10% of its patent portfolio - are worth $3 billion, more than five times Kodak's total market capitalization.[2] Patents have seen a dramatic evolution from a purely legal asset in infringement lawsuits to a key corporate financial asset that has become the primary driver of revenue in the knowledge-based economy (Kossovsky 2002). The lack of common management approaches or valuation standards for patents has led to high variation among firms in terms of the governance and incentive structures deployed to stimulate value capture from patent assets and consequently high variation in its utilization (Chesbrough 2006). Yet, the switch to intangibles as the key generator of value in developed economies should not be underestimated. The *80/20 inversion* is a popular term given for this development. Thirty years ago intangible assets constituted approximately 20% of publically traded company value in the US whereas now they comprises up to 80%; empirical data demonstrates this is also true for small private companies who generate 13 to 14 more patents per employee on average than large firms (Millien and Laurie 2007, 2).

[1] http://www.guardian.co.uk/technology/2011/jul/01/nortel-patents-sold-apple-sony-microsoft

[2] http://www.bloomberg.com/news/2011-08-17/kodak-worth-five-times-more-in-breakup-with-3-billion-patents-real-m-a.html?cmpid=yhoo

Figure 2. Components of S&P 500 Market Value
(Source: Ocean Tomo 2009)



Analysts argue a large fraction of patents are now traded (Serrano 2006) and patent reassignment data shows that the market for patents in the US grew from 2000 reassignments in 1980 to nearly 90,000 in 2003 (Chesbrough 2006). Though the data includes reassignments involved in mergers and acquisitions deals, administrative records and other transactions not directly attributable to the patent market, the transfer of patent rights is a large and growing reason for this reassignment.

Patents are emerging as a powerful and valuable asset class (Monk 2009) and the strategic use of patents is increasingly seen as an important component in creating and extracting value from technological innovation. IBM illustrates the case. IBM licensing income grew over 500% from 1990 to 2001, generating $1.9 billion in revenue in 2001 alone (Sneed et Johnson 2009). Estimates suggest IBM has made over $10 billion in licensing revenues since 2003 (Monk 2009). Patent licensing has evolved into a major source of revenue for many firms in sectors as diverse as software, health, aerospace, telecommunications, energy and many others. The transfer of patent rights both accelerates innovation by improving technology transfer and increases the value extracted from otherwise under-leveraged assets. Annual transactions relating to IPRs have seen a dramatic increase since the integration of digital networks in economic activity, from $10 billion in 1990 to over $200 billion in 2007 (McClure). With this in mind it is hardly surprising that an emerging market for the trade of intangible assets will become a key component of sustainability and competitiveness in the coming years; ‘intellectual property lies at the center of the modern company’s economic success or failure’ (Thurow 1997, 96). While patents are the most effective value-creation tools for research-based companies, capital remains their dearest resource (Kossovsky, Brandegee, et Giordan 2004). As innovative methods help companies reduce the transaction costs of licensing around

the world, firms must seize new opportunities to generate more value from patents in the knowledge-based economy.

The reasons for licensing patents

Firms decide whether or not to license patents based on an assessment of whether or not it will maximize their profits. It is not surprising that firms with different business models and organizational structures approach licensing in different ways (Aoki et Nagaoka 2004). Teece established long ago that the boundary of a firm, in terms of the range of assets at its disposal, is a critical determinant of its ability to capitalize on innovation (Teece 1986). Complementary assets traditionally determine the winners in innovation because the scope and structure of firms has an important impact on the profit distribution between imitators and innovators (Teece 1986). Capitalizing on product or process innovations is about much more than R&D. These are critical ingredients of innovation, but profiting from them is equally reliant on the ability to manufacture, distribute, and market those products around the world. Large companies dispose of greater access to the complementary assets necessary to manufacture, market and distribute their innovations (Arora, Fosfuri, et Gambardella 2001). This means that they can generate more value from R&D efforts by exploiting their innovations on a greater scale across more products and markets.

Academics distinguish between small R&D firms that specialize in 'exploration', due to their organizational culture and expertise, and large firms that focus on 'exploitation', due to the economies of scale and scope provided by their complementary assets (Arora, Fosfuri, et Gambardella 2001). Licensing patent rights enables managers of 'exploration'-based firms to focus on their particular field of expertise while simultaneously extracting revenue from R&D, without the need for complementary assets. By the same token, large 'exploitation'-based firms can capitalize on the research efforts of others by accumulating patent rights and exploiting them efficiently through their large manufacturing and distribution infrastructure. The exchange of patent rights also permits firms to extract revenue from markets with prohibitively high barriers to entry because they no longer rely on direct access to complementary assets to create value. Essentially, firms lacking the complementary assets for efficient downstream commercialization are able to partially substitute their production with licensing programs (Arora et Fosfuri 2003).

There are numerous motivations for managers to license patent rights. Doing so can maximize profits from an innovation while simultaneously optimizing the R&D costs within the firm towards new, potentially lucrative, ventures. Firms can share risks associated with technology investments and expand the use of R&D output beyond their core markets. If a firm abandons operations in a particular industry or ceases R&D in a given field, more value is generated from selective patent licensing than from sitting on a redundant patent portfolio. Some patent owners also seek to generate cash immediately through brokered licensing transactions rather than engage in complex bilateral licensing programs, which often engender significant time, financial and human resource costs for managers who rely on the credible threat of litigation to extract royalties (Monk 2009).

This threat of litigation is a major reason for why manufacturers license patent rights. Operating firms increasingly seek patent rights in order to defend their products from

lawsuits filed by non-practicing entities (NPEs) and patent owners. Major international NPEs such as Intellectual Ventures are estimated to own over 35,000 patents.[3] Estimates of the market capitalization loss resulting from NPE lawsuits in the software industry alone over the past twenty years are around $0.5 trillion.[4] In 1998, there were less than 250 companies that were engaged in litigation with an NPE. By 2010, that number has skyrocketed to 2,600, an increase of 48% over the average of the previous three years. The accumulation of large patent portfolios for this reason has caused serious competitive and antitrust issues. This is an important consideration in the development of more liquid patent markets that should be carefully monitored.

Transaction cost economics of Patent Licensing

The economic efficiency of patent licensing is strongly influenced by the context in which exchange occurs. The majority of licensing agreements have historically been the result of one-off, private negotiations between contracting partners. This engenders significant transaction costs and mitigates the total value generated by the management of patent assets.

Since Ronald Coase we know that the efficiency of market transactions cannot be takes as given. (1937; 2007) The Coase Theorem describes the economic efficiency of any market allocation or outcome in the presence of externalities. It is hinged on the notion that private negotiations always lead to more efficient allocation of resources than state intervention. Belief in the rationality of free market forces is a fundamental component of transaction costs economics from the beginning. However, Coase purported that market transactions were riddled with transaction costs, which necessarily reduced the efficiency of any allocation or outcome. In order to reduce the negative influence of transactions costs on the efficiency of contractual exchanges, these costs had to be identified, understood and limited. Transaction costs were identified, for example, when economic actors spent time to identify potential clients, negotiate contracts and enforce their compliance. By acknowledging the existence of transaction costs in exchange, economists could explore the coordination mechanisms that might minimize them (Hansen et Schmidt Bischoffshausen 2007).

Transaction costs, when they are prohibitively high, can inhibit the realization of valuable cooperation profits. They exist in economic exchange because formal transactions necessitate the identification of potential partners, pre-agreement negotiations, the communication and codification of contractual terms, the drafting of final contracts and the monitoring of compliance (Coase 2007). These transaction costs should not be confused with the final license fees (contract prices) agreed upon; ‘the fee is a measure of the value of the transaction; the transaction cost is the cost of making the transaction and thus realizing the value’ (Posner 2004). Focusing on market transactions means that transaction costs economics has largely ignored the

[3] http://www.intellectualventures.com/NewsRoom/PressReleases/11-11-30/Nanya_and_Intellectual_Ventures_Sign_Intellectual_Property_License_Agreement.aspx

[4] http://opensource.com/law/11/9/ginormous-losses-npe-software-patent-lawsuits

impact of power over private bargaining outcomes as well as the role of macroeconomic regulation and state intervention in economic efficiency (Hansen et Schmidt Bischoffshausen 2007). Interestingly, it is often the perception of transaction costs by managers that is significant. While managers are rarely explicitly aware of the theory of transaction costs, they are consistently engaged in decisions where transaction costs are important and have a sophisticated understanding of the relevant issues (Buckley et Chapman 1997). It is not particularly helpful to pretend that each transaction cost can be quantified objectively and no case has been encountered where managers engaged in a numerically justified assessment of various transaction costs; essentially 'managerial perceptions matter, and transaction costs cannot be quantified or measured separately from these perceptions' (Buckley et Chapman 1997). There is accordingly a limit to the conclusions that can be drawn from transaction cost analysis. Yet, transaction costs are nevertheless a useful framework to analyze the potential impact of PatentBooks on licensing efficiency.

Cooter and Ulen distinguish between the various chronological phases of a market transaction in order to identify four different categories of transaction costs (Cooter et Ulen 2007):

1) Search and information costs – the costs accrued when soliciting potential contracting partners, which must be identified and information about them supplied and processed.
2) Bargaining and decision costs – the costs accrued during the negotiation and conclusion of contracts, once a contracting partner is identified. The contract process is time-consuming and legal advice is expensive.
3) Enforcement costs – the costs accrued after the contract is concluded and compliance must be monitored and often legally imposed.
4) Adjustment costs – the costs accrued over time when unforeseen need for contractual review may arise.

The PatentBook model

The primary rationale for PatentBook licenses, created and brokered by TAEUS Global Licensing (TGL), is based on the fact that the manufacture of technological products requires licensing multiple patents from a variety of actors around the globe. Because a single successful licensing transaction can take many years and relies on multiple negotiations, the threat of litigation, and significant managerial attention, the transaction costs associated with the accumulation of all the rights necessary to manufacture a certain product can be prohibitive. In fact, most companies and institutions do not have the resources necessary to engage in bilateral licensing on this scale. This is particularly the case today, where manufacturers responsible for a high proportion of the global volume of technology products are situated in emerging economies like India and China, while patent owners originate primarily from the developed world. PatentBooks thus primarily target two types of firms: product manufacturers that assemble PatentBook products and firms that own the patents included in the PatentBook.

Aggregating patents and offering single price licenses to manufacturers is commonly associated with the development of technical specification standards. Technical

specification standards are created by industry associations and amongst competitors in order to ensure that all system components designed for new products are interoperable. Aggregated patent licensing exists today for a number of products, such as DVD, RFID, MPEG and 4G/LTE technologies. Collaboration between private organizations in setting industry standards and royalty rates has led to concern over the competition and antitrust issues this raises (Choi 2003; Gilbert 2004; D.J. Teece et Sherry 2003). This is a legitimate concern but one that is not elaborated on here since we are concerned only with transaction costs. Aggregating patents judged essential to an underlying technical specification, and excluding all others, facilitates the legitimate manufacture of high-technology products. Collectively agreed rules establish how license royalties are distributed, which can lead to problems if owners perceive their patents to be of a higher quality than others. Quality is an important issue in the aggregation of patent rights and it is vital to establish fair and explicit methods for distributing royalties. Aggregating patents in certain product domains is difficult because the inventions are not covered by a technical specification standard. Since most technology fields do not have specifications, this is an important issue.

PatentBooks do not aggregate patents according to underlying technical specifications. Instead, they aggregate patents according to product requirements and offer a single license for all the patents to manufacturers of that product. Patent owners receive non-exclusive licensing income from unlicensed manufacturers who make products using patents in the PatentBook. The target licensees for PatentBooks are thus product manufacturers that currently do not license the technologies integrated into their goods. TGL, as the PatentBook aggregator and license broker, distributes the majority of the PatentBook royalties to patent owners and charges one-off fees for evaluating exceptional patents in the book. A weakness of the PatentBook approach, from the perspective of patent owners, is that TGL takes 40% of income from PatentBook licensing. This is due to the administrative costs of aggregating the patents, maintaining the online platform, and identifying suitable manufacturers for license agreements. Patent owners may be reluctant to share this proportion of licensing revenue with an intermediary, opting instead to license their rights bilaterally themselves. However, because submitting patents to a PatentBook does not block owners from pursuing their own license negotiations, the revenue generated is complementary rather than a substitute.

PatentBooks distribute royalty income according to the quality of the patents included rather than the quantity. This is an important difference to other patent aggregation methods. Many analysts suggest that only around 0.5% of patents in a portfolio are serious value generators, with another 10-15% being useful in license negotiations. The rest of the patents included are of minor importance. Since patent owners will not aggregate their patent rights with others if they feel they are not being fairly remunerated, distributing royalty income according to patent quality ensures that contributors with a high quantity of low quality patents do not receive a disproportionate amount of revenue from the single license. TGL publishes a framework of quality criteria, which allows owners to determine whether the patents are worth submitting to the PatentBook. Owners must also submit relevant documentation. TGL acts as the arbiter of patent quality self-evaluation but does not evaluate the patents directly in order to avoid conflicts of interest.

The relative quality of patents in the PatentBook are ascertained by evaluating the patents based on several criteria commonly used in licensing transactions across three major domains: technical, legal and financial/market. Quality criteria include the following factors: observability, ease of investigation, technological maturity, current commercial use, future commercial use, lack of prior art, availability of alternatives and scope of claims. This system is a human-based process where multiple subject matter experts score a patent from 1 to 5 on each of the criteria. This step-by-step framework for assessing quality is distributed by TAEUS to potential submitters who evaluate the patents themselves. Quality evaluation is important because quality determines the royalty income distribution among patent owners in the PatentBook. The top 2% of patents in the PatentBook will receive 50% of the royalty income. The next 13% receive 35% of the royalty income. The last 85% receive the remaining 15%. Evaluating patents prior to their inclusion in the PatentBook has a secondary benefit to the industry because, if a patent ranks poorly in terms of quality criteria, it suggests the patent is of low worth and should be dropped. Determining royalty rates according to patent quality is significant because patents are often aggregated around a few blockbuster patents. PatentBooks recognize the disparity in value between weak and strong patents and ensure that the owners of strong patents are rewarded fairly.

The transaction cost implications of PatentBook licensing

The growth in the licensing of patents for downstream use suggests that technology markets are increasingly important for managing patents and manufacturing high technology goods (Razgaitis 2005; Athreye and Cantwell 2007). As growing demand for technologies increases demand for underlying patent portfolios and the low transport cost of technologies enables the large-scale exploitation of those rights in a globalized market, licensing is increasingly recognized as a valuable revenue opportunity (Arora, Fosfuri, et Gambardella 2001). The transfer of patent rights has conventionally been achieved through bilateral licensing negotiations (Caves, Crookell, et Killing 1983; Arora 1995; Teece 1986). However, historical cases of aggregate patent licensing have shown that it reduces transaction costs in a number of product markets such as movie projectors, hydraulic pumps, swimming pool cleaners, beds, and synthetic polypropylene fiber production (Merges 1999b). Bilateral negotiation is a private and sequential bargaining model (Jarosz et al. 2005) that offers flexibility and privacy but is plagued by multiple transaction costs. Brokers of an aggregated patent license reduce the number of negotiations necessary to access a range of patents and apply technological and legal expertise to reduce the complexity of licensing (Reiko Aoki et Schiff 2010). Common procedures in terms of contract drafting, due diligence, negotiations, and enforcement enable the broker to leverage economies of scale and scope in order to reduce the per unit cost of licensing. By reducing transaction costs associated with licensing, brokers increase the number of licensing transactions overall and generate more revenue for patent owners (Arora et Fosfuri 2003). No robust and disaggregated quantitative estimates exist for the transaction costs associated with licensing. The intangible nature of patents and the private context of bilateral negotiations make accurate assessments inherently difficult. However, the transaction costs commonly encountered in bilateral license negotiations can be compared to those encountered in PatentBook licensing in order to highlight the differences.

Search and information costs

Identifying, contacting and vetting partners can be an extremely time- and resource-consuming process. License partners must first be identified and then all relevant information about them must be collected, supplied and processed. In some cases, the cost of identifying all patent owners can be so high as to be prohibitive. A manufacturer in China will have to invest considerable resources in identifying and processing all information about the patents – and their owners – that are implicated in an LCD display in order to legitimately manufacture it and access important international markets. These search costs automatically limit the manufacturer's ability to identify all the relevant rights as well as the most attractive licensing partners. They may resort to unlicensed manufacture, assuming that the infringement costs incurred in the future will not exceed the immediate transaction costs of licensing all relevant patents. This is a negative outcome for the patent owner as well, who loses out on immediate royalty income and must deploy the threat of litigation to extract revenue from infringers.

PatentBooks aggregate all the patents necessary to manufacture specific products into one license that is instantaneously and universally accessible. Manufacturers can license the hundreds, or even thousands, of patents implicated in their products simultaneously, in a single transaction without incurring litigation expenses. Licensing information can be accessed easily from a single point rather than involving the time-consuming and expensive process of traveling the globe and trawling through commercial databases that lack common standards and interoperable formats. Manufacturers no longer have to identify all the relevant patents and their owners. PatentBooks help managers quickly identify the rights they need for specific products, cutting the time and resources expended on search and information processes. Empirical evidence shows multiple factors influence licensing transaction costs and consequently the decisions of firms to engage in licensing. Companies are more likely to enter into licensing relationships with partners who closely fit their technological and market profile (Kim et Vonortas 2003). PatentBooks match buyers and sellers more effectively since they collect, organize and standardize this type of information. A firm can identify a large pool of patents without suffering the high search and information costs associated with bilateral bargaining breakdown. A Chinese LCD manufacturer may simply be unaware of who owns all the patents implicated in their product. An LCD PatentBook enables the manufacturer to quickly and easily identify these rights and license them in a single transaction, thus reducing search and information costs substantially. Revenue is generated from non-exclusive licensing agreements with previously unlicensed product manufacturers. Patent owners receive a share of the licensing revenue – as dictated by the quality of the patents contributed – without needing to identify and negotiate individually with the manufacturers.

The information costs of due diligence are a serious obstacle to the efficient matching of licensees and licensors. This cost is particularly acute when bilateral bargaining breaks down and negotiations must start again with a new contracting partner (Jarosz et al. 2005). In bilateral licensing, where each negotiation is a new and discrete relationship, simply examining and discarding incoming offers can be daunting. Due diligence in pharmaceutical in-licensing deals can amount to over two thirds of the

total deal-vetting costs. With an average cost of $1.9 million and a ceiling of up to $6 million, due diligence is a large investment.[5] Large pharmaceutical in-licensing deals are complex and require many stages of approval, which increases time and personnel costs rapidly. The survey of pharmaceutical firms found that the total cost of vetting potential licensing deals ranged from $660,000 to $8 million per deal.[6] Clearly, there are a range of costs depending on the complexity and size of the deal and the industry in which it occurs. This range implies due diligence is a major burden on bilateral licensing deals. The high information cost of due diligence is partly the result of 'information impactedness', 'where information that is privately held, difficult to measure, or unknowable, hinders efficacious contracting' (Posner 2004). PatentBooks alleviate this problem by systematically collecting and organizing information relevant to the transaction for third parties. TGL insulates these parties from identity exposure. Since unsuccessful attempts to license patents can expose a company to litigation risks or provide critical strategic information to their competitors, a degree of anonymity avoids some information costs associated with bargaining breakdown.

PatentBooks reduce the total search and information costs of identifying license partners and spread the remaining costs among multiple users. Consequently, TGL can deploy a far more sophisticated search technology than individual users could hope to implement by themselves (Reiko Aoki et Schiff 2010). The value of a network increases with each additional user, generating positive feedback to network size (Arthur 1994). The value of PatentBook licensing increases the more patent owners and licensees are attracted to the platform because this increases the amount of searchable information about patents and licensees. In the same way that a Chinese manufacturer will suffer transaction costs to identify all the owners of patents implicated in LCD displays, owners of LCD technologies suffer transaction costs associated with identifying and collecting information about all the possible Chinese manufacturers. Significantly, an online exchange exhibits increasing returns to adoption. The search and information costs per transaction typically associated with licensing are steadily reduced as more members join. Since the communications infrastructure is already established, additional users can be added to the network at no or marginal cost. This means the exchange easily incorporates new members, increasing the value of its service, and in turn attracting more members. Positive feedback loops improve the user value created by stimulating adoption and fuelling network effects (Shapiro and Varian 1999). 'Demonstration effects' suggest that the more a product becomes prevalent the more it is known, and thus the more likely people are to use it (Arthur 2000). This phenomenon is evident in social networks like Facebook, MySpace and Linked-In as well as online marketplaces such as Ebay. Facebook users have grown at an exponential rate. The total number of Facebook users increased from 1 million to 100 million between December 2004 and August 2008. Its user base grew the same amount to 200 million by April 2009, 300 million by September 2009, 500 million by July 2010, 750 million by June 2011 and finally 850 million by November 2011.[7] As the advantages of the PatentBook platform are

[5] http://www.cuttingedgeinfo.com/2011/due-diligence-costs-pharmaceutical-in-licensing-deals/

[6] http://www.cuttingedgeinfo.com/2011/due-diligence-costs-pharmaceutical-in-licensing-deals/

[7] http://www.benphoster.com/facebook-user-growth-chart-2004-2010/

demonstrated through its use, the exchange should attract more participants and thus increase its value.

Aggregating and organizing patent information on an online exchange relies on multiple technologies and standardized processes. Advancements in Internet technologies, particularly the advent of web 2.0 utilization architectures and networking capabilities, are a critical facet of effectively matching patent owners with manufacturers in a global market. The Internet facilitates the exchange of ideas among culturally diverse, decentralized and geographically disparate individuals or companies (Brabham 2008). The vast scale of the web and the instantaneous exchange possible between users enables the efficient aggregation of disparate rights (Terranova 2004). Communication technologies permit participative, multidirectional and highly inclusive behavior (Delfanti 2010) as they break down transaction cost barriers separating small and multinational firms. Most importantly, the PatentBook exchange capitalizes on the *semantic web*: searchable patent rights databases are efficient because web content is increasingly understood by computers that perform a large amount of the tedious tasks that share and combine the information provided by the multiple users (Albors et al. 2008). Strict self-evaluation and submission processes enforced by TGL enable this process. Patent owners can conveniently submit patents at no cost and offset patent maintenance costs with the minimal royalties received from participation in the PatentBook. The patents can also be removed at no cost. Patent owners simply need to honor the terms of the licenses granted prior to the removal of the patent from the PatentBook. The technology for aggregating user-generated content is low-risk and mature. PatentBooks leverage these technologies and deploy them in tandem to reduce patent licensing search and information costs.

Bargaining and decision costs

Bargaining and decision costs are the costs encountered during the negotiation and conclusion of contracts after a partner is identified. The bargaining process of contract terms and royalty rates can be a time-consuming process that requires expensive legal advice every step of the way. Licensing agreements are generally embedded in a host of other contractual agreements. These can include R&D agreements relating to product development, manufacturing agreements ascribing the right to manufacture, downstream IP agreements and sales agreements, as well as tacit-knowledge transfer agreements involving the loan of personnel across organizations. The importance of explicitly defining the working relationship also requires a set of confidentiality, interim, feasibility and prototype agreements in most cases. Costs accumulate rapidly in negotiations, particularly for smaller firms that do have the same level of experience with licensing and cannot rely on legal and financial resources to the same degree as their larger counterparts.

Difficulties in licensing transactions occur because of disagreement over patent valuation (Mard, Hyden, et Rigby Jr 2000; Merges and Nelson 1994) and obstacles associated with the fuzzy boundary definitions of patent rights (Teece 2000a; Somaya et Teece 2001). Experimental evidence implies that individuals evaluate fairness in negotiations in a self-serving manner (Babcock et al. 1992; Loewenstein et al. 1993). This complicates licensing because licensors systematically attribute a higher value to their inventions than licensees (Posner 2004). Costs also accrue due to diffuse patent

entitlements, where determining which patent is implicated in a product and who owns it can be difficult (Somaya et Teece 2001). Because technologies are subject to technical and commercial uncertainty, the value of a patent can be the subject of significant dispute. The resolution of these disparities introduces transaction costs (Merges and Nelson, 1990; Merges and Nelson 1994). Effectively, 'since the true validity and extent of property rights conferred by a patent may only be ascertained after lengthy and expensive legal proceedings, this leads to genuine disputes as well as strategic posturing during licensing negotiations, significantly increasing costs and delays' (Somaya et Teece 2001). Differences in bargaining power and the inefficiency of licensing contracts are generally cited as the main reasons why innovators cannot efficiently capture rents from innovation (Arora, Fosfuri, et Gambardella 2001). This is especially true when corporate licensing managers intentionally extend negotiations in order to extract concessions from smaller parties. A typical strategy to limit fees and lower the final license price is to stretch out and confuse the entire bargaining process (Detkin 2007). This may improve a licensing executive's corporate performance indicators while only being a minor drawback to their organization, which disposes of significant financial resources and an integrated legal department for contract negotiations. However, smaller firms with more limited resources may be pressured into concluding rapid negotiations on less favourable terms due to the cost of extending the bargaining and decision process.

As the PatentBook broker, TGL mediates between interested parties, helping to resolve disputes about valuation and leveraging its experience to draft carefully tailored contracts. The enforced patent self-evaluation procedures - based on technical, legal and financial/market assessments that are common in the licensing industry – provide a uniform set of conditions that justifies as well as clarifies royalty distribution among the patent owners contributing to the PatentBook. By regularizing the transaction mechanisms for technology licensing and reducing the total volume of transactions necessary for licensing a specific product, PatentBooks lower overall negotiation costs. Transparent mechanisms for the resolution of disputes reduce uncertainty and uniform license terms reduce the costs of exchanges with manufacturers. TGL helps reassure license partners that negotiations are fair and influences the perception of managers regarding the extent and impact of transaction costs. The exchange mechanism also reduces the need for geographical proximity between contracting partners and helps mitigate some of the opportunistic behavior common in license negotiations. Yet, as the PatentBook administrator, TGL is in a privileged bargaining position relative to patent owners and manufacturers. Since licenses are offered to manufacturers at a uniform price set by TGL, and the manufacturer's only alternative is to negotiate each contract bilaterally, TGL could exploit its position to extract more revenue for patent owners and thus itself. However, because maximum licensing revenue is achieved by balancing high transaction volume with adequate royalty remuneration, TGL benefits from balancing the interests of patent owners and product manufacturers in a transparent manner. Crucially, the PatentBook does not restrict an owner from entering into independent bilateral license negotiations.

Repeatedly engaging in a high volume of contract negotiations results in considerable expertise that enables TGL to streamline the bargaining process. Individual negotiation time and cost is reduced via partially standardized contractual terms. The application of largely uniform conditions on all parties confers legal certainty and

reduces the likelihood of recourse to legal advice. In copyright licensing, the cost to rightsholders and potential license partners of the information, coordination and administration procedures would be prohibitively high if done individually (Besen, Kirby, and Salop 1992). Copyright collecting societies benefit from economies of scale that reduce transaction costs and increase total transaction volume as a result (Handke and Towse 2007). TGL, while operating as a broker rather than a collective licensing organization, achieve similar results. Despite incurring high fixed costs to establish and maintain the administrative infrastructure of the platform, the exchange reduces fixed administrative costs per member on average by increasing the volume of transactions. This approach benefits from decreasing average costs in facilitating contract negotiations and passes those advantages on to its members. It leverages economies of scale in order to reduce the per-unit cost of licensing and the corresponding real resource costs associated with it. These economies of scale are not possible to the same degree when firms pursue licensing agreements individually. The US Supreme Court has recognized that aggregate patent licenses regularize technology transactions and, like collective copyright licensing, 'their basic economic rationale is that they significantly reduce the transaction costs of exchanging rights when compared to a series of one-shot licensing deals' (Merges 1999b).

Most high-technology products incorporate multiple patents from a wide range of owners. This results in patent thickets or royalty stacking, where taxation occurs to such an extent among firms that it can halt the rate of innovation or impede manufacturers from producing certain goods. The integration of disparate rights for licensed manufacture can be a major obstacle to producers. The costs of integrating rights into a product bundle is aggravated by the existence of multiple, discrete rights that grant their owners the opportunity block any given stage of negotiations. The 'anti-commons' effect in IPR transactions describes how the process of clearing rights to manufacture a product can be prohibitively difficult or expensive, (Heller et Eisenberg 1998). When a wide range of exclusionary patent rights cover a single product, it can be very costly to clear those rights for manufacture because of the costs associated with bargaining and decision processes; 'each upstream patent allows its owner to set up another tollbooth on the road to product development, adding to the cost and slowing the pace of downstream' innovation due to transactional failures (Merges 1999b). One-off negotiations to clear these rights between multiple parties results in bargaining breakdown and holdup in negotiations, increasing transaction costs (Calabresi et Melamed 2007; Libecap 1989).

A Chinese manufacturer of LCD displays will need to negotiate with many different organizations all over the world in order to clear the rights implicated in their product. Semiconductor, matrix, illumination, and polarizing technologies are only a few of the technologies included. Not only will these multiple discrete negotiations entail massive transaction costs but every negotiation must be successful in order to begin production. Bargaining break down with a single partner risks jeopardizing the entire process if substitutes cannot be found. PatentBooks aggregate disparate patent rights for specific products into useable bundles that preserve R&D incentives while simultaneously overcoming the tragedy of the anticommons associated with patent thickets and royalty stacking (Merges 1999b). A Chinese LCD display manufacturer can instantly identify the PatentBook for LCD displays on the TGL platform and license every patent right needed in a single transaction. Aggregate patent licensing is frequently cited as a useful tool to overcome the harmful impact of overlapping patent

rights (Layne-Farrar et Lerner 2011; Shapiro 2001). It is particularly valuable in high-technology industries where patent owners are scattered around the globe and manufacturers need to access a large bundle of rights simultaneously. By bundling rights and offering a single license, PatentBooks lower the average transaction cost of licensing individual patents. The explicit framework developed by TGL for dividing royalty income among IPR owners in the PatentBook also avoids the typical member-to-member transaction costs of establishing an aggregate patent license. Rather than engage in lengthy negotiations on the distribution of royalty revenue and the licensing terms offered to users, the guidelines established by TGL help owners navigate every step of the process without introducing significant bargaining and decision costs associated with collective action. Different assessments of the value of patents, private information held by members about the precise technical specifications of a product, and strategic posturing in negotiations can all be mitigated by well-administered patent aggregation. Unfortunately, patent owners will need to relinquish some individual control to the intermediary to facilitate this process. However, Merges remarks that this can lower the overall costs of this otherwise complex licensing activity (1999b).

Enforcement and adjustment costs

Enforcement costs summarize the costs incurred after a contract is concluded and compliance must be monitored and enforced. Both monitoring and enforcement costs are a managerial concern because the cost of enforcement litigation can be devastating. Patent infringement lawsuits are expensive and frequently result in early settlements in order for infringers to avoid higher awards of damages and extended legal costs. Boston Scientific paid a settlement of $1.725 billion to the Cordis division of Johnson & Johnson in early 2010 in order to settle a dispute over coronary stent patents.[8] Medtronic paid a settlement of $1.35 billion to Dr Gary Michelson in 2005 in order to settle an infringement lawsuit for $550 million and then acquire the implicated patents for $800 million.[9] Sony's walkman and Playstation portable products were found to be infringing Agere Systems' patents in semiconductors, wireless communications, audio and optical electronics in 2006. A settlement verdict of $18.5 million was finally reached.[10] Apple was forced to pay OPTi Inc. $21.7 million in 2009 for patent infringements relating to cache computer memory.[11] The final court decision on December 3 2009 of $19 million in actual damages and $2.7 million in pre-judgment interest followed a lengthy trial that began with an official complaint on January 16 2007.[12] Clearly, IP infringement settlements can be expensive. Infringement verdicts, in the absence of a settlement, can be even costlier.

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[8] http://www.nytimes.com/2010/02/02/business/02device.html
[9] http://www.nytimes.com/2010/02/02/business/02device.html
[10] http://www.lawyersandsettlements.com/settlements/12875/sony-settles-patent-infringement-18-5-million.html
[11] http://pulse2.com/2009/12/04/apple-forced-to-pay-opti-21-7-million-over-patent-disputes/
[12] http://pulse2.com/2009/12/04/apple-forced-to-pay-opti-21-7-million-over-patent-disputes/

In order to avoid these costs, licensing partners often include compliance monitoring mechanisms in licensing contracts. If a patent owner perceives the cost of monitoring compliance to be too great, they are unlikely to license their patents at all. TGL reassures owners by introducing compliance regulations, auditing contracting partners, and mediating during disputes. Introducing a third-party license broker is particularly valuable for smaller companies that do not dispose of the complementary assets or financial resources to initiate long and costly infringement litigation procedures. Larger firms will be reluctant to rely on third-party monitoring and enforcement mechanisms that diminish control over their patent assets. However, the transaction efficiency gains possible via centralized administration can overcome this concern. Studies have shown that the sharing of large swathes of land increases the ability to privately enforce property rights when compared to enforcing rights individually over a host of smaller units (Field 1989).

PatentBooks, by aggregating patent rights into a single-point license administered by TGL, diminish overall monitoring and enforcement costs. While monitoring safeguards can be integrated into bilateral agreements, the average transaction cost of monitoring and audit mechanisms is reduced as a result of the greater volume of transactions. TGL leverages economies of scale in order to reduce the per-unit cost of monitoring, in much the same way that it is able to reduce the per-unit cost of contract bargaining. Sophisticated analytic software tools simplify this process without the need for consistent and costly human intervention to facilitate transactions. Since accurate measures and transparent monitoring can solve many of the transaction costs associated with enforcement (Posner 2004), the accumulated experience of TGL serves as an additional source of transaction costs reductions. Moreover, patent owners retain complete ownership of all patents listed in the PatentBook and preserve their right to litigate independently against any unlicensed party. They receive periodic lists of unlicensed and licensed parties from TGL, and can also benefit from licensing income from government initiatives to promote SME development and innovation.

PatentBook licensing opens new markets to manufacturers while legal access to highly advanced technologies in a targeted product domain enable the manufacturer to incorporate ever more technologies into their product lines. They consequently enjoy greater freedom to operate. Manufacturers also reduce the risk of patent litigation that could disrupt their product deliveries by taking out a PatentBook license that is passed directly through the supply chain to the retail customer. Manufacturers that have not used the license remain open to patent enforcement lawsuits, injunctions on product shipments and disruptions to their supply chains. Manufacturers that have licensed the PatentBook are able to avoid sales channel disruptions, management distraction, and the poor market perception of offering unlicensed technologies. They are comfortable in the knowledge that they pay the same PatentBook license rate as all other manufacturers and can focus their time and resources on manufacturing, marketing and distributing products rather than licensing the underlying rights.

Adjustment costs are the transaction costs that arise over the course of the licensing relationship when unforeseen need for contractual review occurs. Bilateral license partners often become mutually suspicious or perceive they have miscalculated the terms of their agreement. For example, the global market for LCD displays shrinks after the development of an alternative technology. The product returns forecasted

during negotiations to establish a license price then far exceed the actual returns to the Chinese manufacturer. Or the manufacturer wishes to integrate the licensed patents into more products in different markets. To do this, the manufacturer must adjust the terms of the agreement during license extension negotiations. This process necessarily gives rise to contractual adjustment costs. TGL helps contracting parties communicate their concerns and review contracts. Mediation by a neutral third party reduces opportunism between licensors and licensees. As with all the other stages of contract negotiations, the volume of adjustment transactions facilitated by the broker enables it to leverage economies of scale to reduce the cost of each individual contract adjustment.

Conclusions

The patent system is founded on the idea that technological development accelerates when inventions are made public. Patent archives today are one of the most valuable references of human discoveries in the world. Communications technologies enable these inventions to be rapidly copied all over the world but they have not been adequately deployed to create efficient mechanisms to compensate inventors. As technologies converge, new opportunities are arising to improve access to inventions and reward creators fairly. The music industry is a revealing parallel. Illegal file-sharing exploded with the advent of the Internet and peer-to-peer software. As record companies struggled to retain former profit margins, they sued young individuals and platforms such as Napster in order to discourage the free sharing of music. Apple recognized that many Internet users were willing to pay for music if it was conveniently accessible in digital form. iTunes effectively permitted larger audiences to access more content while compensating creators more than the previous distribution model. The patent market is experiencing similar problems. The Internet enabled corporations all over the globe to access patented inventions and integrate them into commercial products without adequately compensating inventors. Patent attorneys, non-practicing entities, and corporate litigators stepped in to discourage the free use of IP, reward patent owners and capitalize on infringement litigation. However, new distribution models to transfer technology in a commercially responsible manner have not been adequately leveraged. The patent market needs a one-stop shop for licensing thousands of patents from patent owners via standardized license terms at predictable royalty rates and cash flows to licensors and licensees.

The current market for patent licensing suffers high transaction costs. Most licensing transactions are executed as a result of one-off, bilateral deals that are privately initiated, organized, negotiated, and executed. The clandestine and discrete nature of bilateral licensing engenders significant transaction costs in all four chronological phases of a market transaction. Search and information costs, bargaining and decision costs, enforcement costs and adjustment costs are all important transaction costs that can mitigate the total value generated from bilateral licensing or even prohibit a transaction altogether. These costs are particularly acute for smaller firms that lack the resources and experience with negotiating license agreements enjoyed by their larger multinational counterparts. Transaction costs reach prohibitive dimensions when a manufacturer must license thousands of patents from separate organizations in bilateral negotiations.

PatentBooks aggregate patents, classify them according to quality, and offer non-exclusive licenses to manufacturers. Sophisticated search technologies and web architectures render patent-related information much more accessible and organized. Firms are able to instantaneously identify potential license partners anywhere on the globe without having to invest considerable resources in the process. The accumulated licensing experience of the PatentBook broker enables interested companies to reduce transaction costs associated with bargaining and decision processes by relying on a third party mediator. Aggregating patents into a single, uniformly priced, non-exclusive license that covers all patents necessary for manufacturing a specific product further reduces these costs. This is perhaps the most important transaction cost reduction of the PatentBook model. Instead of incurring the cost of hundreds of discrete, one-off negotiations with different actors, manufacturers can access all the necessary patents in a single license. Patent owners are able to generate greater non-exclusive licensing revenue from manufacturers than they could if licensing their rights in isolation. Economies of scale also permit transaction costs reductions at the enforcement and adjustment stages, where mediation limits disputes and decision costs.

While transaction costs associated with patent licensing will never be eliminated altogether, PatentBooks are a valuable mechanism to reduce them and thus increase the total volume and value of licensing transactions. They enable patent owners to generate greater value from their assets and permit product manufacturers to legitimately integrate new technologies in their products as well as access important markets. The inefficiencies of bilateral licensing currently constrain the legitimate manufacture of high-technology products and the transfer of technology, limiting the acceleration of innovation in both the developed and developing world. It also restricts the value that firms can extract from owning patent assets. PatentBooks help aggregate the course of dealing and pricing for technology transfer and provide visibility and unbiased reach across the buy-sell barriers. In doing so, they enable firms of all sizes and nationalities to generate more returns from technology.[13]

References

Aoki, R., et S. Nagaoka. 2004. « The consortium standard and patent pools ». *The Economic Review* 55 (4): 345–356.

Aoki, Reiko, et Aaron Schiff. 2010. « Intellectual property clearinghouses: The effects of reduced transaction costs in licensing ». *Information Economics and Policy* 22 (3) (juillet): 218-227. doi:10.1016/j.infoecopol.2010.01.001.

Arora, A. 1995. « Licensing tacit knowledge: intellectual property rights and the market for know-how ». *Economics of innovation and new technology* 4 (1): 41–60.

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Arora, A., A. Fosfuri, et A. Gambardella. 2001. « Markets for technology and their implications for corporate strategy ». *Industrial and Corporate Change* 10 (2): 419.
Arora, A., et A. Fosfuri. 2003. « Licensing the market for technology ». *Journal of Economic Behavior & Organization* 52 (2): 277–295.
Arthur, W. B. 1994. « Positive feedbacks in the economy ». *McKinsey Quarterly*: 81–81.
———. 2000. Myths and realities of the high-tech economy. Dans *Talk given at Credit Suisse First Boston Though Leader Forum, Santa Fe Institute*.
Besen, Stanley M., Sheila N. Kirby, et Steven C. Salop. 1992. « An Economic Analysis of Copyright Collectives ». *Virginia Law Review* 78 (1) (février 1): 383-411.
Borod, R. S. 2005. « An update on intellectual property securitization ». *The Journal of Structured Finance* 10 (4): 65–72.
Buckley, Peter J, et Malcolm Chapman. 1997. « The perception and measurement of transaction costs ». *Cambridge Journal of Economics* 21 (2): 127-145.
Calabresi, Guido, et A. Douglas Melamed. 2007. Property Rules, Liability Rules, and Inalienability: One View of the Cathedral. Dans *Economic Analysis of the Law*, 19-33. Blackwell Publishing Ltd. http://dx.doi.org/10.1002/9780470752135.ch3.
Caves, R. E, H. Crookell, et J. P Killing. 1983. « THE IMPERFECT MARKET FOR TECHNOLOGY LICENSES* ». *Oxford Bulletin of Economics and statistics* 45 (3): 249–267.
Chesbrough, H. 2006. « Emerging secondary markets for Intellectual Property ». *Research Report to National Center for Industrial Property Information and Traning (NCIPI)*.
Choi, J.P. 2003. *Patent pools and cross licensing in the shadow of patent litigation*. CES.
Coase, R. H. 1937. « The Nature of the Firm ». *Economica* 4 (16): 386-405. doi:10.1111/j.1468-0335.1937.tb00002.x.
Coase, Ronald H. 2007. The Problem of Social Cost. Dans *Economic Analysis of the Law*, 1-13. Blackwell Publishing Ltd. http://dx.doi.org/10.1002/9780470752135.ch1.
Cooter, Robert, et Thomas Ulen. 2007. *Law and Economics*. 5e éd. Prentice Hall.
David J., Teece. 2000. « Strategies for Managing Knowledge Assets: the Role of Firm Structure and Industrial Context ». *Long Range Planning* 33 (1) (février 1): 35-54. doi:10.1016/S0024-6301(99)00117-X.
Detkin, P. N. 2007. « Leveling the Patent Playing Field ». *John Marshall Review of Intellectual Property Law*.
Foray, D., et B.A. Lundvall. 1996. « The knowledge-based economy ». *From the economics of knowledge to the learning» Employement and growth in the knowledge-based economy, OCDE Documents, Paris*: 11–34.
Gilbert, R.J. 2004. « Antitrust for patent pools: A century of policy evolution ». *Stanford Technology Law Review* 2004.
Gould, D. M, et W. C Gruben. 1996. « The role of intellectual property rights in economic growth ». *Journal of Development Economics* 48 (2): 323–350.
Handke, C., et R. Towse. 2007. « Economics of Copyright Collecting Societies ». *International Review of Intellectual Property and Competition Law* 38 (8): 937–957.

Hansen, Gerd, et Albrecht Schmidt Bischoffshausen. 2007. « Economic Functions of Collecting Societies-Collective Rights Management in the Light of Transaction Cost-and Information Economics ».
Harris, Richard G. 2001. « The knowledge-based economy: intellectual origins and new economic perspectives ». *International Journal of Management Reviews* 3 (1): 21-40. doi:10.1111/1468-2370.00052.
Heller, M. A, et R. S Eisenberg. 1998. « Can patents deter innovation? The anticommons in biomedical research ». *Science* 280 (5364): 698.
Jarosz, J., R. Heider, C. Bazelon, C. Bieri, et P. Hess. 2005. « Patent Auctions: How Far Have We Come? » *ORGANIZATION* 21: 23.
Kim, Y.J., et N.S. Vonortas. 2003. « Strategy and Cost in Technology Licensing ». *Unpublished manuscript. The George Washington University*.
Kossovsky, N. 2002. « Fair value of intellectual property: An options-based valuation of nearly 8,000 intellectual property assets ». *Journal of Intellectual Capital* 3 (1): 62–70.
Kossovsky, N., B. Brandegee, et J. C Giordan. 2004. « Using the Market to Determine IP's Fair Market Value ». *Research-Technology Management* 47 (3): 33–42.
Kretschmer, Martin, George Michael Klimis, et Roger Wallis. 2001. « Music in Electronic Markets ». *New Media & Society* 3 (4): 417-441.
Kwan, Y.K., et E.L.C. Lai. 2003. « Intellectual property rights protection and endogenous economic growth ». *Journal of Economic Dynamics and Control* 27 (5): 853–873.
Layne-Farrar, A., et J. Lerner. 2011. « To join or not to join: examining patent pool participation and rent sharing rules ». *International Journal of Industrial Organization* 29 (2): 294–303.
Libecap, Gary. 1989. *Contracting For Property Rights*.
Mard, M. J, S. Hyden, et J. S Rigby Jr. 2000. « Intellectual property valuation ». *The Financial Valuation Group*.
Mazzoleni, R., et R. R Nelson. 1998. « The benefits and costs of strong patent protection: a contribution to the current debate ». *Research policy* 27 (3): 273–284.
McClure, I. D. « Commoditizing Intellectual Property Rights: The Practicability of a Commercialized and Transparent International IPR Market and the Need for International Standards ». *Buffalo Intellectual Property Law Journal* 6: 1.
Merges, R. P. 1999a. « Intellectual property rights, input markets, and the value of intangible assets ». *Draft, February*.
Merges, R.P. 1999b. « Institutions for intellectual property transactions: the case of patent pools ». *University of California at Berkeley Working Paper*.
Millien, R., et R. Laurie. 2007. « ASummary OF ESTABLISHED & EMERGING IP BUSINESS MODELS ».
Monk, A. H. B. 2009. « The emerging market for intellectual property: drivers, restrainers, and implications ». *Journal of Economic Geography* 9 (4) (février): 469-491. doi:10.1093/jeg/lbp003.
Park, Walter, et Juan Carlo Ginarte. 1997. « Intellectual Property Rights and Economic Growth ». *Contemporary Economic Policy* 15 (3): 51-61. doi:10.1111/j.1465-7287.1997.tb00477.x.

Posner, R.A. 2004. « Transaction Costs and Antitrust Concerns in the Licensing of Intellectual Property ». *J. Marshall Rev. Intell. Prop. L.* 4: i.
Reilly, R. F, et R. P Schweihs. 2004. *The handbook of business valuation and intellectual property analysis*. McGraw-Hill.
Schneider, P.H. 2005. « International trade, economic growth and intellectual property rights: A panel data study of developed and developing countries ». *Journal of Development Economics* 78 (2): 529–547.
Serrano, C. J. 2006. *The market for intellectual property: Evidence from the transfer of patents*. University of Minnesota.
Shapiro, C. 2001. *Navigating the patent thicket: Cross licenses, patent pools, and standard setting*. MIT Press.
Sneed, K. A, et D. K.N Johnson. 2009. « Selling ideas: The determinants of patent value in an auction environment ». *R&D Management* 39 (1): 87–94.
Somaya, D., et D. Teece. 2001. « Combining Patent Inventions in Multi-Invention Products: Transactional Challenges and Organizational Choices ». *University of California at Berkeley Working Paper*.
Teece, D.J., et E.F. Sherry. 2003. « Standards Setting and Antitrust ». *Minneso* 87.
Teece, David J. 1986. « Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy ». *Research Policy* 15 (6) (décembre): 285-305. doi:10.1016/0048-7333(86)90027-2.
Thurow, L. C. 1997. « Needed: a new system of intellectual property rights ». *Harvard Business Review* 75: 94–107.
Williamson, Oliver. 1979. « Transaction-Cost Economics: The Governance of Contractual Relations ». *Journal of Law and Economics* 22 (2): 233-261.
Williamson, Oliver. 1975. Markets and Hierarchies: Analysis and Antitrust Implications. Free Press, New York, NY.