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Open Innovation and Intellectual Property

A Two-Sided Market Perspective

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10.1 INTRODUCTION

A recent review of research on intellectual property revealed that out of a body of roughly 9000 articles on intellectual property, fewer than 20% were not legal in character.[1] An even smaller fraction of articles addresses how open innovation relates to intellectual property.[2] Traditionally research in intellectual property has been driven by the quest to understand the scope of substantive intellectual property law with a continuous search to grasp whether IP regimes should be "weak" or "strong" in character (Gould & Gruben, 1996; Lanjouw & Lerner, 2000). The limited economic research in this area did not break with this paradigm and sought to grasp what type of regime ("weak" or "strong") best promotes growth (Maskus & Reichman, 2004; Helfer, 2004; Hassan & Tucci, 2010).

A much more recent viewpoint is the role of intellectual property as an enabling mechanism for innovation, as a means to promote the open exchange of innovation inputs. This has only been addressed by a very few scholars like Arora, Mazzoleni or Merges (Arora, 1995; Feldman & Florida, 1994; Mazzoleni & Nelson, 1998; Merges, 1999). These authors have started to ask how licensing arrangements can promote the growth and efficiency of markets for technology and how IP needs to be subsequently managed to achieve these goals. Because this type of approach essentially incites a paradigm shift in how we think about IP, the literature building upon this work is to a large extent still concerned with the very simple question "how do you actually do that?" (Gollin, 2008; Holmes, 2009; Hurmelinna et al., 2007).

In this chapter, we build upon this second perspective, and connect it directly to open innovation, a particular type of innovation that has become

more salient in recent years (Chesbrough, 2003a). We will discuss how IP can inhibit open innovation, or, if properly managed, can enhance its effectiveness. We sketch out some illustrative examples to demonstrate our arguments, and make them more concrete for the reader.

10.2 WHERE ARE THE MANAGERS?

The audience for mainstream legal research on IP is usually other legal scholars. In this writing there is little of direct relevance for most practicing managers who must make choices about whether, when, and how to protect intellectual property that arises from invention discoveries. Indeed, perhaps the single biggest criticism of the existing approach to the role of patents in innovation is that it omits entirely any role for managers of industrial firms in the innovation process. This neglect of any role for management in overseeing the innovation process is a glaring deficiency that deserves to be redressed.

Here are a few of the omissions in the body of research to date on IP management that trouble us. In the accounts of IP management in these studies, we do not know how innovation researchers were hired, nor the allocation of resources and incentives to inventors. We don't know how they were paid. We don't know what incentives they were offered for inventions reported, or for patents issued, vs. for scientific publications they authored. Most important of

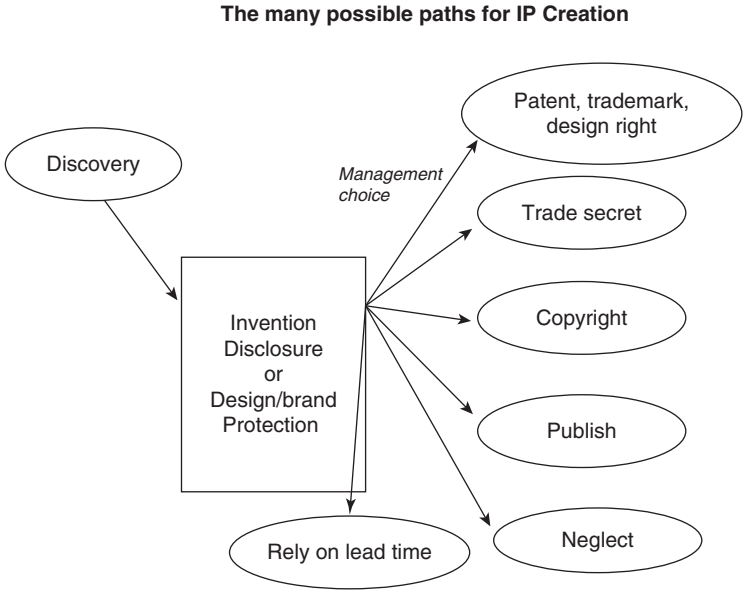

Figure 10.1 The many possible paths for IP Creation

all, we don't know what the strategy of the firm was towards the technologies being patented. All of these important influences are determined by managerial decisions. None get mentioned in the vast bulk of the academic literature on IP. This cannot stand. Managing innovation, after all, is complex, contingent, and connected to the strategy of the firm in question.

Figure 10.1 shows that even within the domain of protectable knowledge, managers might strategically choose not to protect the knowledge with a patent, but instead to pursue an alternate course. These alternate vehicles for protecting knowledge include: trade secrecy, copyright, licensing,[3] neglect,[4] reliance on lead time or even publication. This last mode is used to ensure that others cannot assert claims over useful knowledge that the firm seeks to use, but might prefer not to patent. As the first-to-invent criterion in the US patent system shifts to first-to-file, in harmony with practice in the EU, Japan, and most other countries, publication may become an even more attractive alternative to patenting.

10.3 THE EVOLUTION OF THE PRACTICE OF IP MANAGEMENT

Prior to the 1990s, the management of intellectual property was a small niche that was managed by either the in-house attorney of the firm, or the external patent counsel if the firm was sufficiently small. There seemed to be little in this area to interest top management.

Then, a number of business events occurred that caused skeptical managers to sit up and take notice. One such event was the issuance of the so-called Kilby patent to Texas Instruments (TI) in 1986. This patent gave TI the right to exclude others from many aspects of semiconductor design (Kilby was an early inventor of the original semiconductor who worked at TI and assigned all rights to his invention to TI). Over the next several years, TI generated a substantial portion of its entire corporate net income from royalties it received for this patent (Grindley & Teece, 1997). Another such event was Polaroid's successful suit against Kodak in 1989 in which Polaroid got the largest settlement ever awarded by a US court to that point in time (over $900 million) for Kodak's infringement of its patents. A third, more gradual event, was IBM's enormous success in creating a stream of patent royalties from its IP, starting at some few millions of dollars in the early 1990s, and growing to $1.9 billion in 2002 and continuing to generate hundreds of millions of dollars in royalties annually.

Astute business observers took note of these events, and struggled to imitate them. A group of managers formed The Licensing Executives Society, to exchange ideas and best practices in licensing out patents and other IP. Commentators like Petrash (1997), Sullivan (2000), and especially Rivette and Klein (2000) called attention to the profit opportunity latent in licensing out or selling intellectual property. This last effort, titled *Rembrandts in the Attic*,

promised great riches to those who, as the title implied, would dust off their moldy IP, bring it down from the corporate attic, and offer it for sale to others.

These efforts provide useful facts to managers and executives charged with leading this activity. Yet the larger context, and especially the connection between a company's IP and its overall business strategy was lacking. For example, nowhere in these observers' accounts of these new and apparently profitable practices was there a rationale for why companies would *buy* these assets. Sure, companies might wish to sell their IP, but why would anyone ever want to buy someone else's IP? For these assets were not Rembrandts, at least not to most people. There needed to be a rationale for companies to want to buy someone else's IP if there was to be a market for these assets.

In *Open Innovation*, Chesbrough (2003a), provided just such a rationale. Useful knowledge, the book argued, was now widely diffused, so that no company had a monopoly on knowledge in their field. At the same time, the quality of work at small companies, universities, and non-profit institutions was increasingly high. So, instead of inventing it all yourself, you could innovate effectively by accessing excellent work from an outsider. But what to sell, and what to buy, and what to publish instead? Says Dreyfuss (2011): "On the one hand, more and more segments of the knowledge domain are becoming the subject of IP rights. At the same time, open innovation is flourishing. The puzzle is this: How can these trends be going on simultaneously?"

Those choices depend on the company's business model, the way in which a company creates value and captures some portion of that value for itself (Chesbrough & Rosenbloom, 2002). Opening up to external sources of knowledge may accelerate time to market, fill technical gaps in internal R&D, or reduce the total cost of innovation for a firm. IP rights, in turn, enable markets for IP to function, and foster revenues for those pursuing an inside-out open innovation approach. We turn to a more detailed consideration of motivations to both sell IP and to buy it.

10.4 THE TWO SIDED MARKET FOR IP: BUY AND SELL SIDE MOTIVATORS

10.4.1 The Rise of Intermediate Markets

One key force that is affecting the market for intellectual property is the growth of what Ashish Arora and his colleagues called "intermediate markets," or markets for innovations (Arora et al., 2001a). In the closed innovation model, companies had to take their new discoveries to market themselves, both because they would obtain more money that way, but also because there weren't many other companies who knew enough to utilize the technology

successfully. Innovation markets in the closed innovation system were sparse, and IP was managed defensively, to preserve the freedom to operate. In an open innovation world, where useful knowledge is widespread, there are many companies with many potential ways of using a new technology, and many potential technologies that might be utilized in a company's business model. No company can hope to exploit all of the many ways a new technology might be used, and no technical lead lasts indefinitely, so temporary technical advantages should be exploited both internally and externally. In addition, open innovation companies typically license technologies liberally to other companies.

An economy full of technologies being licensed for others to use is one in which one can say there are highly developed intermediate markets for those technologies. These markets are termed "intermediate," because one firm initiates a technology and develops it to a certain extent, and then a different firm might carry that technology from that point through to the market. The presence of these intermediate markets expands the number of ways a new technology can be used, and promotes specialization among the different participants in the market. So some companies specialize in creating new technologies, others specialize in developing new products, and still others focus on special niches, services, or applications along the way.

As Arora and his colleagues found, a pronounced division of innovation labor has emerged in the chemicals industry. When new chemical plants are built, the company building the plant typically hires a specialized engineering firm to design the new facility. These specialized firms work on virtually all of the new chemical plants being constructed around the globe, so they are up-to-date on the latest ideas and techniques for making the plants as efficient as possible. Since these plants are extremely expensive, amounting to billions of dollars each, no one chemical company builds them very often. So the specialized firms are able to accumulate knowledge and learning much faster than even the biggest of the chemical companies.

Another example of this specialization of innovative labor can be seen in the semiconductor industry. Back in the 1960s, the major semiconductor firms were captive subsidiaries of product firms, such as IBM or AT&T. There were markets for the final product systems, but no markets for the components of these systems. By the late 1970s, independent firms like Intel and Texas Instruments specialized in making chips, and selling them to product companies, who used these chips to create new computer systems, or cell phones, or videogame players. Markets had emerged for chips, which were purchased and integrated to make systems products. By the 1980s, the manufacturing function in developing chips became separated from the design function, as semiconductor fabrication companies (known as "fabs") like TSMC built chips that were designed by so-called "fabless" companies, who effectively outsourced their manufacturing. Now there were markets for semiconductor

manufacturing capability, and associated markets for assembly, packaging, and testing capabilities. In the 1990s, companies like Qualcomm and ARM Holdings began selling intellectual property such as tools and designs to the companies that were designing and building chips. So now a company could buy a design from ARM, model it using tools from Cadence or Synopsys, have the design built by TSMC, and then offer it to the market, creating a market for semiconductor designs themselves.

Surrounding this vertical separation of functions in the semiconductor value chain are still more companies offering design tools (e.g., Cadence or Synopsys above), test equipment, and other services to the industry. This specialization has migrated around the world. In China alone now, there are more than 600 specialized semiconductor design houses, and a number of new manufacturing facilities are being built as fabs for other companies around the world to use to build their chip designs.

Yet another example of this innovation specialization comes from the life sciences. Thirty years ago, drugs were discovered, developed, tested, and marketed by large pharmaceutical manufacturers. By the 1980s, however, specialized biotechnology firms began to discover and patent new compounds. They would then partner with a pharmaceutical company who would take the compound through the clinical trials required by the Food and Drug Administration, and then sell the drug to prescribing physicians. More recently, there have emerged a group of contract research organizations that partner with the biotech and pharmaceutical companies to conduct the clinical trials for them. In the 1990s, Millennium Pharmaceuticals began doing contract research for pharmaceutical clients, but reserving residual fields of use for a compound for itself, and began developing new drug applications for these compounds in the year 2000. Still other firms offer specialized equipment, tools, tests, and other services that assist in the drug development process.

This specialization of innovation also is emerging in the consumer products sector. Procter & Gamble has had a long tradition of internal science-driven innovation, which it has used to create differentiated products to offer to its customers. More recently, though, P&G has realized that its core strengths are not in science, but in its ability to create strong brands. In some of its new brands, such as the Spinbrush and the Swiffer, P&G has created new and large businesses with technologies that it acquired from outside the company. Through its new innovation processes, which it calls Connect and Develop, P&G seeks to exploit the market for external technologies, as it seeks opportunities to create new brands for its customers.

This innovative specialization needn't be based upon products per se. There are intermediate markets that have developed for services too. Based on a longitudinal study of the US mortgage banking industry, Jacobides (2003) found that intermediate markets became a powerful force in the mortgage securities market. As with the chemicals industry, he found that markets arose through

firm efforts to exploit gains from specialization of different intra-organizational functions and trade with different firms. This in turn led to the standardization of information and the simplification of coordination between firms. Unlike chemicals, the government also played a role in disintermediation of the mortgage market, through creating an information standard (in the case of US mortgage banking, this standard was the Federal Housing Administration regulations for conforming loans).

10.4.2 Managing IP in Intermediate Markets

While the intense specialization from intermediate markets has unleashed a lot of innovation, the intellectual property aspects resulting from the specialization can be quite complicated to manage. When a company brings in an external technology to incorporate into its business, it must carefully assess whether it has the legal ability to use that technology without infringing the legal rights of another company. The protection of a particular technology is unlikely to cover every aspect of its usefulness. If the entity licensing or selling the technology has patented the technology, for example, the scope of that patent may or may not cover the uses that the acquiring firm wishes to provide. In turn, the protection of a technology may involve claims that inadvertently infringe on some aspect of another company's technology.

So intermediate markets for technology in a world of open innovation profoundly change the management of IP. On the one hand, a firm cannot acquire and utilize an external technology unless they are confident that they have the legal right to practice the technology(ies) that they wish to use. To be sure, this ability to practice a technology also was a concern with technologies in a closed innovation world. But in that world, the company knew the entire history of the internal technology. In this more specialized world, where technologies flow across the boundary of the firm (perhaps multiple times), obtaining the ability to practice one's technology without incurring an infringement action by another firm is more challenging, because the full history of the technology's development is not as well known. There is always a concern that there may be blocking IP out there that precludes deployment of a technology being bought or sold.

On the other hand, secondary markets provide the opportunity to greatly increase the utilization of internally-owned technologies, by offering them to other firms for use in their business. Not only does this increase the utilization of a given technology, but it also increases the number of areas in which a technology might be applied.

But secondary markets for innovations present other challenges. Before a company identifies a promising technology, it must interact with many companies, and explore a variety of possible technologies, in order to have any

hope of finding a useful technology. As the old fable goes, "you have to kiss many frogs, in order to find a prince."

This raises an old, but very important, problem first noted by economist Ken Arrow: I as a customer need to know what your technology can do, before I am willing to license it. But once you as a seller have told me what the technology is, and what it can do, you have effectively transferred the technology to me without receiving any compensation! And that is not all. If the customer discusses possible technologies with a would-be supplier, but decides not to license the technology, and instead go off and design an alternative technology internally, the customer may have contaminated itself with the knowledge of that supplier. A subsequent internal development in a related area by the customer may be challenged by the supplier, who might allege that the customer stole the idea from the supplier without paying anything for it. If the customer is a very large company, and the supplier is a very small company, this David-and-Goliath situation may make a jury very sympathetic to the small company, even if the large company developed its approach in a completely independent manner.

10.4.3 Beyond the Value Chain: Business Networks

The business networks in which a company operates can also be a fruitful source of external possibilities. Informal sharing of information, and knowledge trading, can lead to the discovery of useful ideas that might solve important business problems. Larger communities where public information is exchanged, such as industry conferences and trade shows, also supply a great deal of public knowledge that can lead an alert innovator to useful solutions. These groups exchange substantial amounts of information, but this exchange is considered generally to be in the public domain. The most valuable information here is often where to look and to whom talk that reveals the location of private information, which then would have to be pursued under non-disclosure.

Technical standards bodies comprise another resource for accessing available knowledge about a particular technology, and then forging a shared approach across a number of firms for how to apply that technology. Even here, though, IP issues surface with great frequency. These groups are not purely neutral forums, trying to develop the best technical solution to a particular technology problem. The research of Mark Lemley (2002) shows that technical bodies have a wide range of rules regarding how much IP must be disclosed to others in the technical body. And this variation in rules can be leveraged by alert companies who position themselves to occupy key positions within an emerging standard.

One such example is Rambus, a virtual semiconductor design firm offering a technology to speed up DRAM chips inside computers, which has profited significantly by exploiting loopholes in the rules of its standards setting body. After that body settled on a standard for how to accelerate the speed at which DRAM chips transferred data to the system, Rambus revealed that it had received patents on important elements of that standard. It then began extracting high royalty payments from other standards participants, who had designed products around the emerging standard, and hence, infringed Rambus' patents.

What Rambus did has been found to be entirely legal, in a series of court cases regarding its conduct, and the legal rules around its intellectual property. The company's stock price is something of a "pure play," in that the intellectual property of the company is the only business it has. Therefore, Rambus' daily stock price reflects the market's current assessment of the value of its IP. As it happens, the valuation of the company over the past seven years has experienced wide swings, from more than $100 to below $10, even though the IP itself has been well-publicized for many years now.

10.5 BARRIERS TO EFFICIENT IP MARKETS

10.5.1 The Quality of the IP

While Salomon Brother's bundling of mortgages established a secondary market for mortgages we also know that this subsequent syndication contributed greatly to the credit crunch in 2008. In order to avoid a similar calamity as secondary markets for IP begin to emerge, it will be crucial to assure the quality of the underlying IP assets. Strong patent quality is of primary importance in this respect. At the moment, patent offices around the world spend on average 20–25 hours per case to search for prior art. As a result many of these patents are declared invalid during the course of litigation as they did not meet the criteria for patentability and should not have been granted in the first instance.

10.5.2 Limitations that Impede the Secondary IP Market

While we have sketched the development of intermediate markets for innovation in a few industries, and provided some preliminary evidence that these markets are becoming more widespread, the fact remains that there are many inefficiencies that are limiting the emergence of secondary innovation markets. Understanding some of these inefficiencies allows us the ability to maintain a proper perspective on these markets. They also point the way to some

mechanisms through which companies can overcome at least some of these current limitations.

One of the most critical limiting factors is the simple lack of information about the extent and terms of trade in secondary markets for innovations. Markets require information in order to function well, and much of the requisite information needed for coordinating market exchange of innovations is not yet available. For example, while there is an estimated trade of more than $100 billion annually in licensing for technologies, there is no place where this trade is reported and tracked. What we know of the licensing market today comes from occasional surveys of companies (which ask the companies to report their trade in total) or from the occasional IP dispute in court, where the terms of a particular contract become part of the court record, and made available to the public.

This very low level of licensing suggests that patents are by and large seen as a defensive mechanism, a negative right, a right to protect rather than enable. This mindset leads to the under-management of valuable assets (Borod, 2005). Various cases show that treating IP as a mere defensive right is not enough to keep business going. 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.[5] Kodak encountered 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.[6] As part of a turnaround strategy, Kodak attempted to generate revenues through aggressive patent litigation, yet filed for bankruptcy protection in January 2012.

The situation is somewhat analogous to the condition of the mortgage market in the US prior to the advent of Salomon's bundling of mortgages. There is no information standard for technology licensing and associated IP trade. There is no FHA that defines a template or format for such trade. And given the wide range of terms and conditions for trading IP, it would be difficult to aggregate statistics on this trade, unless and until one or more information standards arise.

Without these data, it is hard for companies to know what technology is available in the market. One consultant documented some of her technology scouting work for a client, revealing both the potential and the problems of finding available technology. While she and her colleagues found two highly useful technologies in a short period of time, the client's purchasing organization was unable to find any useful technologies using their normal procedures for soliciting external inputs.[7] This is typical of inefficient markets: you don't know what you don't know, and you don't realize what you may be missing.

It is also very challenging to know how to value available technologies, once they are located. Such value is determined by what a willing buyer would pay to a willing seller. Markets aggregate suppliers and customers, so that any individual technology can go to the highest bidder, and bidders know what similar technologies have sold for in the past, giving them a basis for calculating their bid price.

These conditions are typically not present in IP licensing. There is no systematic reporting of previous prices paid for external technologies and their associated IP. This makes it hard for sellers to know what price to expect to receive, or what price would be reasonable, given similar transactions in the past. So too for the buyers. Both sides to a transaction can have unrealistic expectations in these circumstances, and there is little or no objective data to align those expectations more closely. The poor development of the IP market may also be the result of the hassle related to licensing. Revenues from licensing arrangements between small firms may not offset the costs associated with entering into the licensing arrangements. This can however be overcome through the establishment of intermediaries, such as IP trading platforms, public auctions, and websites that bring licensors and licensees together through standardized arrangements. It is to these that we turn now.

10.6 INSTITUTIONAL RESPONSES TO IP MARKET FAILURES

A host of new monetization mechanisms—such as securitizations, pooled patent portfolios, public auctions, and financial exchanges—have been implemented in order to extract value from IP. Securitizations describe a financial instrument which an issuer creates by combining other financial assets and then marketing different tiers of the repackaged instruments to investors. The process can encompass any type of financial asset and promotes liquidity in the marketplace. By combining assets into one large pool, the issuer can divide the large pool into smaller pieces based on each individual asset's inherent risk of default and then sell those smaller pieces to investors. The process creates liquidity by enabling smaller investors to purchase shares in a larger asset pool.[8] Annie Leibovitz for example securitized the copyright of her photographs and in that way successfully raised substantial sources of funding for her future work. In doing so, she followed the approach taken by David Bowie earlier on, who securitized the copyright to his music very successfully. ("Bowie Bonds") The fashion retailer BCBG securitized its trademarks a couple of years ago and even Dunkin Donuts used its trademark to raise successfully capital through a securitization. Yet, these securitizations of various forms of IP have been the exception to the rule and are not used on a broad scale; primarily because it is hard to identify IP that offers solid future revenue streams.

Against this background IP Exchanges seemed to offer the much needed market place to trade otherwise illiquid assets and thus promote more active markets for technology and other forms of creativity. These intermediaries seek to enable non- or under-utilized patents and to be traded in a transparent marketplace. An exchange is valuable because it makes patents as well as being available to those that are in the best position to monetize them. Certain firms may own valuable patents but have insufficient complementary assets to monetize them (Teece, 1998). An effective exchange mechanism for patents reduces the need for complementary assets to commercialize a product. They can thus be seen as important enablers of open innovation. Exchanges enable innovating firms to monetize their rights without the considerable capital traditionally associated with this (Serrano, 2006; Chesbrough, 2006d). Formal secondary markets for patents are believed to level the competitive playing field by lowering entry barriers and undermining privileged access to technology (Fosfuri & Gambardella, 2001). Again, as with IP securitizations, this type of secondary market is embedded, and relies on a set of financial and regulatory institutions.

The Intellectual Property Exchange International (IPXI) is one intermediary that has attempted to establish such an exchange platform for patent rights. IPXI is modeled after the Chicago based Climate Exchange and offers to trade standardized Unit License Right (ULR) contracts. The Unit License Right contract seeks to turn patent rights into a more transparent and standardized commodity by enabling buyers to utilize a standard setting along with third-party monitoring and enforcement technologies to facilitate exchange. This should enable patent owners to license their technology in a non-discriminatory way to a variety of interested parties. The pricing mechanisms of ULR contracts are rather complicated (Ghafele, Gibert & Malackowski, 2011).

IPXI started its operations in early 2012 and found more interest from patent owners wanting to offer their patents at the exchange than from potential buyers. IPXI found that it was also difficult to put the "right" patents up on the exchange. As many patents are of low value and only a few are worth trading, it has been very difficult to find out which patents to trade and which ones to leave untraded. Finally, many companies that IPXI approached had difficulties understanding the value proposition of IPXI and the concept of IPXI altogether. Very likely more educational work will be needed before IPXI will be able to observe the trading volume it would like to see. The example of IPXI shows that patent exchanges encounter a number of difficulties that the exchange of other commodities does not because of the nature of the rights being traded. Patent rights are by definition a claim to unique and novel technologies. The rights traded are thus extremely heterogeneous. Trading patents is not like trading sacks of rice or bars of gold. A lack of common valuation standards and a multitude of different types of rights complicate the process of turning patents into a standardized and tradable commodity. IP rights cannot

be efficiently traded in a transparent market space until there are adequate standards for valuing them (Hagelin, 2002).

Contrary to IPXI's rather complex mechanisms, the TAEUS PatentBooks is less complicated in its approach and has for that very reason found more reflection in business. TAEUS PatentBooks aggregates patents and this enables manufacturers to license all the necessary patents for a specific technology in a single transaction. Royalty income is distributed among patent owners according to the quality of patents submitted. PatentBooks offers significant advantages to both product manufacturers and patent owners. Enabling manufacturers to license hundreds, even thousands, of product-specific patents in a single transaction at a competitive price tag, the PatentBooks eliminates royalty-stacking problems and prolonged bilateral negotiations among multiple stakeholders.

The primary rationale for PatentBooks licenses is based on the fact that the manufacture of technological products requires licensing multiple patents from a variety of actors around the globe. The major value proposition of the TAEUS PatentBooks is that it significantly reduces transaction costs. PatentBooks thus primarily targets two types of firms: product manufacturers that assemble PatentBooks products and firms that own the patents included in the PatentBooks. PatentBooks reduces the total search and information costs of identifying license partners and spreads the remaining costs among multiple users.

This may lead to increased licensing activity. "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, 1989). This phenomenon is evident in social networks like Facebook, MySpace, and Linked-In as well as online marketplaces such as Ebay. As the advantages of the PatentBooks platform are demonstrated through its use, the exchange should attract more participants and thus increase its value. Patent owners should be 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 (Ghafele & Gibert, 2011-A). At present, both IPXI and the TAEUS PatentBooks are too new to offer much evidence of success to date. Sites like IPXI or the TAEUS PatentBooks may see little activity because licensing is still strongly associated with litigation; i.e. licensees have a strong tendency to only take a licence under threat of litigation. To what extent market participants will be ready to take a licence without being threatened of being sued remains to be seen.

ITRI, based in Taiwan, equally seeks to aggregate patents among firms to enable their monetization. The TFT-LCD (thin film transistor—liquid crystal display) alliance is a good example showing the success of this approach. In 1990, ITRI formed a joint venture with the Taiwan TFT-LCD Association to

form a pooled patent portfolio of over 200 patents relating to flat-panel displays (Lee et al., 2009). The patent pool enabled local Taiwanese companies to enter the flat-panel display industry quite late. This can be explained by the significant entry barriers of Japanese and South Korean competitors. By facilitating cross-licensing deals with these competitors using the patent pool created through the alliance, ITRI was integral to the development of this now lucrative industry in Taiwan. The activities of ITRI show the multiple strategies that can be implemented to facilitate access to innovation and promote its commercialization. ITRI can be seen as a prototype that may be replicated in many different industries and regions.

Another interesting development following a somewhat similar rationale is the Open Invention Network. Open Invention Network acquires patents and licenses them royalty-free to companies, institutions, or individuals in return for agreements that these actors will not assert patents against the Linux system. This enables companies to invest in Linux infrastructure and related products without fear of infringement liability, fuelling innovation and growth around this technological ecosystem. What is interesting in this approach is that the IP is used to develop an adequate innovation infrastructure and not as a means to litigate against operating firms (Ghafele & Gibert, 2012-A).

10.7 CONCLUSIONS AND IMPLICATIONS FOR FURTHER RESEARCH

The most crucial institutional change needed to promote the management of IP under an open innovation paradigm is the change of established patterns of thought. As long as those responsible for IP strategy see IP primarily as a negative right, a right to exclude, it will be very unlikely that secondary markets for IP will take off. Changing belief systems is, however, a lengthy and sometimes desperate undertaking as history shows. Ignaz Semmelweis, Louis Pasteur, and Gregor Mendel were ground breaking scientists whose research was disregarded by their times in spite of the fact that they were ultimately proven to be right. Perhaps the strong interest in open innovation will help enlighten IP managers on alternative avenues possible for handling IP questions. If IP is to be managed pro-actively and markets for technology are to be developed, then it will be of paramount importance to look at IP as an enabling mechanism promoted under an open innovation paradigm. The TAEUS PatentBooks, ITRI, and Nike's Green Exchange have sought to overcome the existing limitation by providing sophisticated electronic trading platforms. It seems that it will be equally important to educate corporate leaders and help them frame new questions on IP. A new market is not only created by ICT alone.

Outside the domain of IP, online intermediary services have proven to be an important means to bring potential buyers/customers and sellers/service providers together. Successful examples are for example Ebay, Booking.com, Kiva, Zipcar, or Expedia. The success of "infomediation" is based on lower transaction costs as search, coordination, and payment costs decrease (Ng & Yip, 2010). By establishing a space for price comparison and the aggregation of buyers and sellers, it makes a market investable and paves the way for secondary markets for IP. The exchange and pricing of new commodities as offered by IP exchanges bears the potential to stimulate liquidity, transparency and standardization in a manner that positively impacts economic growth. The creation of financial instruments to monetize non- or underutilized assets encourages greater investment and can even create totally new markets. Standardizing the valuation procedures of the asset in question and rendering price responsive to market fluctuations is still the most significant obstacle to establishing such a market. Various IP Exchanges have created complex financial instruments to try to overcome this limitation, and this commoditization process has helped them tap into previously inaccessible markets. Such innovation fuels a virtuous cycle of productivity growth that underpins a stable increase in GDP.

Open innovation shows how intellectual property protection can be used in a creative way to achieve the goals of the knowledge-based economy. IP bears the potential of a tradable asset that promotes the transfer of technology and the sharing of ideas rather than the opposite. The popular perception of IP as a defensive legal tool stands in the way however. This has a negative impact on the innovation efficiency of an economy. Open Innovation provides a novel rationale for IP that goes beyond the scope to appropriate rents from inventions. It is important to understand that Open Innovation is not promoting a "gift economy," where inventions are freely revealed for no economic gain. Rather, it offers a window of opportunity to a different economic regime, where firms are offered a range of new strategies to generate business from their inventions. This effectively constructs a new appropriability regime (Teece, 1986). Open Innovation is therefore a gateway to a different IP system. A system predicated on the open exchange and diffusion of ideas made possible through clearly codified inventions. If an Open Innovation rationale is applied to the management of IP, the establishment of secondary markets for IP follows by consequence. Open innovation provides the answer to what "Rembrandts in the Attic" leaves unanswered. Firms need to buy and license technology in once they realize that they do not need to have all competences in-house (Ghafele & Gibert, 2012—B).

IP management under an Open Innovation paradigm recognizes the value of knowledge exchange and uses the IP regime to ensure access. In doing so, it is paving the way for a new vision of IP. This paradigm is not founded on

the ability to exclude others. It is founded on the ability to use the legislative mechanisms associated with the introduction of private property rights over knowledge. For decades the enabling mechanisms associated with the use of IP remained untapped because of a highly litigious market culture. However, IP is now increasingly accepted in the economic literature as an asset. Analysts argue that intangibles have now fully emerged as a powerful asset class (Millien & Laurie, 2008) while others propose that IP assets can be proactively managed, developed, and nurtured to enhance business value (Reilly & Schweihs, 2004). The shift from an intellectual property—"rights" perspective towards an intellectual property "management" paradigm is a key factor in discovering creative mechanisms to leverage the intellectual property system as a means to fuel Open Innovation. Open Innovation has been at the forefront of this exploration by developing new licensing agreements to ensure openness and thus effectiveness of innovation. Attempts to develop secondary markets for IP have been made before and failed. They failed, not because the idea is wrong, but because an open innovation paradigm has not been sufficiently embraced by market participants. As long as corporations are only willing to take out a license under the threat of litigation and suffer from "not invented here" syndrome, it is not very likely that secondary markets for IP can be established. The absence of buyers/licensees illustrates how little understanding there is about the enabling opportunities associated with IP. This chapter hopes to have made a contribution to change that.

NOTES

1. The literature review for this chapter was undertaken by Robert O'Brian and Eric Motycka. The work on IP intermediaries and IP exchanges draws upon a body of research that Roya Ghafele created jointly with Benjamin Gibert over a couple of years of collaboration.
2. As of June 25, 2012 there were 1397 records available for export from the ISI Web of Knowledge database related to "intellectual property" in journals related to business, economics, and management. HistCite is a powerful tool that helps in reporting this data.
3. Note that licensing can be used to create value from knowledge that is not patented, and may not even be codified. The licensing of know-how, for example, is a frequent aspect of many technology licenses. See Arora et al., (2001a) for examples from the chemicals industry.
4. The category of "neglect" or "do nothing" is usually excluded from academic study, but from our casual observations of research managers, this is a frequent path for many early stage inventions.

5. http://www.guardian.co.uk/technology/2011/jul/01/nortel-patents-sold-apple-sony-microsoft
6. 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
7. Citation to Chesbrough and Crowther, *Beyond High Tech*, 2006.
8. Read more: http://www.investopedia.com/terms/s/securitization.asp#ixzz2HP6Fv9cj