4. Patent exploitation strategies and value creation

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4.1 INTRODUCTION

The idea that patents are a means to an end, that end being innovation (McDonald, 2004), has very recently changed. They no longer play the role of legal instruments, rather of business tools which are strategically exploited by managers for profit and competitive advantage (Rivette and Kline, 1999). As a matter of fact, many firms are now capitalizing on their previously unexploited intellectual property – also known as *Rembrandts in the attic* from the title of a famous book (Rivette and Kline, 1999) – by leveraging the rent-generating potential of in-house developed patents. The rising availability of patents (supply-side) is fostering the diffusion of markets for technology which creates new strategic opportunities also for recipient firms (demand-side) – the other side of the coin – by lowering technological barriers to innovation (Arora et al., 2001). Firms are increasingly seizing this opportunity and becoming more and more reliant on externally sourced knowledge to ignite the innovation funnel (Chesbrough, 2003) and fill-in the roadmap of innovation.

The aim of this chapter is to present the main patent exploitation strategies which are pursued by firms in the current competitive scenario. For patent exploitation strategy we refer to those strategies which are designed around the deployment of patents in different settings and for different purposes. The rationale underlying this chapter is to understand the main features of these strategies – actors involved, timing, outcomes – which are very relevant to assist the evaluation process. Indeed, disentangling the link between patent exploitation strategies and value creation represents a required step to take before any evaluation attempt.

The remainder of this chapter is as follows. First, we will highlight the relevant role of intellectual property rights (IPRs), including patents, as competitive weapons in the knowledge-based economy firms are living in. We will pay specific attention to the recent shift toward a less defensive and thus a more open attitude in the strategic management of a firm's intellectual

property rights. This premise will allow us to shed light on the renewed motive to patent which is mainly exchange-driven and which deploys its full potential in the markets for technology. Patent licensing-out and licensing-in strategies – which are the most frequently employed strategies for exchanging patents in markets for technology – are described with the identification of the main objectives a firm can aim at through them. New trends are then highlighted suggesting possible new uses of patents which specifically build upon their rent-generating potential which can be directly or indirectly used for the achievement of the competitive advantage. The overall message of the chapter is finally conveyed in the conclusion section.

4.2 PATENTS AND THE KNOWLEDGE-BASED ECONOMY

The centre-stage role of intellectual property rights, mainly patents, within the innovation strategy of the firm can be interpreted through the principles pertaining to the so-called Knowledge-based Economy (OECD, 1996). In the 1980s, the concept of Knowledge-based Economy started to circulate within the academic community as a way to address the third industrial revolution, founded on the important role of new information and communication technologies that would characterise the coming century (Harris, 2001). The intellectual origin of the knowledge-based economy stems from the recognition that economic wealth rests upon knowledge and its useful application (Teece, 1981; 2007). Knowledge creation thus becomes the most relevant means to generate profits and growth in living standards.

At the level of the single firm, this revolution implied a 'new ecology of competition' (Rivette and Kline, 1999:4) in which the firm's competitive advantage increasingly rests on the deployment, development, combination and utilization of intangible assets, including knowledge and intellectual property rights. Amongst other intellectual assets, patents have displayed a significant potential as a source of revenue and as a means to improve the competitive position of leader firms and to be on the forefront of innovation. Traditionally, firms have fiercely protected and exclusively relied upon their own patents in facing the blurring of industry boundaries and the increasingly global competition. According to Granstrand (1999: 210): 'the primary motive for a company to apply for a patent is to increase the economic returns of its research and development (R&D) efforts by ensuring restricted but enforceable monopoly rights, that is the right to exclude others from the protected technology' (see also Chapter 2). By establishing a proprietary market advantage, the right of exclusion

granted by patents allows firms to reward R&D efforts and to focus on complementary activities (for example branding) that are meant to sustain the products once they have been launched in the market. However, research has found that firms most often do not rate patents as the most effective appropriability mechanisms. Indeed, informal mechanisms – such as such as trade secrets and lead-time advantages – have been shown to be perceived to be more effective means of protection in most industries (Levin et al., 1987; Arundel, 2000; Cohen et al., 2000). In addition – and perhaps unexpectedly – patents have not increased in importance over the years (Cohen et al. 2000). Nevertheless, this occurrence has not hampered the rate of diffusion of patenting. Rather, we have witnessed a surge in patenting activity since the 80s that paradoxically contrasts the abovementioned scepticism about the effectiveness of patent protection. Several authors have tried to provide a fitting explanation for this paradox (Kortum and Lerner, 1999; Hall and Ziedonis, 2001; Ziedonis, 2004). Among others, the friendly court hypothesis is one of the most cited ever (Kortum and Lerner, 1999). According to this, the increased propensity to patents has been driven by changes in the legal environment for patent holders. Indeed the inauguration of the Court of Appeals for the Federal Circuit in the United States – a specialist exclusive patent court – has strengthened the perceived patent enforcement system. This hypothesis has been also echoed by the so-called demonstration effect of Polaroid's successful patent infringement suit against Kodak (Hall and Ziedonis, 2001) which has been frequently mentioned to highlight the cost of underlooking the IPRs of rival firms in presence of a strong IPRs regime. An alternative hypothesis hinges upon the recognition of a widening set of technological opportunities which are now available to firms. The fact that patent protection has been extended to new areas that were not deemed patentable before, like software, internet business methods and biotech, have boosted the explosion of new firm formation in the high tech sectors which were generally financed by venture capital funds on the bases of the composition and quality of their patent portfolios (Kortum and Lerner, 1999; Granstrand, 1999; JPO, 2008). In addition, with reference to at least the American situation, the rising availability of patents has been also boosted by the introduction of the Bayh-Dole Act in 1980 which allowed new actors (Universities) to be assigned patents over government-funded research (Mansfield, 1996). Others (for example Rosenbloom and Spencer, 1996), instead, have suggested that the raising number of patents appears to stem from a broad increase in R&D productivity. However, this hypothesis is not easy to demonstrate, since it requires analyzing the internal efficacy of the management of R&D facilities inside the firms. Recently a new explanation has gained attention over the last decades that can be

called – in analogy of other hypotheses we have just described – the strategic hypothesis of why patenting has surged. According to several authors (among others, Cowan and Harrison, 2001; Hall and Ziedonis, 2001) firms have decided to harvest more patents from their R&Ds for strategic reasons, say either for blocking competitors from developing rival technologies, or to ensure themselves the freedom to operate without infringement or to aggressively impose their bargaining position by improving their leverage in negotiation. According to Granstrand (1999), there are a certain number of patent strategies which firms can pursue to navigate the technological space which has overall leverage on the competitive-weapon potential of patents. According to him, there are five types of patent strategies which are: Ad hoc blocking and inventing around, strategic patent search, blanketing and flooding, fencing and surrounding (Granstrand, 1999: 218–222). All of them are meant to block up or prevent competitors from either investing in research and development trajectories leading to new patents or to successfully exploit existing strategic patents.

Over time, there has also been a generalized misuse of patents, provoking a competition-distortion effect that has been debated for long time within the academic and the practitioners' communities. According to some authors (eg Granstrand, 1999; Arundel, 2000; Cowan and Harrison, 2001; MacDonald, 2004) firms have been in fact much more interested in preventing competitors from developing rival technologies in order to fiercely maintain their proprietary monopoly, rather than focusing on empowering and leveraging their internal knowledge-base. As a result, patent strategizing has often become the exclusive object of senior managers' speculation rather than the outcome of a joint vision of managers, engineers, researchers and legal attorneys (among others, Afuah, 1999; Rivette and Kline, 1999; Cowan and Harison, 2001). In other words, in many cases firms have diverted their attention from using patents as devices to facilitate innovation and have employed them as strategic tools that discourage the innovations of others (MacDonald, 2004). For this same reason, opposition and litigation in the court against alleged infringing rivals have become centre-stage in the day-by-day management of the company. In some industries, characterized by systematic innovation, like bio-medicals and semiconductors, this phenomenon – the proliferation of patents for anticompetitive purposes – caused the so-called *Anti-Commons tragedy* in which 'multiple owners each have a right to exclude others from a scarce resource and no one has an effective privilege of use' (Heller and Eisenberg, 1998: 698). As a consequence, technical and thus economic progress has been hampered rather than eased as it was supposed to through the beneficial effect of patent systems.

While the trend described above is worrying, another recent trend is

countervailing this development. This other trend favours a less defensive and, thus, more proactive and open attitude towards the strategic management of firms' intellectual property rights. Indeed, the recent diffusion of markets for technology – which are defined as 'markets for intellectual property that is licensed and its close substitutes, ie the technologies or goods that are close enough substitutes significantly to constrain the exercise of market power with respect to the intellectual property that is licensed'. (Arora et al., 2001b) – has confirmed this trend. There is widespread evidence suggesting that firms are now enjoying the advantages of the diffused model of innovation based on sharing knowledge within and across firms' boundaries (Chesbrough, 2006). Big players like IBM, Microsoft, Xerox, and Procter and Gamble are taking advantage of the stunning size of their patent portfolio by licensing out their (mostly un-exploited) technologies – both peripheral and core – after having promoted them through their virtual markets for technology (Rivette and Kline, 1999; Grandstand, 1999; Arora et al., 2001b).[1] Insightfully, in its *Open Innovation Whitepaper*,[2] Microsoft has recently declared with regard to its very active patenting activity: 'In the five years since [2003], we have been granted more than 5,000 US patents, and we have more than 15,000 patents pending. The central goal of this intensified patenting work is to create opportunities to work with companies of all sizes to promote innovation and technological progress. On a fundamental level, broad adoption of our products and technologies remains central to the business strategy of Microsoft. That means our approach to licensing intellectual property is based much more on making patents available on reasonable terms than on licensing them to generate revenue.' (Microsoft Corporation, 2008:7)

Symmetrically, other big firms like Cisco, Sony, and several others from the pharmaceutical and automotive sectors are becoming increasingly reliant on externally sourced technologies. For instance, over the last few years Cisco has effectively and purposively developed an outward-oriented strategy to gain technological leadership in the market that hinges upon the following 'golden rule': '[w]hatever technology the company needed, it acquire[s] from the outside, usually by partnering or investing in promising start-ups [. . .]' (Chesbrough, 2003: 35).

4.3 PATENTS AND THE DIFFUSION OF MARKETS FOR TECHNOLOGY

As a consequence of the fast changing nature of the competitive environment and the increasing amount of resources required to come out with

innovations, firms are relying more and more often on external sources of complementary assets. A new division of innovative work seems to be emerging (Arora et al., 2001a) which underpins the diffusion of markets for technology. Firms focus on what they do best at different stages of the value chain, pack it into IPRs and then sell in the downstream market. Or conversely, they buy other firms' technologies in the form of IPRs, integrate them into products and sell in the product market. In this context – where technologies become tradable assets – the unbundling of intellectual property from products shifts the attention from how to create valuable knowledge assets to how to capture value from them. The model of organizing innovation, where R&D and the complementary assets required for innovation are largely integrated inside the firm (Teece, 1988), is now challenged by the principle of interdependence which can be described as follows: '[t]echnology management in the future will centre on leveraging technology that a company owns to gain access to technology that it needs' (Parr and Sullivan, 1996:6).

Markets for technology represent the locus in which such an exchange takes place and thus the supply and the demand of technologies meet each other. Available information suggests that markets for technologies are recently growing at an increasing pace (Arora and Gambardella, 2010). One of the most reliable and most employed measures of their size is provided by data about licensing agreements revenues and expenditures (Kamiyama et al., 2006). Although it is recognized that a large portion of technological assets are still unexploited – thus creating large potential for trade (for example, Rivette and Kline, 1999; Kim and Vonortas, 2003; Sheehan et al., 2004, Athreye and Cantwell, 2007; JIII, 2003, 2004; Razgaitis, 2003, 2004; Kamiyama et al., 2006; Cockburn, 2007), the extent of the recent explosion in licensing activity is remarkable, mostly in the high-tech sectors as shown by several authors (Grindley and Teece, 1997; Rivette and Kline, 1999; Annand and Khanna, 2000; Gu and Lev, 2001; Arora et al., 2001a; Arora and Fosfuri, 2003; Vonortas, 2003; Kim and Vonortas, 2006).

By law, a license agreement is an arm's length contract for the transfer of IPRs encompassing patents copyrights, trademarks and trade secrets (see Chapter 9 for a more detailed description of patent licensing contracts). It represents the leading mechanism in trading patents (Arora and Ceccagnoli, 2006; Arora and Fosfuri, 2003; Chesbrough, 2003: FVG, 2007). The reason for this resides in the following. According to several authors (Green and Scotchmer, 1995; Merges, 1998; Arora and Merges, 2000; Gallini, 2002) a strong patent system may be pivotal to an innovator's decision to license-out new technologies rather than to use them exclusively. Empirical evidence witnessed that licensing is more

widespread in industries where effective patent protection is guaranteed, like the biotechnology and chemical industries (Arora and Fosfuri, 2000; Anand and Khanna, 2000). Consistently, Gans et al. (2002) by investigating the commercialization strategies of 100 start-up firms found that whenever they enjoy strong patent protection they are more likely to cooperate with incumbent firms (for instance by licensing-out), otherwise they will rather prefer to compete against them by introducing competitive products (Arora and Merges, 2004). Indeed, whenever patents are strongly enforced, they ensure that technologics boundaries are legally well-defined and consequently their transfer is feasible and effective. Also, strong patents enhance the inventor's bargaining power that could make licensing agreements be faster concluded (Gallini, 2002). In line with this reasoning, Gans et al. (2008) found that the licensing of a patent occurs primarily within a small time period around the date of its grant, since the legal uncertainty of the right fades away and the transaction costs associated to the license are, in part, resolved.

To sum up, patents provide a currency that allows knowledge to be traded to an extent that has not been previously experienced in the markets (*The Economist*, 2005). Economic scholars have recently provided a positive interpretation of this phenomenon as suggestive of a partial resolution of the long-debated static negative effect associated to the patent system – referring to the grant of a proprietary market advantage which may slow down the technical and economic progress. Accordingly, Gallini (2002:141) proposed a renewed interpretation of the role of patents which is based on the following consideration: 'in facilitating technology exchange, patents may be self-correcting: a stronger legal right to exclude others from using an invention generally provides a stronger economic incentive to include them through licensing'. Thus, the recent surge of licensing activities is shifting the attention towards a more *exchange-based motive* for patent exploitation which displays an untapped potential for value creation. Consistently, in the next section we will describe the various ways in which patents can be exploited through licensing, both from the licensor's point of view (patent holder) and the licensee's (patent recipient).

4.4 PATENT EXPLOITATION STRATEGIES THROUGH LICENSING

There are many strategic reasons for firms to either license-out or license-in patents. Nevertheless, within the economic and management literature, the supply-side of the coin has generally been emphasized (among others,

Arora et al., 2001; Fosfuri, 2006). This is also a result of the common tendency among firms to pay more attention to selling their intellectual property rights to others (the financial benefits are quite evident) than buying intellectual property rights from outsiders (Chesbrough, 2003). However, given the increasingly global competition and complexity of products and the necessity to be on the forefront of innovation, in-licensing strategy – which implies tapping into (complementary or new) external sources of knowledge – is gaining increasing attention both by (industrial and financial) practitioners and, thus consequently, by management scholars. A few years ago Hawkes (2003) conducted a study based on the examination of licensing announcements filed at the London Stock Exchange between February 1999 and August 2001. She aimed to provide a market-based measure of the value the financial community attaches to license agreements, in terms of abnormal movement in share prices following such announcements. The findings overall suggested that licensing agreements do indeed provoke a positive movement in share price. Specifically, among other type of licenses, patent licenses create most value with an average above normal return[3] of 3.03 percent. She also found that exclusive in-licensing strategy is more valuable than the symmetrical out-licensing option, displaying average abnormal returns of 4.14 percent. The possible explanation is that: 'the exclusive terms in a license are less critical if a company is the owner of the intellectual assets being licensed' (Hawkes, 2003:9). This is because, by exclusively licensing-in patents – which were developed by other firms – the technology recipient not only saves R&D investment, but also can benefit from other firms' innovation efforts in a monopolistic way. With these considerations in mind, it is also easy to understand why when in-licensing is not granted in an exclusive basis, the share premium associated to the announcement falls inexorably

4.4.1 Reasons to license-out

The licensor is the IPRs holder who grants permission to another legal entity (person or company) – the licensee – to make use of, sell, or otherwise benefit from the underlying IPR under certain restrictive conditions (Granstrand, 1999: 414). From its perspective, the relevant choice is between internal versus external commercialization through licensing. According to Teece (1986), the solution depends on the interplay between the appropriability regime and the presence of complementary assets inside the firm. According to him, licensing propensity increases if the innovator, lacking complementary assets, such as marketing and manufacturing capabilities, enjoys strong patent protection.[4] More recently Fosfuri (2006) suggested that the decision to license-out should be made by taking

also into account another relevant factor: the competition in markets for technology. His findings suggested that whereas there is a market for technology which 'implies the presence of several firms owning substitutable technologies' (Arora, et al., 2001:178), technology holders face a dilemma: to license out the technology to a third company or not to license and only rely on internal commercialization. On the one hand, if they license out their technologies they will incur lower marginal profits (profit-dissipation effect) due to an increase in competition in the market for products. On the other hand, if they miss the opportunity to license out to third downstream companies, they first give up on the prospect to gain royalties from licensing (revenue-effect) and may also face the possibility that rival technology-holders take advantage of this chance and thus bite the market.

Based on this premise, the main reasons for a firm to license-out its patents can be listed as follows:

(a) to get additional revenue/finance;
(b) to open up new product/market opportunities;
(c) to specialize in technology development and exploit complementary resources of the licensee;
(d) to deter entry of new competitors into the market;
(e) to get access to other firms' patent portfolios (cross-licensing);
(f) to establish a new standard; or
(g) to realize learning effects.

The classical approach of a licensor is to extract as much profit as possible from its technologies. The monetary dimension of licensing remains the most relevant one (see Chapter 9). Licensors' firms generate extra revenues that would have not been realized by carrying out their core product business (Lichtenthaler, 2008: 70). In other words, licensing becomes a source of additional revenues/finance for the firm which can be employed for different purposes (Gambardella and Giarratana, 2006). This attitude is particularly suitable when the transaction involves peripheral technologies that are distant from the core business of the licensor. Licensing-out may be beneficial to the potential licensor who otherwise would not be able to exploit the technology surplus (Cesaroni, 2006) it has voluntarily or accidentally developed in-house. This was the traditional attitude pursued by large patenting companies which have stockpiled patents covering peripheral innovations, including uncommercialized technologies, which are arranged into various patent groups and licensed (Carson et al., 2003). This is the baseline approach of large firms like IBM which '[. . .] licenses technology primarily to enhance the return on its investment in the technology'.[5]

Conversely, there are many reasons why licensors may license-out (some of) their core technologies. The main motive is to open up new product/market opportunities. Indeed, when the market for product – where the product covered by the licensed technology is produced and sold – reaches maturity, the licensor should then consider licensing-out its patented technologies in order to exploit their cash-cow potential in other competitive arenas. In this case licensors are provided with the opportunity to diversify their supply and to gain access to new (emerging) product markets which otherwise will not be accessible. In this attempt, the licensee firm becomes an outgrowth of the licensor in which the relevant knowledge and the required expertises about the new product markets are expected to reside. In this case licensing works as 'an enabler of new product market opportunities' (Lichtenthaler, 2008:70). For instance, with reference to the recent license agreement with ARM, a company specialized in the development of technologies for consumer electronics products, Yasuo Kawahara, general manager of the Toshiba's Semiconductor Company, stated '[w]e expect the agreement to make a major contribution to expanding Toshiba's business'.[6]

While the above-mentioned reason to use markets for technology through licensing is typically addressed by larger firms which are equipped with resources and competences to diversify broadly, small firms in the pursuit of similar strategies are a more recent phenomenon – at least on a larger scale. Indeed, an important implication of the development of markets for technology – which stems from the enabling effect of strong intellectual property rights[7] – is the establishment of small firms focusing on the development of technology-intensive inputs (Arora and Merges, 2004). These specialized supply firms which survive as separate, independent entities, on the one hand, enjoy the benefits of a small firm's architecture – flexibility, intimacy and innovativeness – and on the other hand, can rely on an arm's length supply of contracts to provide downstream firms with their inputs. This phenomenon mainly characterizes the biopharmaceutical industry which is witnessing a significant growth of vertical supply transactions (*The Economist*, 1998: Arora and Merges, 2004). That is, a division of innovative labour between new research-intense biotechnology firms and large drug manufacturers which have the complementary assets for developing the specialized inputs (components) developed upstream (Cockburn et al., 1999).

Another reason to license-out technology reflects the willingness of the patent holder to provide additional sources of supply or to get control over competitor's supply. Indeed, by licensing-out the proprietary technologies to others, firms can expand the scale of use (Kats and Shapiro, 1985) and thus create multiple sources of supply. This, in turn, will allow

for a higher level of product quality – given the stronger image of the product – combined with a lower level of product price – given the wider scale of use – which is the perfect condition to enlarge the product demand by improving customers' satisfaction (Shepard, 1987). Sometimes, technology holders pursue this line of attack to achieve or maintain their technological leadership. In this case, the prospective licensee is generally a competitor. The strongest one, if it is possible (Rockett, 1990). This choice is explained by the desire of the licensor to reduce/choose the competition in both the markets for technology and the product market (for example, Gallini, 1984, Salant, 1984; Rockett, 1990; Eswaran, 1994). For instance, Gallini (1984) analyzed the decision of the incumbent to license-out its old technology to potential new entrants before they even start to invest on R&D trajectories leading to a new (possibly better) technology.[8] According to the author (1984:931), in this situation '. . .] firms are encouraged into the product market – via licensing – as a way of deterring them from R&D activity'. Otherwise, as suggested by Lichtenthaler (2008: 71), a technologically leading company may license its technology to its competitors whereas the company itself decides to concentrate on the development of other technologies which, it believes, will turn to be superior in the long run. In any case, licensing becomes a means of reaching a deterrence effect (Gallini, 1984). The strategic anti-competitive potential of licensing, in fact, is well-known among policy makers and remains one of the main debated topics among the regulators community (Tepperman, 2002).

In the telecommunications and semiconductor industries – which are characterized by systematic cumulative innovation – patent licensing generally takes part of an overall strategy which is intended to ensure the so-called 'freedom to operate' without infringement (Grindley and Teece, 1997). On the basis of a widespread survey evidence of several industry representatives, Hall and Ziedonis (2004: 110) highlight that 'a given semiconductor product (say, a new memory or logic device) will often embody hundreds if not thousand of <potentially patentable> technologies that could be owned by suppliers, manufacturers in other industries, rivals, design firms, or independent inventors'. In such a context the risk and thus the cost to infringe other firms' patents is very high and may hamper the innovation process. In order to overcome this hold-up problem, firms have started treating patents as bargaining chips to gain access to other firms' technology portfolios by concurrently allowing access to firms' own knowledge bases (for example, Hall and Ziedonis, 2001; Reitzig, 2004; Lichtenthaler, 2008). The reason why they are defined as bargaining chips is straightforward. The higher the number of patents that can be brought to the table and the greater their intrinsic value, the more powerful is the firm's leverage in negotiations. This is why firms with strong patent

portfolios are able to capture considerable benefits from their patent estates (Grindley and Teece, 1997). This is also why cross-licensing contracts are generally employed in this setting. According to this contractual form, firms cross-license their 'portfolios of all current and future patents in a field-of-use, without making specific reference to individual patents' (Grindley and Teece, 1997:9). The portfolio approach, implied by this type of agreement, reduces transaction costs associated with the negotiation of each single license. Recently, SanDisk and Samsung have announced that they signed a definitive agreement to renew the cross license of their semiconductor patent portfolios. Specifically, the new patent cross-license agreement includes rights to each party's patents covering multi-level cell flash memory and flash storage systems.[9] Given the relevance of the strategic move, financial terms of the agreements were not disclosed. This type of agreement is not uncommon. In a similar vein, The Zumtobel Group of Austria and Royal Philips Electronics of The Netherlands have concluded a comprehensive, worldwide, cross licensing agreement for current and future patent rights in the fields of lighting electronics and solid state lighting.[10]

Sometimes firms do create a patent pool which is a consortium of firms agreeing on cross-licensing their patents either because they want to save time and cost of patent management or because they have mutual blocking patents which they want to get and allow access to or because they want to purposively set a common technology standard. Control of these standards can yield large rents. Lower costs of production due to product standardization will be also combined with higher profits given the large adoption of the new standardized product. In this case the relationship between IPRs and standard is worth further investigation. According to Bekkers et al. (2002:1145) '[w]hile it is in the interest of any party that wants to promote a standard to have the technological knowledge that is needed to implement the standard diffused widely, the main aim of IPRs, on the contrary is to restrict diffusion'. This means that, on the one hand, firms holding essential IPRs would like to enforce their exclusive rights over their technologies; but on the other hand, they need to gain access to other firms' IPRs in order to contribute and use the standard. To avoid the risk of being blocked by eachother, the group of firms will agree to pool their intellectual property (IP) rights and license to each other all rights each will need to manufacture and sell the product. Recently, some firms have designed their business models around this practice. In other words, their primary activity consists of buying technologies from other firms which each have developed patents covering only a portion of the relevant knowledge. Afterwards, they license-out this pool of patents to others firms (including the previous technology holders) which are interested in

getting involved in (and don't want to be excluded in) the standard-setting process. A notable case at hand is provided by Sisvel S.p.A., an Italian innovative company, whose activity of granting licenses to consumer electronics firms represents the core-business of the firm and also an important source of auto-finance.[11]

The establishment of a technology standard can be also achieved de facto (Arora et al., 2001a). In this regard, licensing enables the licensor to boost the technology-diffusion process, which leads to the creation of a critical mass of adopters and suppliers of complementary inputs of technology. Timing issues are essential in this scenario. Firms who are better able to choose who and when to license-out their technology will become the standard-setter. The recent standard war between Sony's Blu-Ray and Toshiba's HD is a notable case at hand. Besides the technology superiority of the former – which can be debated – what made the difference in favour of Sony was the way the standard setting was conducted. Choosing the right partners (both Hollywood producers and Wall-mart were inclined to only go for Blu-ray) and the right time to set their own technology as the dominant design turned to be the key-drivers for eventually ensuring victory.[12]

Finally, a licensor may want to license-out its technology in order to easily reach the help of the recipient firm. According to Bidault (2004) the licensor may want to improve its own efficiency – in terms either of costs and quality – thanks to the help given by the licensee. At the least, aiming at this, the company will define a buy-back license agreement, in which the licensee will sell back to the licensor the product which has developed on the basis of the licensed technology.[13] There is another outcome to be achieved alternatively. It reflects the longer-term objective of realizing learning effects (Lichtentalher, 2008). The licensor may benefit from the improvements developed by the licensee during the term of the agreement. The idea that licensing creates potentials for learning opportunities (Pitkethly, 2001) is little recognized both within the academic and the practitioners' community. However, Lichtenthaler (2008) reported that several interviewed companies were inclined to highlight the role of their licensees in coming up with and developing relevant new ideas to improve the licensed technology. This situation explained why firms are now putting efforts into extensive licensing programs of their crown-jewel technologies (Kline, 2003: 90). This trend spans both traditionally-known 'protective' firms, like Procter & Gamble and 'open-oriented' firms, like IBM. For instance, the former one, known for being fiercely protective of its proprietary innovation, announced in 2000 a very extensive indiscriminate licensing strategy of their main patents and an unprecedented joint venture with one of its strongest competitors (Kline, 2003). Anyhow,

whenever a room for learning exists, the licensor has a clear interest in obtaining control over the technological improvements if it believes that there is an unexploited potential in the licensed patents. This means that it has to make sure it has free access to those improvements, otherwise the licensee might take the technological lead to its detriment. Contractual 'grant-backs' are frequently employed to deal with this issue. According to this clause '[t]he patentee (licensor) requires the potential licensee to agree to grant back to the patentee rights to improvement patents developed by the licensee that relate to the original patent as partial consideration for the license rights' (Schmalbeck, 1975: 733). However, licensing agreements are sometimes part of a broader plan pursued by the licensor with the aim of creating a complementary relationship with the licensee.[14] This amounts to saying that grant-back clauses may be replaced by mutual commitment and trust. Especially when the licensee's pool of firms includes well-known companies. Building a long-term relationship with the counterparts may also be leading to enhancing the licensor's reputation (Licthenthaler, 2008), and consequently, the licensed product's acceptance in the product market.

4.4.2. Reasons to license-in

From the potential licensee perspective, markets for technology provide firms with an enhanced strategic flexibility due to the increasing range of options they can choose from for shaping their corporate strategy (Arora et al., 2001; Cesaroni, 2004). This basically means that as long as firms can rely on external sources of technological knowledge, internal technological constraints become much less critical while the ability to exploit the increasing amount of external sources of knowledge is much more relevant to compete and to gain the lead in the competitive arena. In a similar vein to the licensor's dilemma, a licensee's dilemma can also be identified. First of all, firms may take advantage of the wider array of strategic opportunities available outside by scanning, searching through, assessing and profiting from externally sourced knowledge. In this sense, markets for technology encourage firms to be open (Arora et al., 2001b; Laursen and Salter, 2006) by raising the opportunity costs of the not-invented-here attitude that generally affects large firms which look at external technologies more negatively then an economic attitude would suggest (Katz and Allen, 1982). This is because the widespread diffusion of R&D capabilities makes R&D duplication more likely. In other words, an excess of self-reliance may have the undesired outcome of reinventing the wheel to a high degree (Arora et al, 2001b). However, this does not mean that firms should rely 100 percent on external sources of new knowledge in the pursuit of

innovation, or they will be more likely to be locked-in by technology suppliers and stuck in the middle of the innovation race. On the contrary, in order to gain the most from external knowledge, firms should be equipped with a certain level of internal R&D resources that facilitates the interpretation of the incoming pieces of knowledge. This means that internal and external innovative capabilities should not be considered as substitutes rather than complementary (Cohen and Levinthal, 1990; Cassiman and Veugelers, 2006).

Embracing the licensee's perspective, licensing-in represents a viable mechanism to meet the following aims:

(a) to catch-up with competition;
(b) to achieve technological diversification and eventually open up new product/market opportunities;
(c) to gain access to essential patents; and
(d) to multiply the building blocks of innovation.

According to Caves, Crookell and Killing (1983:265) the clear advantage that a licensee has to enter into a licensing agreement is to 'secure technology at a cost lower than by developing it afresh'. Licensing-in is in fact traditionally considered a short-term reaction to a technological shortfall of the licensee (Lowe and Taylor, 1998) and thus a viable way to catch up with competition. Put differently, licensing-in is a mechanism to get rapid access to a proven/mature technology while reducing firms' financial exposure and time-to-market (Atuahene-Gima, 1993; Chatterji, 1996; Roberts and Berry, 1985). This means that – besides the direct benefit accruing to the recipient firm in terms of speeding up the innovation process – the access to the licensor's patents and eventually complementary know-how leads to a reduction of both technology development risk and market risk (Atuahene-Gima and Patterson, 1993). This is mostly true when licensed technologies have been already employed by the licensor before.

Another reason underlying the decision to license-in other firms' patents is to drive technological diversification and eventually open up new product/market opportunities. Indeed, accessing external patents through licensing is one of the easier and cheaper[15] ways to achieve technological diversification – searching through and entering into new areas of the technological space. Technological diversification may lead to product and market diversification (Cantwell et al., 2004). The direction of this process is generally coherent with the bundle of skills and expertise already developed and stored inside the firms and it takes the form of a two-step process passing by product-related technological diversification and consequently technology-related product diversification. Earlier studies

on licensing have consistently suggested that technological trajectories that firms pursue when licensing-in new technologies are closely related to their pre-existing technological background (Killing, 1978; Caves et al., 1983; Chatterji, 1996; Lowe and Taylor, 1998; Kim and Vonortas, 2006a).[16] However, recent work (Laursen et al., 2010) has demonstrated that licensee firms are able to move further away from the existing knowledge base through licensing – which means they license patents pertaining to different technological classes as compared to those covered in their patent portfolio – as compared to corresponding non-licensee firms that have developed patents in-house. Earlier, Cesaroni (2006) investigated how technological diversification through licensing may affect product diversification. Consistent with the main argumentations of the literature on markets for technology, he empirically demonstrated that '[i]f technology can be traded more easily through arm's length contracts, the lack of technological assets that prevents firms from entering into new product markets can be overcome. Firms will decide to diversify when other non-technological assets (for example, marketing capabilities) can be shared and exploited between the current and new product markets' (Cesaroni, 2006: 1551). In other words, he found that the greater the diffusion of markets for technology, the higher the degree of product diversification, whenever this strategy entails the employment of existing technological and marketing capabilities. As such, licensing-in provides the recipient firm with the opportunity to draw on the knowledge achievements of others while at the same time avoiding investing in the development of the technologies from scratch. This will allow the licensee to focus on the customization of the technology and, in turn, on developing the market for products (Arora et al., 2001). Several firms are seizing this strategic opportunity. Among others, Siemens, Advanced Simulation Technologies Inc., Thinklogical, which are leading firms in the ICT sector in their particular fields, have started to license, for instance, the ExtremeUSB® technology from the Canadian Icron Technologies Inc., to develop vertical market solutions. The licensor, which is the global leader in high performance USB (Universal Serial Bus), describes its activity as follows on its website: 'Icron has protected its innovations, building a portfolio of patents covering key techniques critical to the design of extending USB connections over a variety of media, including Cat 5 UTP, fiber, coax, powerline and wireless. Icron is focused on licensing its intellectual property assets, particularly its ExtremeUSB® technology for inclusion of its technology into a variety of customer applications.'[17]

Another reason why the licensee may agree on signing a license agreement is to gain access to essential patents which otherwise would have not been available or it would have not been able to develop on its own. This

situation occurs for instance when a standard-setting process is taking place. Firms don't want to be excluded from the market and thus agree to take a license over the relevant technologies embedded in the standard. Broadly speaking, this may also happen anytime there is diffused and mutual technological dependence among players generally competing in cumulative-innovation-based environment, like semiconductors. As already highlighted in the previous section on cross-licensing practices, the license agreement becomes a means to get access to other firms' patents while ensuring access to their in-house patent portfolios.

Finally, licensing-in may also deplete longer-term effects. As the licensor could benefit from learning opportunities by tapping into the improvements which have been developed by the licensee; likewise, the licensee could learn from the licensed technology in the very first place and thus acquire new pieces of knowledge which help to speed the process of knowledge acquisition and thus building complementary assets (Lowe and Taylor, 1998). Besides a few insights suggesting that a licensee may learn 'about a technology during the licensing period, possibly even developing new patentable technology during the license [. . .]' (Johnson, 2002: 175), the idea that licensing may foster technological learning is mainly addressed in the literature about technology transfer between developed and developing countries. The experiences of Korea, Japan and Singapore (for example, Prahalad and Hamel, 1990; Hobday, 1994; Kim, 1999; Mathews and Cho, 1999) are generally provided as insightful examples of the technological learning taking place within domestic organizations by in-licensing technologies from foreign providers. The principal driver of this learning is the capacity and predisposition of receiving nations' firms to absorb technological knowledge from outside.

At the level of single firms, licensed patents extend the knowledge base of the licensee by boosting the number of possible re-combinations a firm enjoys as potential inventions (Arrow, 1962; Motohashi, 2006; Rivera-Batiz and Romer, 1991; Ahuja and Lampert, 2001; Fleming, 2001; Henderson and Cockburn, 1994; Leone et al., 2009). Following this reasoning, Leone and Reichstein (2011) have also proposed and empirically tested the effect of licensing-in as a precipitator of inventive activity of the licensee, measured as the number of new patent applications filed after the sign of the license. Their original results suggest that licensing-in can be considered as a short-cut of the innovation process instead of only being a way to fill the technological gap and catch-up through market exploitation of the licensed technology, for example). All these insights and findings suggest overall that the main principle of the open innovation model – according to which the competition would be defeated only if firms make the best use of both internal and external ideas – is fulfilled. By licensing external patents, firms 'multiply the building blocks of innovation' (Rigby and Zook, 2002:82) to ignite the innovation funnel (Chesbrough, 2003) and thus fill in the roadmap of innovation.

4.5 NEW TRENDS ENTANGLED IN THE OPEN INNOVATION MODEL

In the previous sections we have demonstrated that IPRs, mainly in the forms of patents, display several functions and can be the object of different exploitation strategies for value creation. They are the basis of a proprietary competitive advantage; they pave the way for both technological and product/market diversification attempts; they can also be treated as bargaining chips in technological trade to get what companies need; they are the basis for the establishment of either de iure or de facto standard; they promote spill-over effects attributable to technological knowledge circulation; and they finally work as building blocks of innovation which enhance the inventive rate and speed of the firm and increase the chance to end up with successful products in the downstream market.

There is also another indirect function of patents. There is widespread evidence suggesting that the difference between the market value and the book value of the firm can be explained by the fact that firms hold a certain level of intangible assets whose value is not accounted for in the balance sheets. A growing body of empirical literature has indeed documented a significantly positive relationship between patents and firm market value (see Chapter 13), for firms that are publicly listed and also in the contest of initial public offerings (IPOs). The value of patents is crucial also for start-up firms, whose assets in many cases almost coincide with patents and represent the only means to ensure venture capital financing which is of vital relevance for them (see Chapter 12 for the valuation of start-up firms by VC funds).

Very recently, there has been an increasing lean towards a more nuanced use of patents which leverage on their value in terms of rent-generating potential. Indeed, as a consequence of the increasing cost of R&D to come out with new technologies and products, new financial tools have been designed with intellectual property rights as underlying assets (IP-backed financing) to provide extra financing for innovative companies (for example, Edwards, 2001; Agiato, 2002). The rising amount of IP-backed transactions hinges upon the recognition that 'the value embedded in intellectual capital often extends beyond directly profiting from it through direct appropriation, commercialization or licensing.

What is more, a patent is often seen by investors as a guarantee that their money is spent on something of high quality' (Striukova, 2007:9). In other words, patents can also help firms in raising extra capital in the form of collaterals – patent backed loans – or as a source of guaranteed payments (for example, royalties) through licensing – patent backed securitization (see Chapter 12 for a description of the different forms of IP-backed financing).

4.6 CONCLUSION

To conclude, it is worth highlighting the following. The overall message conveyed throughout this chapter refers to the recognition of the quintessential role of IPRs within an organization. It thus calls for a deeper understanding of how the management of IPRs can contribute to the competitive advantage of the organization and how managers have to master them properly in order to get the most from their exploitation. Specifically, we have described the different strategic uses of patents which are available to firms. Each of them requires the firm to put in place specific capabilities and make organizational choices in order to build a competitive, demanding, strong-willed and purposeful attitude towards IPRs (The Insight Group Ltd, 2009). One of the main dimensions that should be paid particular attention to refers to the assessment of the value of the patents that are the object of firms' strategizing. This is the general concern of this book. Indeed, depending on which situation and which circumstances firms are involved with and according to the final aim of the patent exploitation, different valuation approaches and techniques are required. There is not one-size-fits-all method for patent valuation. No best way that fits all possible uses of patents. The real challenge is to understand the objectives underlying the valuation – which will be different depending on the different settings – and then to choose and apply the right valuation approach and valuation technique. This is what the remaining chapters of the book are concerned with, first presenting the different valuation methods, and then discussing the main contexts in which they can be applied.

NOTES

1. Arora et al. (2001) provided selected webpages of major firms advertising the licensing of their own intellectual property (p. 434).
2. The doc file is freely available at http://www.microsoft.com/iplicensing/, retrieved in April 2009.

3. According to the author (2003:9) 'above returns were calculated by looking at the share price change relative to average sector and market movement'.
4. The reason for this has been already investigated in the previous paragraph.
5. IBM website. Available at http://www.ibm.com/ibm/licensing/technology/, retrieved in May 2009.
6. Yasuo Kawahara, general manager of Toshiba's Semiconductor Company, available at http://www.cxotoday.com/cxo/jsp/article.jsp, accessed June 2008.
7. See previous section for further explanation.
8. In this paper, it was assumed the innovations were drastic. This is equal to say that the first mover innovator will reap all the advantages from the introduction of the new technology by crowding potential rivals out of the market. The underlying standard assumption – that is common to this stream of literature about the strategic use of licensing – is the presence of a sole technology holder in the market.
9. 'Sandisk and Samsung Renew Patent Cross-license and Flash Supply Agreements', available at http://www.eetasia.com/ART_8800573970_499486_NT_a3aedc9c.HTM, retrieved in September 2010.
10. 'Zumtobel and Philips sign comprehensive cross-licensing agreement', available at https://www.ip.philips.com/articles/latestnews/2009/20090505Zumtobelagreement.html, retrieved in September 2010.
11. Sisvel's website. Available at http://www.sisvel.com/, retrieved in May 2009.
12. 'A victory for Blu-ray [which] would be sweet revenge for Sony, whose Betamax lost out in a similar duel in the early 1980s to Panasonic's VHS to set the standard for video cassettes', Kioskea.net, 'Blu-ray set to be DVD standard after Toshiba white flag', 18 February 2008. Available at http://en.kioskea.net/actualites/blu-ray-set-to-be-dvd-standard-after-toshiba-white-flag-10124-actualite.php3, retrieved in May 2009.
13. This type of contract is usually employed for International licensing agreement. The licensor transfers its technologies/know-how for labour-intensive product/processes to low-wage countries (Bidault, 2004).
14. IBM website. Available at http://www.ibm.com/ibm/licensing/technology/, retrieved in May 2009.
15. It can be also the least risky whenever the licensed patents have been used by the licensor before.
16. Some empirical studies have suggested that technological trajectories that firms pursue when licensing-in new technologies are closely related to their pre-existing technological background. Which means, in other words, that licensing is more suitable when firms have to acquire technologies that are new, but familiar (Roberts & Berry,1985). These findings recall the relevance to combine internal resources with external resources in a way which is as complementary as possible.
17. 'Icron Technologies: Licensing Program', available at http://www.icron.com/products/usb_new/design_license.php, retrieved in May 2009.

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PART II

Patent valuation methods

NEW HORIZONS IN INTELLECTUAL PROPERTY

The Economic Valuation of Patents

Methods and Applications

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Introduction

Federico Munari, Raffaele Oriani

BOOK OVERVIEW

In the knowledge-based economy, intellectual property rights – and patents in particular – lie at the very heart of firms' strategies for value creation. Academic studies from several domains – for example economics, management, finance and accounting – and managerial practice have extensively documented how patents are having an increasing prominence for firms' decision-making and performance. Patents do not play the only role of legal instruments any longer, but have rather become business tools which are strategically exploited by firms for profit and competitive advantage. The increase in the number of patents filed worldwide over the last two decades and the growth of markets for technologies convincingly confirm this trend.

In this context, however, the rigorous assessment of the economic value of patents and the identification of patent value drivers still represent key challenges for inventors, entrepreneurs, managers and external investors. Indeed, in spite of the growing awareness of the role of patents for innovation development and business success, the issue of patent valuation is still affected by several specific problems, linked to the lack of generally accepted methodologies for the valuation, the difficulties of understanding the potential commercial value of the underlying technologies, the high level of uncertainties characterizing the valuation and the need to involve a combination of economic, legal and technical considerations.

These problems make it hard to determine the value of specific patents and of entire patent portfolios and the overall contribution of patents to a firm value in the different stages of its lifecycle. These shortcomings are critical to several important decisions of managers and financial investors, such as patent portfolio management, patent sale or licensing, patent litigation and innovation financing. Addressing these issues would therefore be important both for practical evaluation problems within patent-related transactions or managerial decisions and for policy analysis