Licensing In The Context Of The Business Model: One Size Does Not Fit All

By Henry Chesbrough

In a world of open innovation,[1] every company needs to pay closer attention to its IP than it used to do. Protecting ideas is costly and time consuming, but it has become too important to innovation to neglect. For the same reasons, the management of licensing must also be revisited. Too often, licensing decisions are driven by a legal perspective, where prior precedents and licensing policies take on a life of their own. Instead, licensing decisions must be driven by the needs of the business model, which will vary over the technology life cycle of the IP in question.

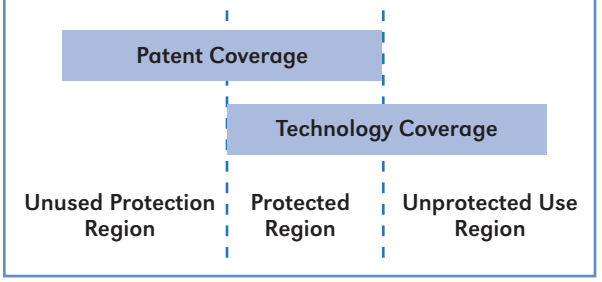
Protecting Individual Patents and Technologies

Choosing how to protect one's technology and ideas is a challenging and complex activity. There are many legal and economic considerations that must be taken into account.[2] While it is well known to legal experts, most business and licensing managers may not realize that patents do not directly protect technologies. Patents may cover aspects of a technology that are embodied in a product. But the technologies in the product, and those used to make the product, may not align entirely with a company's patent(s). For the sake of what follows, I am assuming that the patents in the analysis are valid. (In many patent infringement cases, however, the defense usually claims that the patents in question were wrongly granted, and therefore not valid. This complexity is ignored below.)

To illustrate what protection patents do and do not provide,[3] consider the series of figures, Figure 1 through Figure 3. Figure 1 shows a schematic representation of a technology, and its associated patent protection. The technology and the patent protection are drawn deliberately such that the practice of the technology, and the protection for that technology, are not entirely aligned.

There are three regions of interest in the figure. The middle region is the region where the two overlap. Uses of the technology in this area are protected by the patent(s) held by the firm. This is the conventional assumption made by most managers–that they can practice their technology safely, due to their patent protection. The second region on the right, though, is a region where the technology is practiced (that is, it is being applied to solve a real problem), but lacks any protection from patent(s) held by the firm. This is an unprotected region. Companies deploying a technology in this space are running a risk, that someone somewhere else might have a patent that covers (or "reads on", in industry parlance) that usage. The left-most region is also typically neglected by most managers. This is an area where the patent provides coverage, but where the technology is not currently practiced. This can be thought of as "unused protection" because the scope of the patent coverage extends beyond what the company is currently using. In contrast to the unprotected region, this is a region of latent potential value, because that coverage could support extensions of the technology in that area, or might provide licensing opportunities to other firms who might be operating in that space.

Figure 1: Evaluating Technology Alignment With Patent Coverage



1. Henry Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press: Boston, MA, 2003.

2. Carl Shapiro and Hal Varian's (1999) book, *Information Rules*, and the references in that book, are good places to start for the economic and legal aspects of protecting one's IP. Kevin Rivette and David Klein's (2000) book, *Rembrandts in the Attic*, provides an exuberant account of some of the management opportunities in underutilized IP. Another more balanced account of the management of IP can be found in Julie Davis and Suzanne Harrison's (2001) book, *Edison in the Boardroom*.

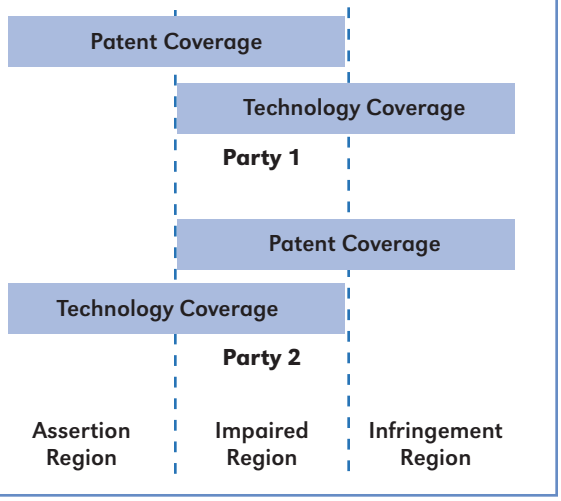
3. This analysis is offered to expose managers who ordinarily do not deal with IP to the issues and opportunities that IP offers. Readers should be aware, however, that this analysis is a simplification of reality. For example, the following analysis does not consider the complications created by the fact that most U.S. patents have multiple claims, not just one. Infringing on a single claim of a valid patent is sufficient to be legal infringement of the entire patent. In all of this, any important decisions should be taken only after consulting with legal counsel, because the many such details that I am glossing over here may prove critical in a litigation action.

Figure 2 introduces a second party into the analysis. That second party also has some patent coverage, and a region where its technology is useful. Like the first party, the alignment between the patent coverage and the usefulness of the technology is not complete. For ease of exposition, I have drawn the second party's position to be symmetrically opposite that of the first party. This makes the analysis much easier to explain, but each party's position is unlikely to be so symmetrical in practice.

The presence of the second party forces us to be more clear about what protection patents actually provide. A patent is a legal right to exclude others from practicing a technology when you own a patent that covers that technology. It does not actually grant you permission to practice the technology yourself. In order to have "freedom of action," you must be sure that no other companies' patents cover your technology.[4]

Figure 2 attempts to illustrate this situation. The middle region that formerly was Protected for Party 1 is now transformed. The presence of Party 2's patent(s) now make this region Impaired for Party 1. That is, Party 1 cannot simply practice its technology as before in this region, because Party 2 also holds valid patents that "read on" this area. Party 2 may have the ability to block Party 1 from using its technology here, or may choose instead to charge a fee for allowing Party 1 to use its own technology.

Figure 2: Complex Technology Alignment with Patent Coverage, when Two Parties Have Conflicting Claims



The right-hand region that formerly was Unprotected has now changed to an Infringing Region for Party 1. Party 1's practice in this region directly infringes Party 2's patent rights. Party 1 is vulnerable to Party 2's enforcement of those rights.

■ Henry Chesbrough, Executive Director, Walter A. Haas School of Business, University of California, Berkeley, California
E-mail: chesbrou@haas.berkeley.edu

The left-hand region that formerly was Unused Protection has now evolved into an Assertion Region for Party 1. That is, Party 1 has valid patent claims here that cover Party 2's practice of its technology. Here, Party 1 has the choice of how it wishes to assert its rights, and can charge a wide range of amounts to enforce those rights. However, the firm does not have to license. If it prefers, it can simply deny Party 2 the right to use its technology in this area (one example of this was Polaroid's victorious lawsuit over Kodak in the 1980s, in which Polaroid forced Kodak to exit the instant photography market).

The stage is set in Figure 2 for a grand bargain: Party 1 and Party 2 agree to cross-license each other, so that both can practice their respective technologies without having to fight patent infringement litigation with each other. This cross-licensing is a common practice in complex industries like semiconductors, where every company must utilize the technologies of many other companies to make their products.[5]

Now consider a slight modification to Figure 2, shown in Figure 3. Here, Party 2 has the same patent claims as in Figure 2, but in this case, Party 2 is not making any products, and is not practicing any technology. This subtle change dramatically alters the

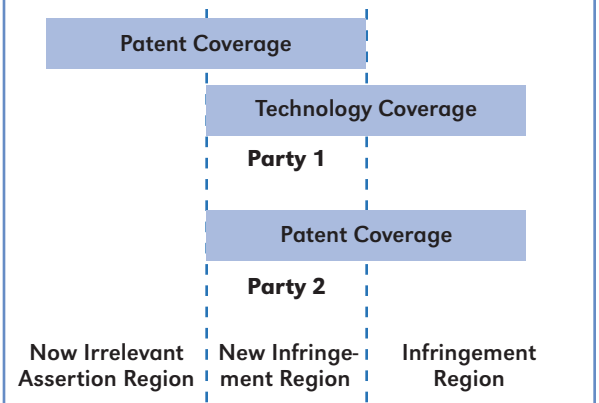
4. Economists distinguish between "simple" and "complex" technologies in terms of whether owning a patent gives you effective protection of your technology. Simple technologies are ones like in biotechnology, where your patent on a particular compound not only excludes anyone else from using that compound, but effectively lets you be the only one to develop it. Complex technologies like semiconductors, by contrast, involve hundreds or even thousands of patents held by dozens of companies. No one patent in this sector enables a company to practice the technology; instead, patent holders must secure access to all relevant patents in order to practice the technology, typically accomplished through extensive cross-licensing activities. *See* Douthwaite B.; Keatinge J.D.H.; Park J.R., 2001, "Why promising technologies fail: the neglected role of user innovation during adoption," *Research Policy*, Volume 30, Number 5, May 2001, pp. 819-836.

5. See Bronwyn Hall and Rosemarie Ham Ziedonis, 2001 "The patent paradox revisited," *Rand Journal of Economics*, vol. 32(1): 101-128. In that paper, they discuss their explanation for the rise in semiconductor patenting as a result of the strengthened patent courts, which in turn strengthened the need for more patents for defensive purposes.

circumstances. There can be no grand bargain here in Figure 3, because Party 2 is no longer at risk for losing the ability to practice its technology. It is a "pure play" IP company whose business model focuses exclusively upon IP, and nothing else. Examples of such "pure play" IP firms include ARM or Rambus in the semiconductor industry, NTP in the recent litigation over Research in Motion's Blackberry, or Dolby Stereo in the consumer electronics and entertainment industry. They also include the so-called patent trolls.[6]

The pure play IP business model does not value a cross-license, it wants cash compensation instead. In Figure 3, this is shown in two ways. First, the Infringement Region for Party 1 expands to include the middle region. And second, the previous Assertion Region for Party 1 is now irrelevant, because Party 2 is not practicing any technology covered by Party 1's IP. This is a far more dangerous business model to confront for Party 1, because its earlier ability to barter access to others' IP with its own IP is no longer effective. Correspondingly, this business model potentially increases the economic value of Party 2's IP, by removing any commercial activities that could be held hostage (assuming that there was some risk of infringement from those activities) in a negotiation with Party 1.

Figure 3: Complex Technology Alignment With Patent Coverage, When Second Party Holds IP, But Does Not Practice Technology



6. Michael Kayat and Tova Greenberg credit Peter Detkin, formerly of Intel and now at Intellectual Ventures, for coining the phrase "patent troll," see their article "IP-based open innovation pre-empts trolls," *Intellectual Asset Management:* 43, February/March, 2006.

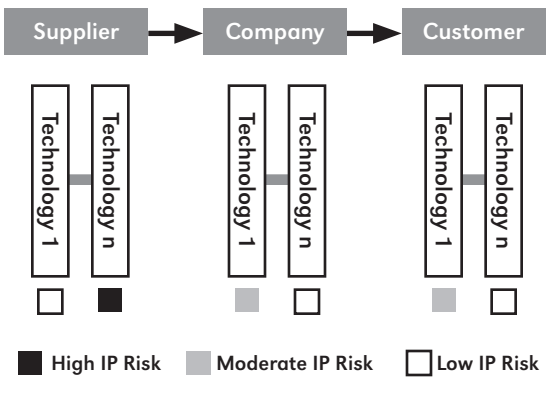
Mapping Your Situation

How does a manager know what his or her situation is, with regard to these different regions? The basic tool used to assess these questions is called "patent mapping." This mapping examines all of the granted claims of an issued patent, and considers where they might apply. It then examines other patents from other patent holders, to see where their claims might apply. This is an expensive exercise, and the resulting analysis is not nearly as neat and precise as what is shown in Figures 4, 5, and 6. It has become increasingly essential, though, in creating and managing business models in many different industries.

The above analysis looked at one technology in isolation. A more realistic analysis, and one that is increasingly common in many companies, is to map the entire value chain for a company. At a minimum, such maps would examine the company, its direct competitors, and then include the company's suppliers and the company's customers (and often their respective direct competitors as well). Fig. 4 provides a simplified illustration of such a patent map.

In essence, Fig. 4 shows where companies are protected or exposed in different parts of the value chain. The analysis above of potential patent infringement of a technology being practiced would be performed at each node of the value chain in Figure 4. For simplicity and ease of communication, companies will often use black, gray and white (or, equivalently, red, yellow, and green colors) to indicate the level of exposure that a company faces at each stage of the value chain. Black areas in the value chain indicate areas where the continued practice of the technology is at risk of infringing

Figure 4: A Patent Map Of The Value Chain



one or more patent claims of another company. Gray areas indicate areas of caution, where there may be some risks or challenges. White areas indicate areas of freedom, where the company can continue to operate with little or no risk to its business. In Fig. 4 above, the company itself faces a moderate risk on one technology (Technology 1) and a low risk on another technology (Technology n). And its customers and distribution channels face a similar level of risk. However, there is a serious IP risk in the company's supply chain, as shown by the black square for Technology n. If the supplier is challenged on this technology, the supplier may not be able to continue its supply of that item.

Figure 5 shows a greatly simplified map of a value chain in the semiconductor industry. As this figure shows, the usual processes of chip design and chip manufacturing are now preceded by steps in which the requisite intellectual property for those two activities must be accessed. Because they are largely intangible, these IP-intensive steps are shown as clouds, rather than as traditional process steps in a value chain. In a firm such as Intel, where chip design and manufacturing are often vertically integrated, this IP may reside inside the firm. For most companies in the semiconductor industry, however, the functions of design, manufacturing, and assembly/test have been separated, and markets for the necessary IP preceding these functions have emerged.

The clear message of Figures 4 and 5 is that firms should not only think about their IP situation in their own business, but also consider IP risks in other portions of the value chain.

Patent maps are snapshots of a company's situation at a single point in time. These pro-active approaches become even more interesting in a dynamic context.

The Dynamics of IP Management: Linking IP to the Technology Life Cycle

The proper management of IP should vary over the stage of the relevant technology in the technology life cycle (TLC) underlying that IP. Currently, most companies use a "one size fits all" approach to managing IP, effectively ignoring the underlying technology life cycles. IP management should align with the stage of the technology in question, and help shape the subsequent stages of that technology's development.

The technology life cycle is one of the most fundamental aspects of managing technology. The idea goes back to the seminal research of William Abernathy of Harvard Business School, and James Utterback of MIT, and has been widely embraced by other scholars since.[7] This line of research has shown the technology does not simply develop at a single, straightforward pace. Instead, there is an initial period where a wide variety of technologies vie for acceptance in the market, a later period where the winning or "dominant design" technology establishes itself in the market, a third period where the technology matures, and a final period in which it becomes obsolete.

The notion of technology life cycles can be well explained with a simple "S curve" (or logistic curve, as it is sometimes called). In Figure 6, the performance of a technology is graphed on the Y-axis, while the X-axis shows the time since the technology first appeared. Four distinct stages in the technology's evolution may be observed.

7. *See* William Abernathy and James Utterback "Patterns of Industrial Innovation," *Technology Review*, June/July, 1978, for the pioneering work in this area. They show that technological competition goes through a predictable cycle. First, very different technologies compete in the market, until a dominant design emerges within the market. At that point, there is a marked phase shift, and competition moves to competition within the dominant design, as those designs that did not win fade from the market. Competition within the dominant design means that the basic parameters of the technology have been established, and now companies must compete on process technologies to achieve success.

Figure 5: IP In The Semiconductor Value Chain: Its Growing Role

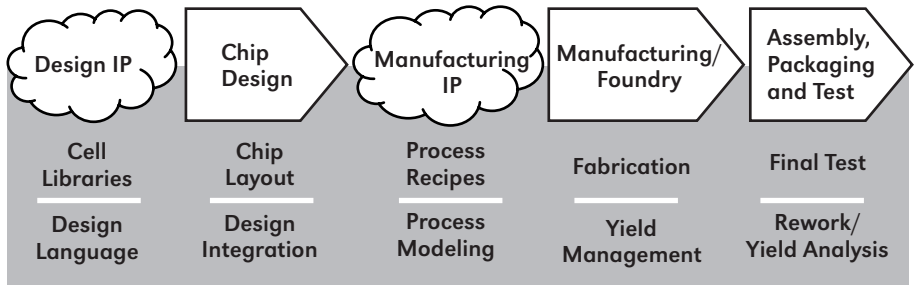
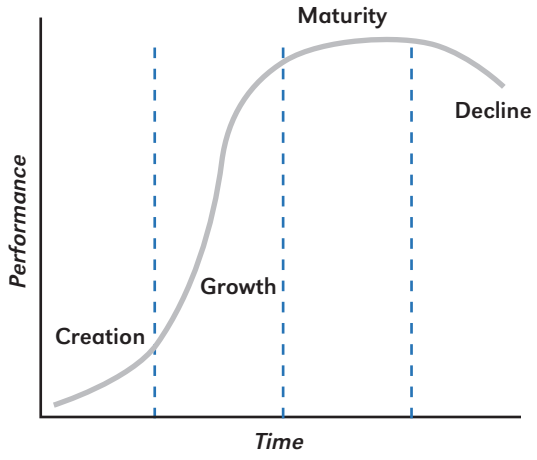


Figure 6: Stages In The Technology Lifecycle



In the first stage, the technology is just beginning to emerge. Its rate of improvement is modest at best, and it takes some amount of time to eke out even this modest performance advance. This stage comes prior to the emergence of a dominant design, so there are a wide variety of potential technologies. In automobiles, for example, there was a time in the very early 1900s when gasoline engines vied with steam and electrical engines to be the dominant powerplant for motor vehicles.

The second phase is the growth phase, and this is where technologies "catch fire," and grow explosively in performance. In the terms of academic scholars, the "dominant design" of the technology has taken root, causing the industry to focus its innovative efforts on how to advance the technology within the dominant design. To stick with the automotive example, the gasoline engine has now become the accepted design for the power plant of the car, and now innovations focus on how to increase the horsepower of the engine. Henry Ford's Model T, and the later Model A, are examples of products in this phase. Customers now find the technology to be a powerful solution for at least one pressing problem they face, and begin to incorporate the technology into portions of their business. The market now takes off, generating very rapid growth in units and in revenues.

The third phase of the curve is the mature phase, where the market growth slows down, and the industry reaches its maximum levels of revenue for the technology. At this stage, the technology is well understood, the leading players are well established, and there is little or no entry by new firms into the industry. The technology itself begins to subdivide, creating new niches of opportunity for novel applications of the technology, and geographic penetration is now widespread throughout the globe. Within the auto industry, this might correspond to Alfred Sloan's segmentation of the auto market into different categories of vehicles and price points. More recently, the rise of sport utility vehicle (SUV) and minivan categories could be seen as outcomes of a mature phase of the industry. Customers now show real interest, as the technologies are now proven and reliable, and customers are able to innovate themselves by creating new ways of applying the technology to their business problems.

The fourth phase is the declining phase of the technology. In this phase, the technology's rate of performance improvement reaches a plateau. Often, a newer technology has arisen to take the place of the earlier technology, substituting for the functions performed by the earlier technology. While autos continue to grow and advance, albeit slowly, there are examples of declining technologies within the industry. One such decline was clearly seen in the response of U.S. tire manufacturers to the advent of radial tires coming into the industry from Europe. Relative to the performance offered by radials, bias ply tires simply couldn't advance much further, and eventually conceded the entire market to the newer belt technology.[8]

This view of a technology life cycle is necessarily a simplification of the complexities of technological evolution. But the model shows some important features that will be important for the analysis of crafting business models and managing IP. One important feature is the necessary emergence of a dominant design, in order to spur the growth of the technology in the market. Another important feature is that technological performance is of critical importance early on, while quality, volume, and cost become more critical to success later on. A third important feature is the high number of newly entering firms in the first two stages, and the lack of such entry in the final phases.

8. See Donald Sull's fascinating research, "The Dynamics of Standing Still: Firestone Tire & Rubber and the Radial Revolution," *Business History Review*, 1999:430-464, for an engaging yet scholarly account of how U.S. tire manufacturers responded to the threat posed by the new and superior radial tire technology offered by Michelin and others. His research finds that while the U.S. manufacturers tried many maneuvers to fend off the threat, they failed to make the critical and necessary investments to adopt the technology until very, very late in the game.

Perhaps the overarching implication, though, is that one cannot manage technology in the same way throughout each of the phases of the cycle. The key success factors for the technology in one phase are NOT the key factors in a different phase. Instead of using a "one size fits all" model of technology management, one instead must adapt one's management of technology to the phase of the cycle in which one competes.

The IP Life Cycle Model

The very same logic of avoiding "one size fits all" needs to be applied to business models and the management of intellectual property as well. Just as one does not manage technology in the same way in each phase of the technology life cycle, so too one ought not to manage IP covering that technology the same way throughout its legal life. As with the management of technology, the management of IP ought to be tailored to the phase of the technology life cycle which the IP covers. I call this tailored approach the IP Life Cycle Model.

- In the initial stages of a new technology, companies must invest in creating IP, and choose the best method to protect that IP. That choice will depend on the role that the new technology might play in the company's business model.
- In the next phase, the company will deploy the technology and go to market. Options to take the technology to market include partnering to access distinctive capabilities required to complete the offering, and accessing necessary complementary assets to support the offering.
- In the third phase, the company will consider how to harvest the fruits of the technology. While this certainly includes using the technology within its own business, the possibilities extend well beyond the company to include competitors, customers, suppliers, and third parties in other markets. There are both revenue and profit opportunities that promote external licensing or spinouts in many cases, as well as strategic considerations that might limit the outside licensing of the technology in other cases.
- In the final phase, the company will manage the exit from the technology. This might be forced by the expiration of legal protection for the IP (note that while patents and copyrights expire, trade secrets do not). Or the exit might also be motivated by the introduction of a new, improved technology that replaces the earlier technology. In these cases, the legal protection for the IP may extend well beyond its value in use within the original business model. However, the IP may remain quite valuable to another company's business model in another use.

Managing Across Phases of the Technology Life Cycle: Windows in China

With the IP Life Cycle Model, the prevailing conception of managing intellectual property with a "one size fits all" mentality will be swept aside. In its place, a more nuanced, dynamic, and strategically focused approach will arise, causing firms to search actively for unrealized business opportunities latent within their knowledge base, even as they manage risks that emerge to their current businesses. While I have illustrated examples of differing IP management strategies within each phase of the TLC above, much of the power of this approach comes from looking across phases of the cycle.

In the earliest phase of the technology, it pays to be very open. Neither you nor others know yet the best use of a particular technology, and no one has an appropriate business model to commercialize any applications either. As the dominant design emerges, tightening the protection for one's ideas becomes very important. In the mature phase, IP management must become more differentiated and segmented, to support different applications of the technology in different uses. In the decline phase, firms can now aggressively harvest the fruits of their earlier investments in IP protection.

To see the benefit of this approach across phases of the TLC, consider the problem Microsoft is facing with pirated copies of Windows in China. In the U.S. and Europe, Windows has become the dominant PC operating system, and growth in those regions now is quite flat–placing it squarely in the mature phase of the technology life cycle. In China, however, matters are quite different. The rising economic prosperity of the country has created a recent boom in the number of PCs selling in the country, so that in this region, the technology life cycle is transitioning from Emerging to Growth.

"One size fits all" thinking would suggest that Microsoft should seek to employ the same protections against software piracy in China that it uses in the U.S. This would mean that the company (perhaps in concert with other prominent software companies) should vigorously police the use of its software, and undertake prompt legal action against any and all illegal use, wherever in the world such illegal activities are found.

A more nuanced view of where Windows falls in the TLC suggests a dramatically different approach.

In the U.S., Microsoft has won the battle for the desktop. Its Windows operating system enjoys a market share in excess of 90 percent.[9] Even the rival operating system of Linux, from the open source community, poses little real threat to Microsoft's position on the desktop.

In China, however, the battle for the desktop is still very much in progress. While Microsoft is in the lead, Linux is making a strong challenge. In fact, the Linux community has signed a deal with the Chinese government to make Linux the default operating system for computers in the Chinese government, and many parts of the Chinese educational system.

In this context, applying Western IP enforcement policies to stem the flood of illegal copies of Windows in China risks winning the battle (to deter and punish IP infringement) while losing the war (to become the dominant standard on the desktop). So long as Linux remains a serious rival for the desktop operating system of choice in China, Microsoft should actually welcome pirated copies of its software. Illegal copies of Windows are free, which helps Microsoft offset the initial cost advantage of "free" open source software. Every copy installed on a Chinese computer that is used by one or more Chinese citizens brings one more person into the Microsoft ecosystem. This strengthens Microsoft's market for third party developers of applications, tools and other complementary products (some of which are made by Microsoft itself, so that Microsoft can make money on pirated versions of Windows through these other products). More importantly, it denies Linux that next new customer that would similarly strengthen its ecosystem against Windows.

If Microsoft succeeds in discouraging piracy of Windows in China at the present time, it is far more likely to drive the user of the pirated software into the Linux camp than it is to drive them into the legion of paid-up users of Windows in China. So long as Linux remains a strategic threat to Windows, this is the exact opposite of what Microsoft's IP management should be trying to accomplish. Microsoft's IP management strategy in China should be focused on securing the victory of Windows on the desktops of all PCs in China. That may require deliberately lax enforcement efforts against pirated copies of Windows for the short and medium term.[10] Only after the Linux threat has been seen off does Microsoft have the luxury of then tightening up the protection of Windows against piracy, as it is now doing in the West.

So Microsoft would be well advised to take a very different approach to managing its IP around Windows in the earlier phase of the TLC in China, when compared to its approach to protecting its IP around Windows in the U.S. This suggests that IP management must be driven first and foremost by the business objectives of the company, and not by a legal perspective.

A legal perspective might well be, for example, that lax enforcement of IP in one region sets a bad precedent for IP enforcement in other regions. Another legal view might be to pick an especially egregious case of piracy of Windows in China to set an example for others who might seek to copy Windows illegally themselves. These are worthy points to consider, but are subordinate to the strategic objective of establishing the market position of the default standard operating system in China. Unless the legal team is included in all of the key business and strategic decision making for Windows in China, the legal specialists, doing their job as best as they know how, might inadvertently sabotage the overall strategy.

Summing Up

Patents allow you to exclude others from practicing a technology that is covered by your patent. It may not, however, allow you to practice your own technology, if someone else holds patents that also read on your approach. This subtle distinction gives rise to a variety of circumstances that the firm must manage as it creates and manages a business model to profit from a technology. In some cases, the firm can achieve freedom of action by cross-licensing. In other cases, though, the owners of other patents may employ business models that make cross-licensing unattractive to them. In this latter instance, cross-licensing will not provide any protection to the business model.

Patent mapping can help identify the risks, and

9. *See en.wikipedia.org/wiki/Microsoft*, last accessed May 12, 2006.

10. And there are hints that Microsoft may be doing just that. Microsoft co-founder and Chairman Bill Gates made the following observation in an unguarded moment in 1998:

"Although about 3 million computers get sold every year in China, people don't pay for the software. Someday they will, though," Gates told an audience at the University of Washington. "And as long as they're going to steal it, we want them to steal ours. They'll get sort of addicted, and then we'll somehow figure out how to collect sometime in the next decade." (Source: C. Pillar, "How Piracy Opens Doors for Windows," *Los Angeles Times,* April 9, 2006: C1).

the opportunities, that exist in the value chains in which your business model operates. Hazardous areas can be proactively flagged for specific attention. Here is where you can take steps to protect yourself against the trolls that we discussed in the previous chapter. Areas of opportunity may help direct the entry into related products and services that benefit from the IP portfolio of the firm, or enhance relationships with suppliers and customers, or generate new revenue streams.

Managing IP requires a phased approach that corresponds to the technology life cycle of the industry. Effective management will vary by the phase in this cycle, instead of a "one size fits all" approach. And a truly dynamic approach will harness the management of IP to the larger business strategy objectives, whether those objectives are operating in the U.S., or around the globe. ■