

Strategic Management of Intellectual Property:

AN INTEGRATED APPROACH

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In many organizations, the R&D, strategy, and legal functions are poorly integrated. As a consequence, firms miss opportunities to create and exploit the value of intellectual property. Functional silos are one reason for the lack of integration. More important, however, is the lack of a common framework and even language that would allow engineers, lawyers, and business executives to manage IP assets better. This article provides such a framework. There is no one best way to manage IP and many managers overestimate the attractiveness of using IP to exert market power. Rather, the value of the various means to protect and benefit from IP depends on firm strategy, the competitive landscape, and the rapidly changing contours of intellectual property law. (Keywords: Intellectual Property, Innovation Management, Strategic Management, Knowledge Management, Legal Aspects of Business, Licensing)

When Pfizer acquired Pharmacia for \$60 billion in 2003, the company booked \$31 billion in acquired intellectual property (IP) rights. Across a broad range of industries and geographies, IP rights now constitute a significant fraction of enterprise value. Yet, in a recent survey of executives who manage IP portfolios, the respondents indicated that only one half of corporate leaders “understand the value and importance of IP and are actively involved in strategic planning related to IP.”¹ In our experience, this limited integration of IP management and strategic planning reflects a number of obstacles. In many companies, the responsibility for IP management is delegated to legal staff, who tend to be little involved in strategic planning and decision making. In addition, functional silos within management often impede a more strategic view of IP. The separation of IP management and strategy formulation in turn mirrors the common view that managing IP portfolios, while technically challenging, bears

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few strategic consequences. Having developed new products or services, a simple prescription reads, companies ought to obtain patent or copyright protection for them in the hopes of closing markets to competing firms and raising prices. Viewed in this way, effective IP management affords little room for strategic decision making and can easily be delegated to lower levels in the corporate hierarchy. Even in companies that perceive the need for

an integrated approach to managing IP and setting strategy, the dialog between engineers, lawyers, and business executives is often difficult. The specialists lack a common framework and even a language to develop an approach to IP that is broad in its outlook and integrated with the firm's strategy. This article offers such a framework. We provide a set of guidelines that help managers and lawyers better navigate the complex landscape of strategy and IP.

The device that we use to present our framework is a map. The heart of the map is set forth in the Appendix. A much larger version of the map, which contains many additional case studies and considerable substantive information, is available through the following website: <http://cyber.law.harvard.edu/people/ffisher/IP/Strategic_Management.htm>. The choices for companies that currently have or might obtain intellectual property rights are listed on the left side of the map. The options for firms that currently lack intellectual property rights, but are considering entering lines of business that may run afoul of rights held by others, are listed on the right. With the help of the map, we seek to advance and defend the following theses.

First, a firm holding an intellectual property right can and should choose among five main ways of extracting value from it. All too often, the managers of a firm holding an IP right assume that the best way of using it is to suppress competition—in other words, to prevent potential rivals from offering customers an identical or similar product or service.² The resultant market power, it is commonly thought, will enable the firm to raise the prices it charges for its own products or services and thus increase its profits.³ Although this is indeed a potential strategy, it is by no means the only option available. In fact, in our experience many managers overestimate the desirability of this option. As the first tier of boxes on the left side of the map indicates, the firm should also consider: selling (i.e., assigning) the IP right to another enterprise in whose hands it would be more valuable; licensing the right, perhaps even to competitors; using the right as a vehicle to organize profit-enhancing collaborations with competitors, suppliers, customers, or the developers of complements; and, least obviously, even giving the right away.

Similarly, the managers of a firm considering entering a line of business that may implicate IP rights held by other firms too often assume that their best (or only) course of action is to challenge the validity or scope of those rights through litigation. Again, although this is indeed a possible and sometimes attractive strategy, it is not the only option. Others, indicated on the right side of the chart, include: developing an alternative, non-infringing technology; securing a license from the holder of the IP right; building a portfolio of IP rights sufficiently substantial and credible to deter litigation; and, least obviously, deploying a potentially infringing product or service

so widely and rapidly that, by the time it is challenged through litigation, the firm can either persuade the IP holders to grant them licenses or, better yet, can persuade a judge or jury to declare it to be lawful.

No one of these strategies is optimal under all circumstances. Which is best varies by context. Not surprisingly, choosing among them requires weighing their relative costs and benefits—both short term and long term. All too often, however, managers called upon to make such assessments fail to appreciate the high degree to which those costs and benefits are influenced by the details of the laws governing patents, copyrights, trademarks, and trade secrets.

Our final thesis flows naturally from the previous one. Wise strategic decisions arise out of consultation among managers, lawyers, and the creators of new products and services.⁴ Conversations among managers and creators are, of course, already common. Too frequently, however, lawyers are brought into the mix much too late. The product or service has been designed, a tentative marketing plan is in place, and the lawyers are then asked: May we do this? With distressing frequency, the lawyers (most of whom are temperamentally risk averse) answer: No. This sequence is, at a minimum, wasteful. If managers and lawyers engaged earlier with one another, products and services could be designed in a way that reflects not just market demand, but also the legal opportunities to exploit the resultant IP.⁵ To facilitate this collaboration, managers need a keener sense of the legal opportunities and constraints, and lawyers must become more aware of the strategic considerations that arise out of their specialized body of knowledge. Everyone, in short, must learn a new language—and must speak it more often.⁶

Stated thus broadly, these theses may seem banal. Their force becomes apparent, however, through the examination of case studies (given as grey boxes in the map) that illustrate the conditions under which a given path does or does not make sense. The online version of the map contains a wealth of additional case materials that can help illustrate the costs and benefits of specific avenues to capture value from IP.

Offense

Using IP protection to prevent imitation and exercise market power is the most common approach to thinking about IP.

Exercising Market Power

Choosing Among the Potential Sources of Market Power

The first strategic decision confronted by firms that develop new products or services is which form of IP protection they should seek.⁷ Patents, copyright, trademarks, and trade secrets have different advantages and drawbacks. Sometimes the choice among them is clear. For example, a firm that has synthesized (or purified from naturally occurring substances) a new drug should strive, if possible, to obtain a product patent on it. A film studio that produces a movie should be sure to register a copyright in the audiovisual work.⁸ In these cases, the cost of seeking protection will typically be smaller than the discounted value of market power, making the choice simple.

In other situations, however, the best option will not be so obvious.⁹ For example, a firm that develops a consumer product whose structure or composition is not apparent has the option of either: keeping its composition secret and relying on trade-secret law to reinforce the precautions the firm takes against industrial espionage; or seeking a patent on the product itself or the process by which it is made. Each approach has distinct advantages and costs.¹⁰ Five considerations appear to be particularly important. First, trade-secret protection is potentially infinite in duration (and indeed, Coca-Cola seems to have kept its formula secret for over a century¹¹), whereas a patent lasts only for 20 years from the date the patent application is filed. Second, maintenance of trade-secret protection will require the firm to impose confidentiality obligations on its employees whose aggregate costs may well exceed the costs of obtaining a patent.¹² Third, licensing the use of a trade secret is logistically more difficult than licensing the use of a patent because the latter poses a smaller risk that the innovation will be inadvertently released into the wild. A fourth consideration is of particular importance for entrepreneurial firms that seek external finance. Through disclosure, patents help to signal credibly the quality of the venture to potential investors. There is strong empirical evidence to suggest that patents help improve the terms of external finance available to entrepreneurs.¹³ Finally, the choice between trade-secret protection and patents also hinges on the strength of property rights. Because patenting involves the (partial) disclosure of information, the likelihood of rival firms imitating a patented product increases if property rights are weak and the innovation is particularly valuable. As a consequence, it can be optimal to patent little ideas but keep the most promising innovations secret.¹⁴

Weighing the choice between secrets and patents intelligently is only possible if one is familiar, not merely with the technology (e.g., its susceptibility to reverse engineering, which is a permissible way for competitors to ferret out a trade secret), but also with how the rules pertaining to each type of protection are interpreted in the country or state in which protection is sought. For example, much will hinge on the stringency of the “nonobviousness” (a.k.a. “inventive step”) requirement for patent protection¹⁵ and the degree to which trade-secret law restricts the ability of employees to move laterally between firms and then make use of knowledge acquired in their former job.¹⁶

Whether to keep IP secret is one important consideration in choosing between the four potential sources of market power shown in the map. The choice between patents and copyright is another. Consider, for instance, the case of software. All member countries of the World Trade Organization are now obliged to extend copyright protection to computer software.¹⁷ Although they are not required to extend patent protection, many do so. Software firms doing business in countries where both forms of protection are available can, if they wish, rely on both copyright and patent law to shield innovative programs. Should they? At first glance, the answer would seem to be no. Patents are both more expensive and harder to obtain than copyrights. Why pursue a patent if copyright protection is readily available? In part, the choice depends on the nature of the imitation managers would like to prevent. If the activity consists of verbatim replication of the object code in which the program is embodied, patents offer few advantages over copyrights.¹⁸ By contrast, if the activity

the firm anticipates and wishes to block is the development of another program that performs the same function in a similar way without using any of the same code, then obtaining a patent *might* be worth it, because on this axis copyright protection tends to be weaker than patent protection.¹⁹

To decide whether the potential advantages of a patent justify its costs, managers and lawyers will also want to take into account the detailed rules that govern IP cases in their jurisdiction. Specifically, they will consider: how courts determine whether two programs are “substantially similar” for the purposes of copyright law; how courts decide whether one program infringes the patent of another (either under the doctrine of literal infringement or under the doctrine of equivalents); and whether, when applying for a patent, the firm would be obliged to reveal the source code for the program, thereby ironically facilitating the development of competitive products.²⁰ As in the case of trade secrets, the nature of the available protection and nuances in the law will often tip the balance in favor of one of the four potential sources of market power.

The Cost of Exercising Market Power

Companies that employ IP protection to exercise market power typically hope to raise prices above their competitive level, thereby increasing profitability. In many circumstances, IP holders also rely on market power in order to price discriminate among customers. This broad ambition can have serious strategic drawbacks. Our discussion focuses on three mechanisms that can turn exclusive rights into a liability for the innovative firm: changes in the nature of competition, rivals’ increased incentives for innovation, and smaller markets for complements. When present, each of these three mechanisms can raise the attractiveness of sharing IP with rival companies through licensing, collaborating, or even donating IP.

IP rights grant exclusive market opportunities, but the value of these opportunities often depends on the strategic actions of rival firms. Their response is important because they often have the ability to influence the overall value of a market. For example, if a firm terminates a joint marketing campaign because its competitor secured an important patent, the market share of the competitor might increase but the overall value of the market can decline. This mechanism is quite general. To the extent that investments in the value of a market represent a public good—the company that makes the investment bears its full cost, but the returns to the investment spill over to other firms—companies with a larger market share have stronger incentives to contribute to the public good. Consider a campaign to educate consumers about the benefits of electric cars. A Nissan advertisement for its Leaf model benefits the company, of course, but it also educates consumers about the advantages of electric vehicles more generally, benefitting rival producers such as Chevrolet and Tesla. The larger Nissan’s expected share of the market, the stronger are its incentives to invest in consumer education, but the weaker are the incentives of Chevrolet and Tesla. In settings such as this one, exercising significant market power with the help of strong IP rights can undermine the value of the market as a whole, which in turn hurts the dominant firm as well as the subordinate firms. The history of the at-home teeth-whitening industry provides an interesting illustration.²¹

Procter & Gamble Company (P&G) revolutionized the at-home market when it introduced Crest Whitestrips in 2000, offering consumers a far less expensive method to whiten their teeth. P&G patented the strips, an adhesive material that guaranteed the whitening agent would remain in contact with the teeth for an extended period of time. The cleverly designed patenting strategy made it close to impossible to invent around P&G's product. Because the new product shed a favorable light on the Crest brand more generally, P&G gained market share broadly across its oral care products. Colgate-Palmolive Company, desperate to stem the adverse trend, eventually launched a largely ineffective product at a low price, expecting to undermine the profitability of the at-home category and curtail the umbrella-branding effect from which Crest benefitted. The ensuing competition led to a steep decline in prices from which the market never recovered. Back-of-the-envelope calculations show that a less aggressive exploitation of P&G's patent would likely have served the company better. For instance, had P&G licensed Whitestrips to Colgate—a decision that is arguably legal because the patent made effective competition very unlikely²²—stable prices could easily have improved the bottom line of both P&G and Colgate.

As the example shows, the desirability of exploiting a monopolistic position hinges on rival firms' incentive and ability to influence the overall value of the market. With few spillovers to other market segments and a limited ability to influence demand or the IP holder's cost, rivals may not care much about a market with high barriers to entry. If any one of these conditions is violated, however, exploring avenues of collaboration may well be in the interest of the rights-holder. At a minimum, the ubiquity of joint marketing agreements and other forms of collaboration suggests that the gains from cooperation can be substantial.

A second mechanism by which an exercise of market power can undermine the longer-term profitability of the innovative firm is by increasing rivals' incentive to innovate. As the flow of profits to an innovative company increases, so do the incentives of other companies to "invent around" the innovator's IP. As a result, it can be desirable for an innovator to license its patented product, making the market more competitive but reducing the incentives for entrants to engage in R&D.²³ A classic example of this strategy is the decision by Standard Oil and Farben, two leading companies in the synthetic oil and rubber markets during the 1940s, to license broadly their process technology in an attempt to discourage independent research.

Similar considerations apply when companies lobby for changes in patent protection. At first blush it would seem that extending the life of patents is always in the interest of patent holders. While this may be true for marginal extensions that have a limited impact on rivals' incentive to invest in R&D, more significant changes in patent duration increase the incentives of competitors to invent around existing patents. As a result, innovative companies ironically might be better off with a shorter patent life.²⁴

The value of many products and services depends heavily on "network effects." Such effects are conventionally divided into two subcategories. *Direct network effects* exist if the value of a product increases with the number of users. Consider social networks such as Facebook: As the number of individuals using Facebook grows, joining the site becomes more attractive. *Indirect network effects* similarly

enhance the value of a product. As the number of users grows, a greater number of complements becomes available. A complement is a product or service that increases the demand for another product or service. Indirect network effects are critical for products such as gaming consoles. Consider the Sony PlayStation as an example. Developers will produce a larger number of games for this specific console if more people own it. In this example, games are a complement to the console. The value of owning a PlayStation also increases if these games become less expensive, thereby increasing the number of games that a console owner can purchase.

A distressingly common mistake made by firms holding strong IP rights is to leverage the resultant market power in ways that neglect opportunities for network effects—or, worse yet, enable competitors to capitalize on network effects. The history of Apple Inc. illustrates this hazard—and the catastrophic results it can generate. In the late 1980s, Apple was the most profitable company in the personal-computer business. Apple offered consumers a superior graphical user interface, plug-and-play performance, and stylish design.²⁵ The company's products were protected by patents and copyrights,²⁶ allowing Apple to raise prices and earn generous profits. However, those profits came at a significant long-term cost. While Apple's market share remained small, the producers of IBM compatible machines fiercely competed for customers, driving down prices, increasing sales, and soon establishing Wintel as the dominant standard.²⁷ Buying a Wintel machine allowed consumers to share documents seamlessly with many others—an instance of direct network effects—and IBM compatibles offered a far more varied and attractive set of software—an example of indirect network effects. By 2003, Apple's worldwide market share stood at 1.9%, and many analysts expected the company to go out of business.²⁸

IP rights again played a critical role in saving Apple. In 2001, the company brought to market the iPod, an innovative portable player of digital music files. In this instance, Apple stood to benefit from weakening IP rights for the iPod's most important complement—recorded music. With the advent of file-sharing in the early 2000s, many customers began to share music files illegally, reducing the effective price for music close to zero.²⁹ By 2006, an estimated 60% of Internet traffic was due to the transfer of copyrighted materials for which the owner of the copyright did not receive compensation.³⁰ Lower prices for content were bad news for the entertainment industry. However, Apple produced a complement to recorded music, the iPod. In the presence of free content, consumers were willing to pay a premium for the device. By some estimates, piracy increased Apple's iPod sales by 20%.³¹

While network effects and the role of complementary products and services are particularly strong in the computer and communications industries, there are many segments in the economy that benefit from the presence of complements. Consider the nascent electric car industry (where charging stations are an important complement) or medical devices and prescription drugs. In all these industries, market power due to IP rights should be exercised cautiously.

In the previous paragraphs we discussed the longer-term strategic cost that can arise when firms use IP rights to exercise market power. The mechanisms that can turn exclusive rights into a liability for the innovative firm include changes in the nature of competition, rivals' increased incentives for innovation, and the weakening of markets for complements and network effects. In our experience, managers

who overlook these potentially serious drawbacks often exhibit a mindset that is exclusively focused on value capture, the share of industry rents that goes to their firm. However, value capture alone is a poor guide to strategic decision making. It overlooks the often more important opportunities for value creation—business transactions rarely need to be zero-sum—and it fails to see how aggressive moves to capture value change the incentives of rival firms, suppliers, and customers—often to the detriment of the company. For these reasons, sharing value from IP can be attractive.³²

Selling

In its intended consequences, the sale of IP is no different from the sale of other assets. Selling is advantageous for the firm and society if the assets are more valuable in the hands of the new owner.³³ With respect to IP, this will be the case if the innovator lacks the manufacturing or marketing capacities to exploit the asset fully. The process of selling IP, however, is often fraught with difficulty, both because the potential buyer will have limited information about the value of an innovation, and because the seller, concerned about misappropriation, will have limited incentives to disclose his or her idea fully. As Kenneth Arrow famously pointed out, it is challenging to sell innovative products and services in the presence of buyer uncertainty and incomplete property rights.³⁴

Companies can benefit from the sale of intellectual property if they address these two obstacles. For instance, in a strategy sometimes called “block to fence,” firms acquire a large number of patents not only for their core innovation, but also for related processes and substitute products, hoping to drive up the cost of “inventing around.”³⁵ As the cost of imitation rises, the innovative firm can more easily disclose information, thereby reducing buyer uncertainty. Similarly, there are various ways to send signals about the value of the innovation to potential buyers. For example, companies can fully disclose the novel product to a single buyer, threatening to sell the idea to others should the buyer attempt to misappropriate the innovation.³⁶ In this setting, the threat to destroy monopoly profits serves as the mechanism to enforce weak property rights. Companies can also partially disclose valuable IP and offer to retain some “skin in the game,” for instance by accepting the buyer’s stock options as a form of compensation. Because the unobserved value of the innovation influences the cost of partial disclosure and the cost of keeping “skin in the game,” the chosen combination of disclosure and “skin” allows buyers to infer the value of the idea.³⁷

While techniques such as “block to fence” and partial disclosure facilitate the sale of valuable IP, they remain costly to the seller. In view of the substantial transaction costs of selling IP, there is a role for specialized intermediaries that serve as market makers. These include live auctions, online platforms, “non-practicing entities,” and IP brokers.³⁸ Which type of intermediary is most promising will vary with the nature of the technology at issue, whether the IP in question is “standalone” or is valuable only as part of a larger portfolio, and so forth. As yet, the set of IP intermediaries remains small—compared, for example, to the set of intermediaries that facilitates real-estate transactions. However, as it grows and matures, transaction costs might diminish, making the option of selling IP increasingly attractive.

Licensing

Instead of selling, an innovating firm may retain ownership of the IP but give one or more licensees the right to use it. More specifically, the IP holder may grant the licensee(s) the right to engage in one or more of the activities that patent, copyright, or trademark law would otherwise forbid. In the most basic licensing decision, companies compare the revenue they could earn in license fees with the cost of increased competition.³⁹ In settings where market power is particularly valuable (in other words, where the innovation shielded by the IP is said to be “drastic”), companies typically refuse to license. Licensing is more attractive and likely in situations in which rival firms are more efficient than the innovator or in which rivals have resources and capabilities that the innovator lacks. For instance, licensing IP might help an innovative firm to increase capacity or to augment the demand for its products. A powerful example is Monsanto, the globally dominant agricultural biotechnology company.

Much of Monsanto’s success is founded upon two related technological innovations. The first is “Roundup,” a potent herbicide whose principal active ingredient, glyphosate, is nontoxic to animals but kills most plants until it is dissolved by rainwater. Monsanto secured a patent on Roundup, but it expired in 2000. The principal benefit of Roundup is that it sharply reduces the cost to farmers of weed control. Its principal disadvantage is that its use requires careful timing to avoid killing valuable crops along with the weeds. Monsanto’s second innovation addresses that disadvantage. Through genetic engineering, the company developed so-called “Roundup Ready” seeds, which contain a gene that makes the crops they produce resistant to Roundup. The technology used to produce these seeds and the seeds themselves are protected by patents, which will expire in 2014. Recently, Monsanto has developed an improved system of genetic engineering, which, it claims, produces even more resistant crop strains. That technology is also protected by patents, which will expire in 2020.

Monsanto could have used its patents to exclude competitors from the rapidly growing industry of genetically modified crops (the most important application of which involves soybeans). Perhaps surprisingly, it has not. Instead, it has entered into licensing agreements of two sorts. First, it has granted licenses (on reasonable terms) to several hundred seed companies, authorizing them to develop and sell seeds embodying the “Roundup Ready” technology. Second, it has granted licenses to its principal rivals (DuPont [Pioneer Hi-bred], Bayer, Syngenta, Dow AgroSciences, and BASF) to combine the Roundup Ready genes with other modified genes to produce seeds with multiple advantages—drought resistant, insect resistance, and so forth.

Adoption of this strategy has benefitted Monsanto in three ways. First, by capitalizing on the production capacity and marketing abilities of other firms, Monsanto spread the technology faster than it could have done on its own—and thus not only increased total industry revenues (much of which Monsanto is able to garner through license fees), but also corroded popular resistance to genetically modified crops, which has been based in part on unfamiliarity. Second, the “technological lock-in” achieved through licensing seems to have enabled Monsanto to engage in a novel form of “evergreening”—the popular term for extending the effective duration of

a patent or other IP right. Specifically, Monsanto has (allegedly) pressured licensees to switch from the initial Roundup Ready technology to the slightly improved version by threatening to terminate their licenses to use the first-generation system prior to 2014, when the patent thereon is scheduled to expire. The result, arguably, has been to compel the licensees who are now heavily dependent on the technology to shift to the slightly improved version, the patent on which will last until 2020. Third and finally, the critical importance to farmers of Roundup resistance enabled Monsanto to charge its rivals license fees for producing composite genes—high enough to enable Monsanto to extract some of the value of its rivals' technological innovations.⁴⁰

Two lessons emerge from this example. First, the apparent effectiveness of Monsanto's approach nicely illustrates how differences in firm capabilities and resources can be made profitable with the help of extensive licensing.⁴¹ Second, some of Monsanto's alleged tactics have brought the firm close to the edge of anti-trust law, triggering both an investigation by the Justice Department and a civil suit by a competitor.⁴²

Exploiting differences across firms is a powerful rationale for licensing, but not the only one. Managers can also use licensing to shape competition.⁴³ We already discussed how licensing can discourage rival firms from investing in R&D that threatens to imitate protected products. In addition, licensing can also be an attractive option for companies with weak property rights. By making a product available at a reasonable cost, rival firms have reduced incentives to challenge the validity of a patent. The wide variety of ways in which licensing can be beneficial help to explain the rapidly increasing popularity of this option.⁴⁴

Collaborating

There are myriad ways to enhance the value of a firm's innovations and its associated IP assets through collaboration. The potential benefits of these strategies are large. However, some of them will bring the firm into close proximity with anti-trust law or other legal reefs.

One of the most important of the collaborative strategies is participation in standard-setting organizations (SSOs). Agreements among competitors to adhere to common standards when designing and manufacturing their products often sharply increase the value to consumers of those products (by catalyzing network externalities, reducing information costs, and so forth), which in turn benefits all of the competitors. However, this socially benign process can become malign in two ways—by enabling a small group of existing firms to raise barriers to entry, or by enabling one of the participating firms to manipulate the standard-setting process so as to take unfair advantage of its own patents or other IP. The latter hazard is especially serious when patent applications have not yet been made public at the time the standard is set. To mitigate these risks, both the United States and the European Union have developed an elaborate set of rules governing the structure and conduct of SSOs and the terms on which each participating firm not only may but *must* license its patents to the other participants.⁴⁵ (The result is that this particular variant of the "collaboration" option and one variant of the "licensing" option, considered in the preceding section, are inextricably linked.) To complicate matters further, the rules

vary across jurisdictions. Generally speaking, they are most strict in Europe, but not invariably. Violation of any of the rules can have serious consequences.⁴⁶

The connection between this strategy and the overall theses of this article should be apparent: in the SSO context, the gains to a firm from participating in a collaborative process that increases the value of the market as a whole typically exceed the losses the firm suffers from being forced to license its IP to its competitors on less-than-profit-maximizing terms. In other words, partial sharing is superior to single-minded exercises of market power.

A second form of potentially profitable collaboration involves working with the developers of complements to one's product or service.⁴⁷ Some versions of this strategy are simple and obvious. For example, most software firms nowadays make their APIs (application programming interfaces) freely available to firms interested in creating compatible programs. Other versions are more complex. For example, Apple attempted simultaneously to encourage the development of applications compatible with its mobile-phone and tablet products while exercising veto power over which of those applications were available to consumers and the prices that consumers were obliged to pay for them. The ways in which Apple tried to reconcile these goals evolved over time. When it first introduced the iPhone, it sought to prevent independent software developers from creating applications that could run on the device.⁴⁸ Later it relented, but only partially. It made the technical specifications of the device available to independent developers, but required developers to submit their programs to Apple for approval. Only if they received Apple's imprimatur could their products be loaded on the phones. The primary criteria that the company applied when reviewing proposed applications were: an application could not touch or enhance the functionality of either the phone itself or the iPod media player that the iPhone housed; no processes could run in the background of the iPhone operating system; and no application was allowed to facilitate copyright infringement. Thousands of proposed programs failed these tests—among them, for instance, *Instinctiv Shuffle*, a clever application that, unlike Apple's proprietary "Shuffle" system, selected songs that matched the user's current mood by analyzing the songs he or she skipped; and third-party instant-messaging and cut-and-paste systems.⁴⁹ The "App Review" system remained in place through 2013, but the criteria used to screen applications, as well as the review process itself, continue to evolve. For example, Apple now places more weight on the "professionalism" and utility of applications, their suitability for children, and the degree to which their user interfaces comport with Apple's aesthetic—and it has added an appellate process for developers whose submissions fail these admittedly subjective tests.⁵⁰ Apple's policies provide a good illustration of the tensions that often arise between complementors. Applications developers have long chafed under the restrictions imposed by the review process.⁵¹ However, in some instances, these restrictions are in the best interest of developers and consumers. Closing out inferior applications, for example, tends to be welfare enhancing. At the same time, limiting the applications store to software that in no way substitutes for any of Apple's proprietary functionalities and products hurts developers and consumers, the (temporary) removal of the popular Google map application from the iPhone being a recent example.⁵² As we have seen, Apple's preference for closed systems has gotten it into trouble before—and may do so again.

A third form of strategic collaboration consists of encouraging and then capitalizing upon innovations by independent developers and even customers through models of “open innovation” and “innovation platforms.”⁵³ For example, patentees frequently insert in license agreements terms that require the licensee to “grant back” to the licensor the rights to any improvements the licensee makes to the technology at issue. Antitrust hazards lurk here,⁵⁴ but if they can be skirted, this technique frequently benefits both licensor and licensee. Less common and well charted is a strategy that has come to be known as “user innovation.” With surprising frequency, the purchasers of consumer products modify them to suit their needs.⁵⁵ Traditionally, manufacturers have either paid no attention to this phenomenon or sought to suppress it. Recently, however, a growing number of firms have begun actively cultivating this behavior. Examples include innovation platforms and more general efforts by manufacturers to encourage independent developers and customers to modify their products and then share the modifications;⁵⁶ selling or giving customers “toolkits” that assist them in modifying products;⁵⁷ sponsoring “idea competitions”;⁵⁸ and the so-called “collaborative customer co-design” innovation model.⁵⁹ In most of these contexts, the manufacturers enjoy IP rights that they could employ, if they wished, to prevent the innovations. Instead, they do the opposite. Many companies that have adopted this approach report substantial gains.⁶⁰

Donating

Perhaps the least intuitive of the offensive strategies displayed in the map is the option to give away a company’s IP. Many instances of donation are non-strategic. Web-based peer production in organizations such as Wikipedia and Slashdot are prominent examples.⁶¹ A growing number of companies are also making their IP available, directly or indirectly, to the residents of developing countries—initiatives that can have large humanitarian benefits.⁶²

However, there are solid strategic reasons to give away IP as well. For example, making information publicly available so that it cannot be patented can help reduce the risk of future holdup. Consider Merck’s decision to put the Merck Gene Index, a database of expressed human gene sequences jointly developed with Washington University, into the public domain. The pharmaceutical company enjoyed a strong competitive position in cardiovascular disease and cholesterol-lowering drugs, and it had invested heavily in its sales and marketing capabilities in these categories. Making its research publicly available produced two advantages for Merck. The move could potentially lead to faster scientific progress, which would make the company’s marketing and sales capabilities more valuable. In addition, keeping the knowledge of gene sequences in the public domain reduced the risk of rival firms patenting research that was important to Merck’s efforts.⁶³

Donations can also be motivated by capital market concerns. By disclosing a part of its knowledge, a firm can signal its value to capital markets and obtain lower-cost equity financing for its innovation efforts.⁶⁴ In this example, financing works as a complement to innovation. Similarly, firms can also signal their capabilities to the market for talent.⁶⁵

As our discussion of the five options for rights-holders illustrates, there is no one best way to manage IP. In fact, the most often considered opportunity, using

IP protection to preclude competitors from gaining access to these assets and drive up prices, is often less desirable than more inclusive arrangements in which value is shared more broadly.

Defense

Companies that compete with rivals who own important IP assets also have a range of options to meet this challenge. In fact, as the map suggests, the options for IP non-holders mirror the choices available to companies who own and control IP.

Asserting Legal Privilege

Firms often assume that entrance into a field already occupied by an incumbent firm holding IP rights will require litigation. To create room to operate, the newcomer must secure permission from a court. This can be achieved in one of two ways. First, the newcomer can challenge the validity of the incumbent's rights. Some examples: in the United States, a generic drug manufacturer can use the so-called "paragraph IV" ANDA certification procedure to challenge the validity of an incumbent's pharmaceutical product patent;⁶⁶ a newcomer wishing to deploy a database that mimics or resembles the database of an incumbent may claim that the information in question lies outside the scope of copyright law⁶⁷ (or, in Europe, database-protection statutes); or a manufacturer interested in entering a field dominated by a single firm may assert that the trademark employed by the incumbent (e.g., "thermos" or "Murphy bed") has become generic and thus that the newcomer may use it with impunity.⁶⁸ Second, the newcomer may acknowledge the validity of the incumbent's IP rights, but contend that the product or practice that the newcomer wishes to deploy would not run afoul of those rights. Some examples: a company hoping to sell an improved version of a patented product (e.g., an air brake for railroad cars) may assert that its version is sufficiently different to fall outside the scope of the incumbent's patent;⁶⁹ the operator of an image-based search engine may contend that the "fair-use" doctrine in copyright law excuses the practice of making without permission so-called "thumbnail" digital copies of copyrighted photographs;⁷⁰ or a newcomer may contend that its use of an incumbent's descriptive trademark (e.g., "micro color" for permanent makeup) to describe a characteristic of the newcomer's own product is justified by the quite different version of the "fair use" doctrine in trademark law.⁷¹

Lawsuits of these two general sorts are common, and the newcomers sometimes prevail. However, victory typically comes at a large cost. The recent spate of litigation in the United States concerning "RS-DVR" technology provides an illustration.

To understand the litigation requires a bit of background. The practice of recording video programming lawfully received at one time and then replaying it at a later time is commonly known as "timeshifting." Several generations of technology—"video tape recorders" (VTRs) in the 1950s and 1960s; "video cassette recorders" (VCRs) in the 1970s, 1980s, and 1990s; and set-top "digital video recorders" (DVRs) after 1999—gradually increased the convenience and decreased the cost of this practice.⁷² By 2002, 91% of American households owned at least one VCR; today, 40% of households own DVRs, and the number is increasing rapidly.⁷³

The legal status of these technologies was initially uncertain. In 1978, the owners of the copyrights in many of the television shows and movies that were being copied using VCRs contended that the making of the recordings violated the copyright laws—and that the manufacturers of VCRs were secondarily liable for the illegal behavior of their customers. In 1984, the Supreme Court resolved this issue against the copyright owners.⁷⁴ Since then, the copyright owners have tacitly accepted the legitimacy of in-home timeshifting, but have successfully challenged ancillary innovations that would make it easier for consumers to delete embedded advertisements or share their recordings with their friends.⁷⁵

In 2006, Cablevision, a cable company serving customers in the New York City metropolitan area, recognized that timeshifting could be performed more efficiently using “cloud-based” technology. Instead of relying upon consumers, many of whom are technologically unsophisticated, to operate the set-top DVRs in their homes, Cablevision could invite them to make and store recordings of broadcast programs on sectors of hard drives maintained by Cablevision in a remote facility.⁷⁶ When a customer wished to watch a program pre-recorded in this fashion, she would send a signal to the facility, which would then transmit the program to the subscriber’s home.

Cablevision’s announcement of its plan to deploy this technology provoked, as Cablevision expected, fierce resistance from the owners of the copyrights in movies and television shows. The copyright owners did not wish to prevent the recordings; they just wanted to be paid an additional licensing fee. Cablevision did not want to pay them. The copyright owners initiated litigation; Cablevision responded with a declaratory-judgment suit of its own.⁷⁷ Two years later, the Court of Appeals for the Second Circuit finally resolved the case in Cablevision’s favor. A year after that, the Supreme Court, acting partly on the advice of the Solicitor General, declined to review the decision.⁷⁸ Then and only then did Cablevision begin to roll out the service.⁷⁹

In two senses, this is a success story. First, Cablevision won in the end and cleared the way for its new service, which consumers reportedly find highly attractive. Second, the clarification of the law that resulted from Cablevision’s initiation catalyzed a surge of investment in similar technologies.⁸⁰ In other respects, however, this is a cautionary tale. The lawsuit—and Cablevision’s understandable desire to avoid catastrophic damages if it lost—caused a four-year delay in the deployment of the new system. The attorneys’ fees and court costs were very large. None of those costs were shared by other cable companies, which are now free to deploy similar systems in competition with Cablevision. This is a general drawback of litigation that opens up business opportunities for companies that challenge IP rights: Success is a public good from which everyone in the industry can benefit. In short, even in the Cablevision case, litigation may not have been the most sensible approach. In many other analogous situations, the outcome of defensive intellectual-property litigation is far worse. Before proceeding down this path, firms lacking IP rights should at least consider other options.

Develop an Alternative Technology

One such option is the development of a technology that avoids the territory already claimed by the incumbent. To determine whether pursuit of this strategy

would be effective and sensible, managers must weigh several variables. The most obvious are the nature of the ensuing competition—it will be fiercest if the two companies offer close substitutes—and the technological opportunities available in the relevant field of science, engineering, or art. How much would it cost to “invent around” the incumbent’s right, and what is the probability of success? These numbers will vary sharply by industry and—less often recognized—by the thickness of the buffer that the IP right creates around the incumbent’s product or service. How close can the newcomer come before triggering a violation? Generally speaking, the buffer will be thickest if the incumbent holds a well-crafted patent portfolio and can invoke the benefit of the doctrine of equivalents; a bit thinner if the incumbent is relying on copyright law and thus must satisfy the legal standard of “substantial similarity”; much thinner if the incumbent is relying on the special kinds of copyrights (or “neighboring rights”) that shield sound recordings. These broad generalizations are subject to many qualifications. For example, the kinds of considerations that courts consider when deciding whether a trademark or form of “trade dress” comes too close to the zone already occupied by another mark are radically different from the “element-by-element” approach used in patent cases, and the “total look and feel” approach used by some courts when applying copyright law.

Generic pharmaceutical firms (if they are unable or reluctant to challenge the validity of the patents on the drugs with which they hope to compete) have especially strong incentives to develop alternatives. Unfortunately, the legal waters that the generics must navigate are especially perilous. The danger arises from the proximity between two competing sets of rules: the doctrine of “equivalents,” which is used to determine patent infringement, and the doctrine of “bioequivalence” or “bio-similarity,” which determines the height of the regulatory hurdles that new drugs must clear before they can be marketed. Generic drug manufacturers hoping to enter established markets try to avoid two hazards. On the one hand, they attempt to modify the composition of the drugs already present in that market enough to avoid infringing the patents on those drugs held by the incumbent pharmaceutical firms. On the other hand, they strive not to alter the composition of the extant drugs so much that the altered versions behave significantly differently in patients’ bodies—thus forcing the generics to undergo prohibitively expensive forms of clinical testing and regulatory review. Sometimes they succeed, but sometimes they veer too far in one direction or the other and thus come to grief. The amounts of money at stake ensure that litigation arising out of generics’ efforts of this sort has been intense—and will further intensify with the increased usage of “biologics,” which are subject to different regulatory standards than so-called “small molecules.” If they hope to navigate in these waters successfully, the generic manufacturers must have skilled lawyers on the bridge, not in the engine room.⁸¹

Getting Permission

“Inventing around” an incumbent’s technology is socially wasteful, at least if the non-infringing technology developed by the newcomer offers no functional advantage. That fact creates an opportunity for licensing. If the incumbent is aware that the newcomer is capable of inventing around its technology, then the incumbent should be willing to license its technology to the newcomer, leaving both better off.

Licensing is also potentially beneficial to both parties in other ways. Licensees gain from reduction of the time necessary to bring their products to market, the ability to produce standardized products and thus reap the benefit of network effects, and perhaps avoidance of liability for unintended violations of IP rights (especially important in fields characterized by dense patent “thickets”). Licensors, as indicated above, stand to gain through avoidance of challenges to shaky IP rights and through inhibition of profit-sapping competition.⁸²

Should the newcomer, aware of these incentives, eschew inventing around and seek a license? Perhaps—but not necessarily. There are three factors a newcomer should consider when weighing this option. First, incumbents sometimes refuse (rationally or not) to consider licensing their technologies. The behavior of Apple, discussed above, provides one example. There are many others.⁸³ Second, both licensor and licensee risk antitrust liability if they structure their deal inappropriately, particularly if they are competitors.⁸⁴ Finally, even if licensing is feasible and lawful, the newcomer may substantially improve its bargaining position when negotiating such a license by at least partially developing an alternative technology.⁸⁵ If the newcomer can credibly contend that a non-infringing technology is both technically possible and affordable, the incumbent is likely to agree to better licensing terms.

The general lesson: the array of defensive options set forth on the right side of our map should not be regarded as mutually exclusive alternatives. Sometimes the best strategy involves combining them.⁸⁶

Detente

To ward off patent infringement suits and gain access to rivals’ technology, companies can opt to build large patent portfolios of their own. The ability to threaten countersuits may dissuade competitors from aggressively asserting their legal privileges. For example, in the early automobile industry, Ford, and later General Motors, amassed large patent portfolios without ever asserting them. In addition, large patent portfolios often lead to a mutual dependence that encourages broad cross-licensing. Canon, for example, uses its extensive patent portfolio to gain access to critical technology. When the company encounters a patent that blocks one of its own R&D efforts, it first checks whether the patent holder infringes any of Canon’s rights. If this is the case, Canon notifies the company and proposes a cross-licensing agreement. Canon management believes that its approach is faster and more cost effective than efforts to invent around existing technology or unilateral licensing.⁸⁷ Access to technology also appears to be one explanation for the large patent portfolios observed in the semiconductor industry.⁸⁸

Rapid Dissemination

Companies considering entering a line of business that may implicate IP rights held by other firms have one last and least intuitive choice: they can choose to disregard the potential claims of rivals and instead disseminate a potentially infringing technology in rapid fashion. The goal is to deploy the technology so quickly and widely that, by the time it is challenged through litigation, the firm can either persuade the IP holders to grant them licenses or, better yet, can persuade judges or a jury to declare it to be lawful. Like “shooting the moon” in the game of hearts, when

executed successfully this strategy can be hugely advantageous, but when attempted unsuccessfully it can be extremely costly.

An example of success is Sony's deployment of VCR technology. As we noted above, six years elapsed between the introduction of VCRs and the final decision by the United States Supreme Court concerning their legality. By that time, approximately 11% of American households (and some of the Supreme Court justices) owned VCRs.⁸⁹ Familiarity with the technology and its benefits undoubtedly contributed to the willingness of a bare majority of the justices to stretch the doctrines of secondary liability in copyright law enough to legitimate the machines. Sony, the company that took and won this gamble, stood to benefit enormously (although it subsequently forfeited its leading position by underestimating the importance of a crucial complement to VCR technology, the broad availability of recorded movies).

An equally dramatic example of a failure of the strategy is the Napster file-sharing service. The founders of Napster hoped to obtain licenses from the owners of the copyrights in the musical works and sound recordings embodied in the digital files whose dissemination the service facilitated. However, instead of seeking such licenses prior to launching the service, they deployed the service and then asked for permission. The copyright owners refused, and instead sought through litigation to shut down the system. By the time the courts addressed their challenge, the Napster service had over 80 million users throughout the world. However, in this instance, the judges were unmoved by the popularity of the new entrant. Their adverse ruling concerning copyright infringement not only was fatal to Napster itself, it also proved extremely costly to Bertelsmann, AG, the German company that had invested \$85 million in Napster in hopes of converting it to a licensed and thus lawful service. After prevailing against Napster, most of the copyright owners brought suit against Bertelsmann, arguing that it should share responsibility for the injuries they had sustained. The potential damage award faced by Bertelsmann was very large. Rather than run the risk of incurring it, Bertelsmann settled the cases—for several hundred million dollars.⁹⁰

In sum, this fifth defensive option is highly risky. When it works, it can generate enormous gains; when it fails, it can be disastrous.

Managing IP Across Functional Silos

A recurring theme in this essay is the significant benefits of the close and early collaboration between creators, managers, and lawyers. In order to benefit to the greatest possible extent from novel technologies and products, managers need to collaborate across functional silos. This is particularly important during the research, development, and design phases. Asking IP specialists to determine the best means of protecting *a given design* is less than optimal because even small tweaks in product design can often have a significant impact on the available legal forms of protection. The design of Ferrari automobiles is a good example.

Ferrari's products are prestige goods.⁹¹ As a result, the price that Ferrari can charge for them depends in part upon their scarcity. Recognizing that, Ferrari intentionally limits production, thus forcing potential customers to wait for years before they can obtain cars. In the 1980s, this business model was threatened by Roberts

Motor Company, the brainchild of Carl Roberts. Recognizing that some car buyers either were impatient or could not afford the price of a Ferrari Testarossa (at the time, roughly \$230,000), Roberts manufactured and sold “one-piece body shell[s] molded from reinforced fiberglass” that looked remarkably similar to Testarossas. Customers could buy one of Roberts’ “shells” for roughly \$8,500, remove the body from a modestly priced American sports car, such as a Chevrolet Corvette or Pontiac Fiero, replace it with Roberts’ product, and have a car that, from a distance, appeared to be a Testarossa. For obvious reasons, Ferrari wished to stop Roberts. However, its options were limited. It had no utility patent or design patent on the shape of its cars. Copyright protection was unavailable.⁹² Because Roberts did not employ Ferrari’s name or famous “stallion unreined” logo, trademark law in the ordinary sense was not implicated. Nevertheless, Ferrari argued that the shape of a Testarossa was protected against imitation by the little-known doctrine of “trade dress.” In brief, the law of trade dress shields against imitation the packaging or the design of a product if and only if it has come to be associated in the minds of consumers with a particular manufacturer. To prevail under this theory, Ferrari had to establish that the shape of its cars is “primarily nonfunctional.” This might seem a hard row to hoe. After all, aren’t Testarossas designed to go fast? If so, their body shape would be plainly “functional.” Ferrari was able to overcome this formidable barrier by offering the “testimony of Angelo Bellei, who developed Ferrari’s grand touring cars from 1964-75, that the company chose the exterior designs for beauty and distinctiveness, not utility.” Persuaded, the courts granted an injunction against the continued manufacture and distribution of the Roberts replicas.⁹³

This case and others like it generate some surprising opportunities for companies when developing what they hope will become popular and distinctive consumer products. If and only if the shape of those products can be plausibly characterized as “nonfunctional,” the company may be able to rely on trade-dress law to suppress competition or to demand license fees from would-be competitors. However, what exactly does “nonfunctional” entail? The answer is subtle and evolving, implicating some esoteric legal doctrines such as what, if anything, “aesthetic functionality” means.⁹⁴ As the Ferrari case illustrates, even the seemingly minor decision to make aspects of a product’s design functional can have significant implications for the company’s ability to protect it from imitation. The broader point of the case is straightforward: Unless R&D, marketing, and IP decisions are tightly integrated, the company is unlikely to reap the full benefits of its IP.⁹⁵

For a recent example of such tight integration, consider Microsoft’s development of its Kinect entertainment system.⁹⁶ Kinect allows individuals to interact with the company’s gaming console Xbox 360 without a game controller, using only gestures and spoken commands.⁹⁷ Microsoft sold 8 million units in the first 60 days following Kinect’s launch, making it one of the fastest-selling consumer electronics devices. Throughout the development of Kinect, IP specialists worked closely with technology leaders and business executives to position the device in the marketplace.⁹⁸ The team started out by producing a map that showed potential points of differentiation for the new product. In evaluating each of these points, the company considered both the benefits created for consumers as well as the IP implications.

Would the company be able to protect legally a specific point of differentiation? Was it likely to infringe on rivals' patents?⁹⁹ Points of differentiation that created both substantial benefits for consumers and valuable IP were considered particularly attractive. By the time the product was launched, Microsoft had filed 600 patents to protect Kinect-related innovations. Perhaps as importantly, the company had been able to avoid areas with an abundance of existing patents, reducing the likelihood of future legal disputes.

Similar to its integration of IP and R&D activities, Microsoft's trademark, copyright, and trade secrets group worked closely with the marketing function to develop the new brand.¹⁰⁰ One important question was the name of the new product. The company initially considered 90 names, testing them with consumers and conducting worldwide trademark searches at the same time. Business and legal considerations eliminated most candidates. For a short list of eight names, Microsoft completed an international trademark clearance process, seeking around 100 independent legal opinions from multiple jurisdictions. The company eventually filed trademark applications for four names. Marketing research indicated that "Kinect" would receive the best response.

The tight integration of IP management with R&D and marketing is critical for companies that develop significant technologies in-house. In fact, one of the reasons why R&D activities are less globalized than one might expect is the difficulty of replicating this tight integration in foreign markets.¹⁰¹ The functions that benefit from integration will vary with firm strategy. For instance, companies that acquire technology from the outside might want to integrate closely IP management and M&A activities.

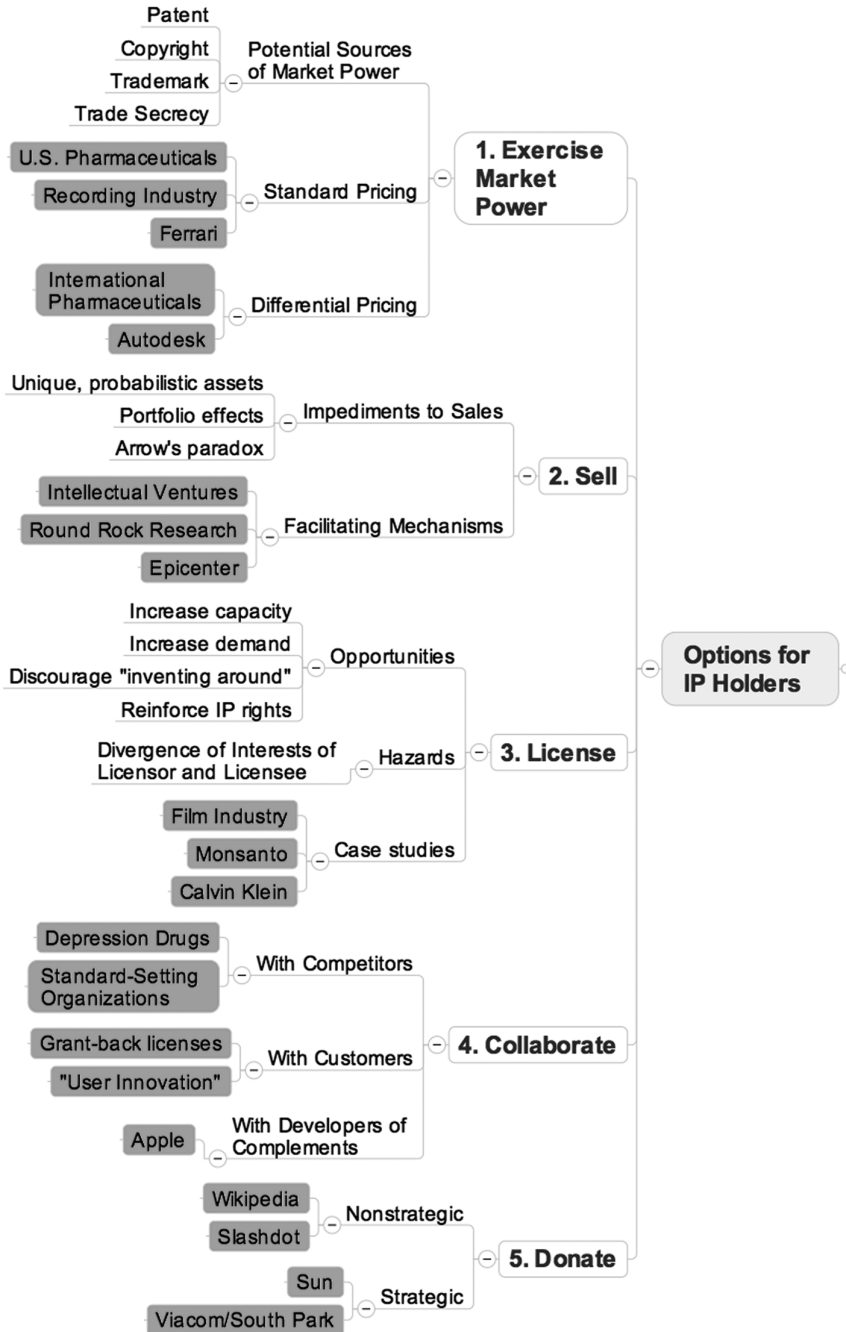
Conclusion

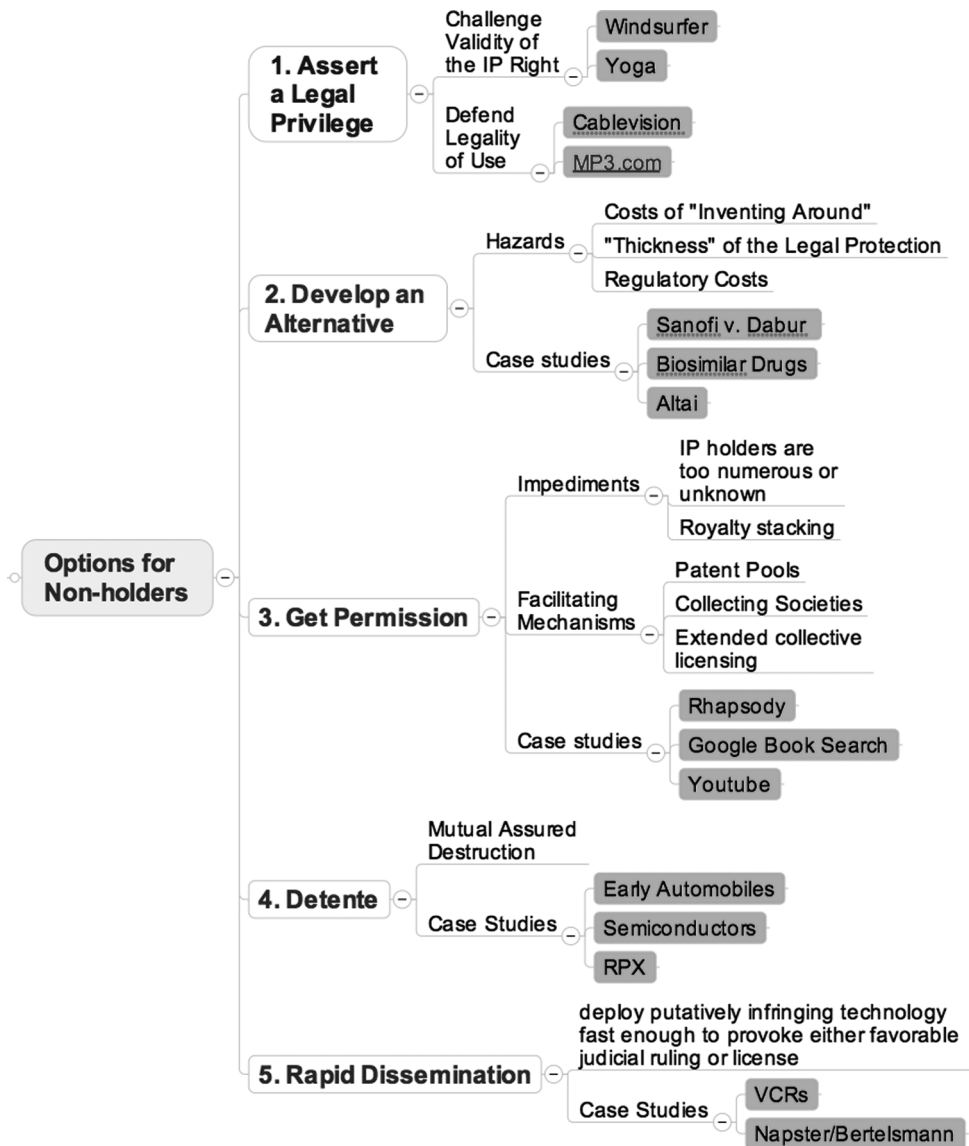
A glance at the map will make clear that this article by no means offers a comprehensive comparative evaluation of the strategies available either to firms holding IP rights or to firms considering entering fields already occupied by IP holders. Our ambition, rather, has been to illustrate companies' principal choices in a systematic manner. We encourage readers to examine additional case studies and arguments by exploring the online version of the map.

From our analysis, three broad conclusions emerge. First, many IP-related decisions are of strategic importance, and they must not be delegated to specialists who tend to be little involved in strategy formulation and implementation. Second, early and continuous interactions between business executives, lawyers, and engineers are critical to identifying the best opportunities for deploying IP. Companies that design products first and then search for ways of protecting them face a far narrower set of options than the one shown in the map. Third, managers assume all too often that the best way of using IP rights is to suppress competition. As the range of options captured in the map and the case studies show, this view of IP is too narrow, and it can have detrimental longer-term consequences. Remarkably often, sharing the value of IP is in the best interest of companies and society.

APPENDIX

Map of “Intellectual Property and Business Strategy”





Notes

1. J. Wild, "The State of Play," in J. Wild, ed., *IP Value 2011: Building and Enforcing Intellectual Property Value—An International Guide for the Boardroom* (London: Globe White Page, 2010), pp. 10-14.
2. The relation between the presence of IP rights and entry is more complex than this simple argument suggests. See I.M. Cockburn and M.J. MacGarvie, "Entry and Patenting in the Software Industry," *Management Science*, 57/5 (May 2011): 915-933.
3. For empirical evidence supporting this view, see J. Lerner, "," *RAND Journal of Economics*, 25/2 (Summer 1994): 319-332; H. Ernst, "Patent Applications and Subsequent Changes of Performance: Evidence from Time-Series Cross-Section Analyses on the Firm Level," *Research Policy*, 30/1 (January 2001): 143-157; S. Shane, "Technological Opportunities and New Firm Creation," *Management Science*, 47/2 (February 2001): 205-220.

4. Several papers in this issue address the challenges associated with organizing IP activities. Cesaroni and Piccaluga (in this issue of *CMR*) analyze the organizational consequences of firms shifting from a reactive to a more proactive IP management approach. Holgersson and Granstrand (in this issue of *CMR*) discuss how corporate entities can maintain access to relevant IP in the wake of spinouts. Fabrizio Cesaroni and Andrea Piccaluga, "Operational Challenges and ST's Proposed Solutions to Improve Collaboration between IP and R&D in Innovation Processes," *California Management Review*, 55/4 (Summer 2013); Ove Granstrand and Marcus Holgersson, "Managing the Intellectual Property Disassembly Problem," *California Management Review*, 55/4 (Summer 2013).
5. Indeed, lawyers should be actively involved, not merely in the design of particular products or services, but in the most fundamental choices made by a firm, including the initial selection or subsequent revisions of the firm's business model. The reason: the relative merits of alternative business models may depend in part on the available opportunities for deploying the firm's intellectual property. Moreover, before choosing any of the options shown in the map, companies will want to develop a good sense of the relevant IP landscape. This can be accomplished with the help of freedom-to-operate studies and searches for patents and prior art.
6. Languages, of course, are best learned early in life. In this context, "early" likely means during the course of professional education. Thus, the best way to address the concerns outlined in this essay would be through greater integration of the curricula of law schools and business schools.
7. While we focus on companies' legal means to protect and exploit IP assets, firms also have at their disposal a broad set of market-based strategies that reach similar goals. See B. Anand and A. Galetovic, "How Market Smarts Can Protect Property Rights," *Harvard Business Review*, 82/12 (December 2004): 73-79.
8. William Fisher, *Promises to Keep: Technology, Law, and the Future of Entertainment* (Stanford, CA: Stanford University Press, 2004), pp. 59-70.
9. For examples of how knowledge-intensive business-services companies choose among the available forms of protection, see N. Amara, R. Landry, and N. Traoré, "Managing the Protection of Innovations in Knowledge-Intensive Business Services," *Research Policy*, 37/9 (October 2008): 1530-1547.
10. For an analysis comparing patents and trade secrets, see A. Arundel, "The Relative Effectiveness of Patents and Secrecy for Appropriation," *Research Policy*, 30/4 (April 2001): 611-624.
11. "Two Sentenced in Coke Trade Secret Case," *CNN Money*, May 23, 2007, <<http://money.cnn.com/2007/05/23/news/newsmakers/coke/>>.
12. R. Bone, "Trade Secrecy, Innovation, and the Requirement of Reasonable Secrecy Precautions," in R. Dreyfuss and K. Strandberg, eds., *The Law and Theory of Trade Secrecy* (Northampton, MA: Edward Elgar Press, 2010). There are also interesting interactions between trade secrets and patents. For example, firms with a reputation for toughness in patent enforcement can successfully reduce the outward flow of knowledge through labor markets. See R. Agarwal, M. Ganco, and R.H. Ziedonis, "Reputations for Toughness in Patent Enforcement: Implications for Knowledge Spillovers via Inventor Mobility," *Strategic Management Journal*, 30/13 (December 2009): 1349-1374.
13. For startups, the Berkeley Patent Survey indicates that securing funds is one of the most important reasons to apply for patents. See S.J.H. Graham and T.M. Sichelman, "Why Do Start-Ups Patent?" *Berkeley Technology Law Journal*, 23/3 (2008): 1063-1097. Empirical evidence for the value of patents as signals is provided by D.H. Hsu and R.H. Ziedonis, "Resources as Dual Sources of Advantage: Implications for Valuing Entrepreneurial-Firm Patents," *Strategic Management Journal* (forthcoming 2013); A. Conti, M. C. Thursby, and F. Rothaermel, "Show Me the Right Stuff: Signals for High Tech Startups," NBER Working Paper No. 17050, July 2011; C. Haeussler, D. Harho, and E. Mueller, "To Be Financed or Not: The Role of Patents for Venture Capital Financing," CEPR Discussion Papers 7115, 2009.
14. J. Anton and D. Yao, "Little Patents and Big Secrets: Managing Intellectual Property," *RAND Journal of Economics*, 35/1 (Spring 2004): 1-22.
15. J. Richards, "The Nonobviousness Requirement of Patentability," *Fordham Intellectual Property Media and Entertainment Law Journal*, 17 (2007): 875.
16. R.J. Gilson, "The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete," *New York University Law Review*, 74 (1999): 575; C.T. Graves and J.A. Diboise, "Do Strict Trade Secret and Non-Competition Laws Obstruct Innovation," *Entrepreneurial Business Law Journal*, 1 (2006): 323; N.D. Bishara, "Fifty Ways to Leave Your Employer: Relative Enforcement of Covenants Not to Compete, Trends, and Implications for Employee Mobility," *University of Pennsylvania Journal of Business Law*, 13 (2011): 751-795.

17. Agreement on Trade-Related Aspects of Intellectual Property Rights, Art. 10(1), <www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm>.
18. This is not to say, of course, that copyright protection is bulletproof, but rather that, in combatting software “piracy,” patent protection offers few advantages. For (somewhat exaggerated) evidence that copyright protection is incomplete, see Business Software Alliance, 2011 Piracy Study, <<http://portal.bsa.org/globalpiracy2011/>>.
19. See Computer Associates International, Inc. v. Altai, Inc., 982 F.2d 693 (2nd Cir. 1992); P. Samuelson, “Copyright and Specific Industries: The Uneasy Case for Software Copyrights Revisited,” *George Washington Law Review*, 79 (2011): 1746, at pp. 1765-1771.
20. See D.L. Burk and M.A. Lemley, “Is Patent Law Technology-Specific?” *Berkeley Technology Law Journal*, 17/4 (September 2002): 1155, at pp. 1160-1173 (discussing the lenient treatment by U.S. courts of software patents when applying the enablement and best-mode requirements).
21. F. Oberholzer-Gee, D. Yao, and F.A. Jorge, “Brighter Smiles for the Masses—Colgate vs. P&G,” Harvard Business School case 706435, March 2007; A. Dutra, J. Frary, and R. Wise, “Finding New Growth in Tough Consumer Markets: An Array of Moves Address Consumers’ Higher-Order Needs,” *Mercer Management Journal*, 17 (2004): 24-34.
22. U.S. Department of Justice and Federal Trade Commission, “Antitrust Guidelines for the Licensing of Intellectual Property,” Washington, D.C., April 6, 1995.
23. N.T. Gallini, “Deterrence Through Market Sharing: A Strategic Incentive for Licensing,” *American Economic Review*, 74/5 (December 1984): 931-941.
24. N.T. Gallini, “Patent Policy and Costly Imitation,” *RAND Journal of Economics*, 23/1 (Spring 1992): 52-63.
25. J. Carlton, *Apple: The Inside Story of Intrigue, Egomania, and Business Blunders* (New York, NY: Times Business, Random House, 1997); D.B. Yoffie and R. Kim, “Apple Inc. in 2010,” Harvard Business School case 710467, March 2011.
26. Apple relied on legal and technical measures to protect the Macintosh. Prior to 1995, the company refused to license its operating system. Because the system’s software embodied the Mac’s entire set of APIs, cloning the Macintosh was technically complex (for a list of early Macintosh clone manufacturers and their eventual demise, see <www.everymac.com/systems/mac-clones/index-mac-clones.html>). Apple licensed many components of its interface to Microsoft for use in Windows 1.0. When Microsoft released Windows 2.0, substantially increasing the similarity of its interface to the Macintosh’s, Apple filed a suit, which it eventually lost (*Apple Computer, Inc. v. Microsoft Corporation*, 35 F.3d 1435 (9th Cir. 1994)).
27. D.B. Yoffie, R. Casadesus-Masanell, and S. Mattu, “Wintel (A): Cooperation or Conflict,” Harvard Business School case 704419, March 2004.
28. Yoffie and Kim (2011), op. cit.
29. F. Oberholzer-Gee and K. Strumpf, “File Sharing and Copyright,” in J. Lerner and S. Stern, eds., *Innovation Policy and the Economy 10* (Cambridge, MA: MIT Press, 2010), pp. 19-55.
30. D. Ferguson, “Trends and Statistics in Peer-to-Peer,” CacheLogic, presented at Workshop on Technical and Legal Aspects of Peer-to-Peer Television, The Netherlands, 2006.
31. T.C. Leung, “Should the Music Industry Sue Its Own Customers? Impacts of Music Piracy and Policy Suggestions,” University of Minnesota Working Paper, 2009.
32. By contrasting uses of IP that emphasize “value capture” with uses that emphasize “value-creation,” we do not mean to suggest that the former do not result in increases to social welfare. On the contrary, in many (although not all) contexts, the lure of enhanced profits through the exercise of market power generated (in part) by IP rights stimulates innovation that otherwise would not occur, which in turn redounds to the benefit of society at large. See, e.g., J.S. Mill, *Principles of Political Economy*, 5th edition (London: Longmans, Green & Co., 1909), 932-933. In those contexts, any lucrative deployment of IP rights is thus part of an overall “value-creation” process, because it increases rewards for innovation. Rather, we mean to differentiate among various ways of deploying IP rights once they have been created. Viewed from this ex-post standpoint, the options we have outlined differ sharply in the degrees to which they “create value.”
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 44. See Palfrey (2011), op. cit., pp. 89-95; M. Schecter "The Emerging Global Market for Intellectual Property," *Forbes*, April 4, 2012, <www.forbes.com/sites/ciocentral/2012/04/18/the-emerging-global-market-for-intellectual-property/>.
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