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Strategic Objectives Supported by Licensing

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INTRODUCTION

Licensing can no longer be thought of as a nonstrategic activity. The pace of technological change and increasing competitive intensity in today's global economy has more rapid commercialization critical to short-term as well as long-term financial success in many if not most product markets. Crowded technology fields are weakening the advantages held by one-time intellectual property fortresses. Technology development and commercialization costs are rapidly escalating. Furthermore, product and technology standards are playing a greater role in many markets, thereby increasing the importance of strategies that encourage customer adoption. These are just a few of the changes that are placing licensing at the nexus of business, technology, and intellectual property strategy and at the forefront of strategic management. The strategic importance of licensing to this nexus of decisions can be recognized by the range of choices available to a firm in today's global economy.

Historically, most commercialization decisions about new technology and associated intellectual property were bipolar—firms would choose either to commercialize through vertical integration, with all activities undertaken by the firm, or they would store the intellectual property in case it might be valuable for commercialization or defensive purposes at some later date. Licensing typically was an afterthought, a reaction to inquiries made by

*The concepts developed in this chapter have benefited greatly from discussions with Peter Grindley. Nonetheless, the author is solely responsible for the opinions expressed.

other firms, and often it was thought of as counterproductive to creating a protected competitive position.

No more. Today, capturing full value from new technology and intellectual property may require any of a wide array of commercialization strategies. While integration is still a vital strategy, licensing by itself or in conjunction with new organizational forms such as joint ventures, partnerships, and co-development agreements are opening up new possibilities for maximizing the value of a given technology. These new strategies, as this chapter discusses, can generate a number of competitive advantages that, among other things, reduce commercialization time and costs, improving both short-term return on investment as well as long-term profits. In other words, strategic licensing can yield comparative advantage.

Unlocking the opportunities provided by licensing activities can and should be an integral part of a firm's competitive arsenal. Using licensing to support business and technology strategies, however, first requires an appreciation of all of the possible strategic advantages to licensing. When can licensing provide commercialization benefits? How can it be used to gain competitive advantage? Unfortunately, very few articles about licensing and intellectual property strategy have provided an appreciation for the richness of strategies supported by licensing. Licensing strategy, when discussed, tends to focus on a single objective or strategy instead of the instrument itself, a license, and the different ways in which the license can be used to gain competitive advantage. Before a detailed and consistent decision logic for licensing can be laid out, all the strategic objectives for licensing must be revealed. This chapter attempts to fill this gap by identifying and describing a full range of strategic objectives for licensing. Its intent is to synthesize the different types of strategies for which in-licensing and, in particular, out-licensing play a critical role. Creating a taxonomy of licensing's strategic objectives will provide licensing executives and corporate strategists with the full range of strategies licensing can support. This may help them capture greater value and gain competitive advantage by enabling them to make the most effective use of their technology and intellectual property portfolios. The synthesis developed herein relies on academic research on licensing found in the economics and innovation literatures, on observations of industry practices, and on interviews with licensing executives. It is meant to provide an overview of the strategic objectives for licensing rather than a detailed assessment of the precise conditions for which licensing is an optimal strategy.

The chapter introduces a taxonomy that places licensing activities into four basic categories of strategic objectives: efficient commercialization, technology and intellectual property access through cross-licensing, strategic interactions, and opportunistic licensing of strategic misfits. *Efficient commercialization* describes a broad range of situations in which both in-licensing and out-licensing offer an innovator the most profitable commer-

cialization path by providing access to low-cost complementary assets or to assets that the innovator does not possess and would find purchasing or creating extremely costly and/or time consuming, if not impossible. *Technology and intellectual property access through cross-licensing* is a set of strategic objectives for gaining access to other firms' intellectual property and innovations through cross-licensing. Cross-licensing can neutralize potential blocking patents, eliminate the need for design-around costs and delays, and enable access to critical technology (and sometimes raw materials) at low cost. The third category encompasses the broader theme of *strategic interaction*, whereby an innovator's decision to out-license influences decisions made by customers, competitors, and suppliers. This includes risk reduction, standard competition, and strategic deterrence. The final category, *opportunistic licensing of strategic misfits*, refers to nonstrategic licensing of innovations and related services that are not central to business strategy but nonetheless valuable to other firms.

Each strategic objective is described in greater detail in the sections below. Examples of many of these strategies are provided to suggest how out-licensing can be used as part of a firm's strategic arsenal to increase profitability and influence competitor, customer, and supplier decisions. The chapter concludes by placing strategic objectives of licensing in the broader context of business, technology, and intellectual property strategy.

EFFICIENT COMMERCIALIZATION STRATEGIES

Perhaps the most common objective for licensing is its usefulness for commercializing technology. The value of an innovation is maximized by linking it with other enabling technologies and employing the most efficient set of assets and capabilities for its commercialization in the least amount of time. While simple in concept, efficient commercialization spans a wide variety of alternative organizational forms and can involve the stitching together of an even wider array of technology, assets, and organizational capabilities. For example, between the historical modes of integration and patent storage alternative commercialization vehicles have emerged, and most of them rely on licensing agreements as their foundation. Joint ventures, partnering, co-development agreements, spin-offs, and franchising are some of the more complex organizational structures firms use to commercialize technology. At the core of all of these organizational forms is licensing's ability to provide access to complementary assets.

Indeed, gaining access to complementary assets is one of the strategic cornerstones of intellectual property licensing. Complementary assets are those assets and capabilities used to transform technology or innovations into revenue generating products. First described by Teece (1986), complementary assets include tangible assets and capabilities such as design, high-

quality manufacturing, marketing, distribution, support services, and capital, as well as intangible assets such as brand names and reputations. Complementary enabling technologies are also included in this list. In fact, each step in the commercialization value chain may employ one or several complementary assets and capabilities that contribute to the value delivered to the end-customer. Accessing complementary assets through organizational forms other than vertical integration can, under the right circumstances, dramatically increase profits by speeding time to market, lowering commercialization costs, or expanding commercialization opportunities that would be otherwise unavailable through vertical integration or buyer–supplier relations.

Complementary assets can be distinguished as either critical or generic. Critical complementary assets are, to some degree, unique and difficult to imitate or develop. Specialized production equipment, consumer recognition of a brand name, and distribution channels for which long-term relationships are required are all examples of critical complementary assets. Generic complementary assets, as the name suggests, are not unique and easily imitated or developed. Standard production equipment, generic product names, and distribution that is easily accessed by any firm are all examples of generic complementary assets. Licensing may be used to gain access to generic complementary assets so that the innovating firm's commercialization resources can be deployed for higher-valued projects. The general conditions under which licensing gains access to each type of complementary asset and enhances value are reviewed below.

Critical Complementary Assets

Licensing to gain access to critical complementary assets is often an economic necessity. Increasingly, global competition makes accessing complementary assets in a timely and low-cost way critical to profitable commercialization. This may be especially true for enabling technologies where today it is unlikely that any one firm will possess all relevant intellectual property rights and technology. Today, firms *from* all areas of the world are competing *in* all areas of the world. Indeed, reductions in trade barriers and the ease with which technology diffuses internationally promises a future of greater not lesser competitive intensity as time-to-market becomes the hallmark of success. Survival in the new global economy has forced many firms to focus on core capabilities and jettison complementary assets and capabilities that are not competitive or that otherwise sap resources or blur strategic focus. Alternatively, small and medium-sized firms in many instances simply do not have and never have had the requisite capabilities and assets needed to commercialize all of their innovations. As a result, firms may not possess all of the critical complementary assets they need to commercialize a new technology or may simply possess complementary assets that are high cost.

Licensing, whether out-licensing or in-licensing, provides one strategy for splicing together the most efficient complementary assets even if they are owned by different firms. In order to understand when out-licensing might be an appropriate strategy, we compare licensing to vertical integration and outsourcing.

Integration is generally favored when a firm possesses relevant complementary assets. Teece (1986), for example, describes a decision logic that predicts when a firm should integrate and when it should contract for complementary assets. Integration, he argues, is the best commercialization strategy when an innovation requires access to complementary assets for commercial success, the firm has needed complementary assets, the technology and intellectual property protection is strong, specialized assets are critical for commercial success, the innovator's cash position can support integration, and imitators and competitors are not better positioned. If any of these conditions are not met then integration could lead to high commercialization costs, long delays, low return on investment, or commercialization failure. Contracting for access to complementary assets may yield a higher value commercialization strategy when any of these conditions are not met.[1] As Teece describes it, contracting could involve licensing, other organizational forms such as joint ventures, or buyer–supplier agreements.

Buyer–supplier agreements are mostly used when raw materials, components, intermediate products, or services are relatively generic or are based on another firm's technology, core capabilities, or intellectual property rights. Supply agreements may prove to be an inefficient arrangement when suppliers have to make nontrivial investments that are specific to the buyer (for example, redeploying the specific investment would yield much lower returns) or when technology and know-how appropriation is a risk. Buyer–supplier codevelopment of a technology provides an example. Once resources are expended for developing the technology, the buyer may act opportunistically to manipulate prices, leaving the supplier with depressed returns. Alternatively, a supplier may attempt to appropriate the buyer's technology and know-how if it is not strongly protected. Additionally, other technologies might leak out to the supplier if close cooperation for commercialization is needed. Avoiding these problems may require either incentive alignment features or contractual and organizational safeguards not easily supported by typical buyer–supplier relationships.

With the limitations of buyer–supplier relationships on one extreme and the expense an opportunity cost of integration on the other extreme, there may be a wide range of technologies and circumstances for which out-licensing may be a profit-maximizing commercialization strategy. Out-licensing agreements

[1]Teece (1986) also acknowledges that in some instances, storing the technology might be optimal.

offer advantages over integration and buyer–supplier relationships in several ways. First, through licensing, firms can access complementary assets quickly so long as other firms already possess them (if not, integration may be the only alternative). Second, leveraging another firm's specific investments in complementary assets avoids costly development or duplication and can lead to economies of scale in the complementary asset(s) of relevance. Third, licensing agreements facilitate the use of two-part pricing schemes (fixed fees and royalty rates) that can be useful for optimally aligning incentives based on the commercialization risks each firm faces. Fourth, licensing agreements can include clauses that provide legal protections against misuse and misappropriation of technology (for example, field-of-use restrictions) as well as specify grantbacks when complementary innovations might be expected that may not be easily implemented in buyer–supplier contracts.

Consider, for example, a licensing agreement where the innovator licenses a technology to a foreign firm for the purposes of commercialization in the licensee's home country. Assume that commercialization requires expenditures specific to the product. A field-of-use restriction safeguards the foreign firm's specific investment by providing a legal recourse should the innovator try to free-ride on the foreign firm's investments by out-licensing, once initial success has been obtained, to other firms selling in that country. It also safeguards the innovator's investment (or licensee's investments) in neighboring countries. Without a field-of-use restriction, the licensee would not have made the investments necessary for commercial success for fear of not earning a sufficient return. Indeed, as Chapter 7 discusses, many licensing agreement restrictions provide a comparatively efficient contract-based solution for accessing complementary assets.

It should be noted, however, that because of the aforementioned contractual difficulties (such as specific investments for commercialization and weak appropriability) licensing to access critical complementary assets sometimes requires more protective and complex governance structures. Technology codevelopment agreements, partnerships, joint ventures, and strategic alliances are organizational structures that, although adding complexity and cost to licensing activities, provide additional safeguards and incentive alignment mechanisms unavailable through licensing agreements alone. These more complex governance structures are beneficial because they can align incentives, provide safeguards, and maintain relationship continuity by providing an organizational structure where firms share investments, monitor each others' investments and activities, and make adjustments to problems not anticipated *ex ante*.

Accessing Generic Complementary Assets

Commercializing technology does not always require the use of critical complementary assets. For some technologies, generic complementary assets are

all that is needed for profitable commercialization. The fact that only generic complementary assets are needed has important implications for a firm's commercialization strategy. With generic assets, a firm gains no competitive advantage over rivals by integrating into all assets and capabilities needed for commercialization. In other words, all profits, should they exist, accrue to the technology and its associated intellectual property (so long as it is not easily appropriated by others).

Out-licensing to access generic complimentary assets is relevant for two situations. First, out-licensing may be an optimal strategy when commercializing a new technology that requires only generic complementary assets so long as its intellectual property rights are strong. Strong property rights can support just about any commercialization strategy. For example, the innovator could reveal the technology and product idea in licensing discussions and extract all supraprofits through licensing without fear of appropriation. Out-licensing to gain access to generic complementary assets can be superior to integration when a firm's resources are constrained or when they can be redeployed to pursue more valuable commercialization opportunities. Out-licensing under these conditions maximizes return on investment because the innovator is not employing its own capital.

Licensing when technology is weakly protected is more problematic. A firm's commercialization strategy when intellectual property protection is weak will depend on a number of factors. For example, if appropriation is likely, the innovator may want to commercialize the technology without licensing so long as the market potential is large and some first-mover advantage is attainable. Alternatively, the innovator may out-license the technology to a firm where a long-term relationship or contractual ties from other transactions creates interdependencies between the firms. Such interdependencies will greatly attenuate the likelihood of appropriation. Another alternative is to bundle a specific technology with other desirable technologies so that the innovator can threaten dissolution of the contract by withholding more desirable technologies if the weakly protected technology is appropriated.[2] If the market and first mover advantages are not sufficiently large or if no additional safeguards are available, out-licensing a single weakly protected technology is the strategy of last resort.

Second, out-licensing can be an optimal strategy for a product that is already commercialized and produced by the innovator but where competition has changed so that the complementary assets needed to support commercial success are no longer critical. In other words, once the requisite complementary assets become generic, firms might consider out-licensing so that

[2]Of course, care should be taken in bundling technologies so as not to create an illegal tying arrangement. One way of avoiding such an arrangement is to develop know-how or complementary technology needed for commercialization for which strong intellectual property rights can be developed.

they can redeploy their complementary assets to more specific and higher-value activities. Viewed more generally, out-licensing of this type is a strategy of vertical disintegration. Firms should integrate into and develop assets and capabilities along the value chain if they provide a competitive advantage and *only* as long as they provide a competitive advantage. Complementary assets often need continual investment and updating. However, if incremental investment is done based on generic rather than specific needs, then the firm may invest unwisely and diminish a competitive advantage. Maximizing profits or return on investment may require that specific complementary assets be used only for new products and technologies. Old products and technologies that are still commercially successful but no longer need access to costly and critical complementary assets can be out-licensed. Hence, out-licensing provides an efficient and profitable strategy for firms to redeploy their critical assets to higher-valued use, thereby sustaining and possibly enhancing value.

The idea of vertical disintegration, or shifting the use of complementary assets from old products to new, touches on the idea of learning economics. Whether critical or generic complementary assets are needed for commercializing technology, innovators need to evaluate out-licensing with regard to learning opportunities. The chance to learn from commercializing technology may give greater or lesser impetus to out-licensing depending on the type of learning available and the complementary asset that benefits from it. Two types of learning are relevant.

First, learning-by-doing is an important consideration whenever there is significant opportunity to improve production processes (that is, to lower cost or improve quality), come up with new innovations, or develop critical capabilities and skills where learning can be applied to other present and future products or processes. Process industries, such as chemicals and semiconductors, are well known for the steepness of their learning curves and the ability to transfer learning from one process to another. Learning-by-doing economies, however, are not limited to production; they are found in all segments of the commercialization value chain. Building capabilities, know-how, and complementary assets and the chance of discovering new innovations may be important considerations that diminish the attractiveness of out-licensing as a commercialization strategy. Nonetheless, out-licensing is the optimal commercialization path for many technologies. Although learning is an important factor, executives should scrutinize the degree of the benefits of learning from an integration strategy as well as from other organizational structures including licensing.

Second, learning from licensees is an important consideration when licensees exploring different commercialization venues might provide new information about the technology and incremental innovations that innovator might not otherwise discover. Receiving feedback and information from several licensees can increase the likelihood of refining a technology quickly

and developing a broader variety of incremental innovations. Integrated commercialization by a single firm can severely limit the number of experimental trials, range of experiments, and sources of new information compared to those available when several firms are experimenting and trying to improve a technology. Take the situation where out-licensing provides access to customer segments that otherwise might not be reached. These customers may use products in ways that might not be considered by the innovator. Out-licensing to reach these customer segments could provide new sources of ideas for technology refinements. Innovators can use out-licensing and grantbacks as an efficient way to enhance technology development that otherwise might not have occurred. The potential for learning from licensees increases the incentive to out-license.

TECHNOLOGY AND INTELLECTUAL PROPERTY ACCESS THROUGH CROSS-LICENSING

The second strategic objective for licensing is to access technology or intellectual property through exchange. Rather than viewing technology and intellectual property strictly as a source of revenue, the strategic objective of technology access through exchange views technology and intellectual property as a currency, a bargaining chip, or a type of leverage that can be used in a negotiation process to achieve one of several objectives. Exchanging technology and intellectual property rights can serve four overlapping purposes: design freedom, technology acquisition, litigation resolution, and leverage.

Design Freedom

Design freedom is a term applied to the practice of cross-licensing intellectual property portfolios to expand design options, avoid costly design-around efforts, and avoid patent infringement-related monitoring and litigation. Cross-licensing for the purpose of design freedom is essentially an exchange of intellectual property rights—a firm grants the right to use its intellectual property but only in exchange for intellectual property rights. In some industries, like electronics, computers, and semiconductors, the number and density of patents in some technological fields are high and patent ownership diffuse. Indeed, the number of related patents is so extensive and ownership so diffuse that some products could never be commercialized unless licenses could be obtained from perhaps several competitors. It is in these industries where cross-licensing to gain design freedom is an important precursor to competition.

Cross-licensing to gain design freedom typically involves the exchange of rights for entire patent portfolios. Cross-licensing patent portfolios for the

purpose of gaining design freedom is not a new idea; the practice has existed for many years, although the particulars of the agreements have changed over time. For example, open-ended agreements with survivorship rights used 20 years ago in the semiconductor industry have evolved into agreements with comparatively short durations and no survivorship rights.[3] Negotiating portfolio cross-licensing agreements can be problematic because portfolios may differ in size, quality, and value. Some large firms in the electronics, computer, and semiconductor industries have resolved this problem by evaluating differences in aggregate quality and value of property rights in the exchanged portfolios. Differences in portfolio value are compensated by a one-time up-front payment sufficient for the duration of the cross-licensing agreement. Payments are based on negotiations between the cross-licensees. Royalty rates typically are not a component of these agreements. At the end of the agreement's term, portfolios are revalued and payments renegotiated if the cross-licensees wish to continue the agreement.

Cross-licensing patent portfolios economizes on a number of costs. Negotiations are undertaken only at the beginning of the licensing period rather than each time a license is needed. Cross-licensing portfolios for fixed duration greatly reduces the high transaction costs that would characterize the repeated nature of an as-needed cross-licensing approach. Further, monitoring products for potential intellectual property violations and litigation are obviated.

The opportunity to cross-license patent portfolios to gain design freedom can have important implications for a firm's R&D investment strategy. Firms with large patent portfolios and overlapping markets are the ones most likely to engage in portfolio cross-licensing. Firms with small portfolios may not have patents of sufficient number, quality, and value to act as exchange currency with firms with larger portfolios, thereby making cross-licensing a potentially expensive proposition if a negotiated exchange is feasible at all. This difficulty might be counteracted by an R&D policy that emphasizes either the patenting of all innovations even if they are outside of the strategic focus of the firm in order to increase the portfolio's size and value or directed research to patent technologies that are valuable complements to other firms' patent portfolios. Patenting for the express purpose of developing currency for cross-licensing may be one way of not only gaining design freedom but doing so inexpensively.

Technology Acquisition

A second objective for cross-licensing is to use technology and intellectual property to acquire other firms' technologies and intellectual property rights by exchanging one set of technology and property rights for another. Tech-

[3]A five-year duration is common.

nology acquisition is an objective similar to design freedom except that the former may include the exchange of know-how and ongoing support while the latter is concerned solely with the exchange of intellectual property rights. Technology acquisition also tends to focus on a small number of technologies rather than on entire portfolios.

A distinguishing feature of cross-licensing for technology acquisition is that it is done on an as-needed basis. That is, firms attempt to enter into a cross-licensing agreement when they need the right to use another firm's technology and intellectual property rights. The agreement is predicated on the contemporaneous need by two firms of each other's technology and patent rights. The absence of contemporaneous needs makes the use of cross-licensing agreements to access technology problematic.

As-needed cross-licensing agreements may pose special problems because of their discrete nature as compared to portfolio cross-licenses. Examples of cross-licensing difficulties can be found in large firms where divisional structures and dispersed divisional ownership of patents may constrain licensing negotiations. One intellectual property executive for a large diversified chemical company explained that cross-licensing negotiations can easily break down if one operating division supplies a patent for cross-licensing and another division within the same firm receives the exchanged technology and intellectual property. Differences in opinion over an intellectual property's value and difficulties associated with setting internal transfer prices makes cross-licensing in these situations problematic. The executive explained that when these situations occur, technology exchange is best organized through individual licensing agreements whose independent value can be determined without the added burden of intradivisional politics. The exchange would proceed only if each individual license makes sense.

Litigation Resolution

It is not uncommon to find competitors with overlapping intellectual property right claims. Whether a matter of happenstance or strategic maneuver, legal disputes that arise from conflicting intellectual property right claims are often lengthy and costly. Claims and counterclaims attempt to invalidate the other's patents while invoking antitrust laws. Although no statistical data is available, personal observation suggests that many of these disputes end in cross-licensing agreements either because such agreements are forced upon the parties by the court or because they stop spiraling litigation costs.

Litigation concerning conflicting intellectual property right claims has several strategic implications. First, realizing that granting cross-licenses may be a likely litigation outcome, firms could negotiate a cross-license to avoid costly litigation and the detrimental impact that litigation risks can

have on financing activities. Second, a firm attempting to access a particular technology might attempt to develop technology patents, similar technology, or conflicting intellectual property right claims with the intent of entering a litigious dispute.[4] Third, realizing that competitors might attempt to gain access to a firm's patents through litigation, a firm might attempt to secure its intellectual property position through a thicket of patents.

Leverage

Another use of intellectual property as an exchange medium involves exchanging intellectual property for tangible goods or preferential pricing. For example, one chemical manufacturer decided to cease production of an intermediate commodity and purchase it from an outside supplier instead. The supplier was the largest producer of the commodity and the manufacturer quickly became its largest customer. Such a buyer–supplier relationship can be problematic as each side attempts to use its power to influence pricing. Rather than disbanding the research team that supported the manufacturer's production of the intermediate good, it continued investing in research and developed a technology protected by intellectual property that was of great value to the supplier. A license for the intellectual property was used as leverage to acquire and safeguard a low price from the supplier. This case suggests that intellectual property can be used as leverage to gain preferred pricing or perhaps an exchange for other tangible assets. R&D can be an inexpensive strategy to earn handsome returns by using its output, intellectual property, as an exchange medium of partial payment for purchases. Although included as part of the section looking at the strategic objective for licensing as part of an exchange vehicle, as shown in the next section, leverage also can be thought of in terms of strategic interactions.

STRATEGIC INTERACTIONS

Out-licensing can be used to interact strategically with investment and purchasing decisions by customers, suppliers, and competitors to expand, and in some instances to create demand for a new technology. Out-licensing to influence decisions made by other actors has three main objectives: risk reduction, standards creation, and strategic deterrence. While they are discussed separately here, the objectives are not mutually exclusive; a successful licensing strategy sometimes encompasses several, if not all, of the objectives.

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[4]The timing of such a strategy is likely to be critical. Obtaining an overlapping patent several years after the first one is granted may not succeed. In general, the tactic may be inherently limited.

Risk Reduction

Out-licensing can expand and create demand for a new technology by reducing customer and supplier adoption risk. Three types of adoption risks are relevant: price gouging, quality gouging, and supply disturbances. Price gouging can occur when a customer or supplier is locked into a particular product because switching costs would be prohibitive. Although promises might be given (even through contracts), once they are locked in suppliers may find ways to circumvent their promises and opportunistically increase price. Only the magnitude of the switching costs buyers must absorb to change suppliers constrains such opportunistic actions.[5] Customers, realizing the potential of opportunism, might not adopt the product unless producers find a credible way of keeping their promises. Farrell and Gallini (1988) have pointed out that out-licensing a technology provides a credible commitment by an innovator to abstain from price gouging, because licensees provide market discipline against *ex post* opportunistic price increases.

Quality gouging is a hazard similar to price gouging and again is problematic when customer and supplier switching costs are nontrivial. While contracts might be relatively complete for safeguarding against price gouging, they often are relatively incomplete when specifying quality. Consider an innovator that creates a new widget for which a patent has been obtained. A customer who designs and produces a product containing the widget is locked into the widget supplier to the extent that designing around the widget and altering its manufacturing is costly. A long-term contract might protect the customer against price increases but not against the supplier lowering quality and saving on production costs. Shepard (1987) has argued that customers recognize the risk of quality gouging and will reduce demand or forgo purchasing the product altogether to avoid being gouged on quality. Shepard has shown that like the aforementioned commitment to abstain from price gouging, out-licensing is one mechanism an innovator can employ to credibly commit to abstaining from *ex post* opportunistic quality gouging. Out-licensing reduces the risk of opportunism and thus can increase demand for a technology.

Supply disturbances are a third source of risk for customers and suppliers that must confront nontrivial switching costs once a technology is adopted. Relying on a single supplier for a product can be disastrous for an assembler or intermediate goods producer when there is a discontinuity in supply. Especially during the past decade when many firms have implemented just-in-time production systems with little or no inventory, unanticipated production line shutdowns can impose excessive costs on an

[5]Opportunism can occur in both directions. For instance, a buyer may act opportunistically once a supplier has made specific investments. In this case, a supplier's switching costs rather than a buyer's switching costs are critical for constraining opportunism.

assembler, and its production and distribution can grind to a halt if critical components are unexpectedly unavailable. Out-licensing provides a safeguard against supply disturbances by offering lower probabilities that all suppliers would experience supply disruption simultaneously. Unless a safeguard such as out-licensing a second source is offered by the innovator, customers may choose a different, potentially less advanced technology in order to avoid possible supply disruption risks.

In general, out-licensing can be used as a strategy to increase, and in some instances create, demand for new technologies. Out-sourcing can be viewed as a credible commitment mechanism that forces the licenser to abstain from *ex post* price and quality gouging and to provide insurance against supply disruptions. Commitment and risk reduction also play important roles in establishing technology and products as standards, as is next described.

Standards Creation

For many products and technologies creating a standard is vital for commercial success, and out-licensing is a pivotal instrument for creating a standard (Grindley, 1995). Standards are particularly important in markets that display what economists call network externalities. Network externalities occur when a product is more valuable to a consumer when more consumers adopt the same or compatible products. Benefits can be both direct and indirect. Take the Internet as an example. The more people who have access to the Internet the greater the direct benefit to individuals using it. For instance, I get more benefit from communicating via the Internet if my friends also are connected. Also, the greater the number of users the greater the indirect benefit from more offerings of complementary products with greater variety (prices may also become lower as the market expands).[6]

Creating a standard is a coordination problem that requires (sometimes simultaneously) adoption by customers, suppliers, complementary product suppliers, and, occasionally, competitors. Out-licensing can solve the coordination problem in several ways. Out-licensing can influence customer expectations. Given two or more equal alternatives, customers will gravitate towards products with the lowest appropriate risks (as described in the section on risk reduction). Even when a proprietary product has clear superiority advantages over a rival out-licensed or open standard product, the inferior product may win.[7] Suppliers of complementary products are similarly swayed. For example, as Microsoft's Windows clearly became the dominant personal computer interface, Apple Computer began having difficulty con-

[6]In the short run, a tidal wave of new Internet users may impose costs on existing users because of slow response times, the equivalent of Internet traffic jams. In the long supply of services should catch up to customer demand.

[7]See Grindley (1995) for a more detailed discussion.

vincing independent software vendors to write or update software products for its computers.[8] Out-licensing also can limit some commercialization risks by shifting investments a firm might otherwise have to make alone to competitors (licensees) who share the risks.

The creation of a standard does not require out-licensing as an integral part of a firm's strategy to get its products adopted as a standard. IBM's introduction of the 360 mainframe offers the classic example of a firm that created a de facto standard without the use of out-licensing. IBM developed the computer, the software, and all the peripherals, and it provided service as well. Without integration, it would have been far more difficult for IBM to have coordinated the simultaneous introduction of the full complement of products that contributed to the 360's success. The market dominance of Microsoft's Windows offers a more recent example of a product that has become a de facto standard without out-licensing its technology to other competitors.[9] Nonetheless, out-licensing is often a critical strategic instrument. Even though Microsoft is the celebrated victor of the PC desktop interface wars, many industry observers argue that even as late as 1991, Apple could have been the heir apparent if it had out-licensed its operating system. With competitors attempting to make their products and technology a standard, the timing of market entry and the speed at which an installed base is built up is critical.[10] Out-licensing can greatly hasten the adoption of a standard and could combat the growing dominance of a competitor. As typified by Apple, choosing not to out-license could be a serious strategic miscalculation.

Several out-licensing tactics that are integral to reducing risk also could be employed to encourage standards adoption. Three key tactics include out-licensing to key suppliers, open licensing, and assignment of a licensing program to a standards-setting body. Sun Microsystems (SMI), for example, implemented a highly publicized strategy employing all three tactics. It out-licensed its microprocessor (MPU) designs, which encouraged several semiconductor manufacturing firms to adopt and proliferate its MPU designs, thereby allowing it to use its capital for other purposes while insuring low manufacturing prices for its MPUs. It out-licensed information exchange protocols, which helped to place SMI at the center of today's move towards networked computing. Finally, it has participated in standard-setting bodies

[8]One might argue that Apple's partnership with Motorola and IBM and its shift to the Power PC microprocessor was an attempt to counteract problems it has been having with independent software vendors by expanding the market.

[9]This is not precisely true. Microsoft licenses Windows to personal computer manufacturers so that PCs are sold with Windows installed. However, licensing of this nature has more to do with copyright protection than patent protection.

[10]Many researchers have investigated standards competition. For reviews of the theoretical literature see Bensen and Johnson (1986) and Bensen and Saloner (1987). For an applied discussion see Grindley (1995).

to get the industry to adopt some elements of its technology. These strategies were critical to SMI's rapid growth and financial success in a highly competitive business segment.

Firms profit in several ways from out-licensing to create a standard. Should a firm succeed in creating a standard the market would greatly expand, allowing the innovator to operate profitably even when it has rivals and to profit from licensing fees. In markets where technological change and innovation is ongoing, the innovator might be able to use its first-mover position to advantage by providing new innovations and thereby retaining a large market share. An innovator that fails to get its technology accepted as a standard when network externalities are present will be relegated to the periphery of the market if it survives at all.

Strategic Deterrence

Several researchers (Gallini, 1984; Gallini & Winter, 1985) have studied the use of out-licensing as a strategic mechanism to deter competitors from investing in innovative activities that might lead to superior technology. Gallini (1984), for example, argues that an incumbent firm, when confronted by a small number of potential entrants, might license its production technology to reduce the incentive of potential entrants to develop their own, possibly better, technology. In other words, situations might arise whereby deterrence is achieved by inducing entry.

While out-licensing for the purpose of strategic deterrence and the maintenance of a dominant market position may draw antitrust scrutiny, Gallini's model predicts that wasteful research and development from simultaneous work by rivals may be lessened by out-licensing, because a firm has an increased incentive to wait for a possible offer to share a technology discovered by its rival. Gallini and Winter (1985) developed a model that shows that deterrence depends on the cost differences between firms. They claim that out-licensing encourages research when firms have similar costs and discourages research when firms have costs that are far apart. Thus, the ability for out-licensing to strategically deter competitors will depend upon relative cost positions. It is important to note that using out-licensing for strategic deterrence may invite antitrust scrutiny but should not be per se illegal from an economic standpoint, because in some instances social welfare is enhanced.

STRATEGIC MISFITS

The moniker of strategic misfits is given to the fourth and last licensing objective. As the name implies, it refers to those technologies and intellectual properties that are inconsistent with a firm's product market focus. Strategic

misfits are the byproduct of the innovation process. Even the most targeted research and development efforts have spillovers that lead to unintended innovations. Also, R&D is not the only source of innovations. Customer feedback, learning-by-doing, and serendipity can lead to innovations that are inconsistent with a firm's strategic focus.

An important question for a firm is what to do with these strategic misfits. Should these innovations be ignored, not patented, or put in the public domain to preempt competitor patenting? Or should these innovations be pursued at least to the stage of generating strong-enough intellectual property rights so that they can be out-licensed?

Examples of firms following either strategy can be found. Firms that follow the first focus all of their intellectual capital on generating only those innovations that fit with their existing business plans. These firms tend to be in fast-paced technology industries such as electronics, computers, and semiconductors. Although leaving fallow innovations or potential innovations outside of a firm's strategic focus forgoes income opportunities, it also reduces the additional expenditures needed to acquire and maintain intellectual property rights and eliminates losses from research efforts that defocus the firm's strategic technology direction.

Firms that follow the second strategy use out-licensing as a means of capturing value from technological spillovers. Many industries require R&D efforts that are broad in scope. Broad research programs lead to a broad set of possible innovations even though only a few may lead to commercialization. Indeed, one large U.S. chemical company claims to rely on only 3 to 5 percent of its patent portfolio to support its current businesses.

Unfortunately, the jury on determining which strategy is best is still out. It is likely that the optimal strategy for handling misfit technology will differ by industry and perhaps by company depending on the nexus of business, technology, and intellectual property strategies it employs. Consider the differences found between the electronics and chemical industries. Electronics manufacturers such as Hewlett Packard operate in markets with very short product life cycles. A technology must be developed and brought to market quickly or it will become outmoded sometimes as quickly as 18 months after it is first conceived. The nature of the technology is such that research and development can and must be focused on specific technology trajectories. Undertaking significant efforts to develop, protect, and out-license strategic misfits may be misguided, because there may be few of them and the resulting reallocation of research efforts may ultimately slow innovation in strategic areas. Chemical manufacturers such as Dow Chemical Company face the opposite conditions. Broad R&D activities often are needed to identify new chemical compounds, making technological spillovers a frequent occurrence. Product life cycles are much longer than in the electronics industry and expending effort and resources to protect a

broad set of technologies may have little defocusing effect while, at the same time, generating new opportunities for income. Undertaking significant efforts to develop, protect, and out-license strategic misfits may be an optimal strategy for maximizing profits in this industry. Indeed, in some instances the profit-maximizing strategy may be to link technology strategy with intellectual property strategy with the purpose of generating technology that can be out-licensed.

DISCUSSION AND SUMMARY

This chapter synthesized licensing activities into a four-part taxonomy of strategic objectives. The taxonomy encompasses efficient commercialization, technology and intellectual property access through cross-licensing, strategic interactions, and opportunistic licensing of strategic misfits. Under efficient commercialization, in-licensing as well as out-licensing may provide the most efficient commercialization path by providing access to low-cost complementary assets or to assets that the innovator does not possess and would find purchasing or creating extremely costly and/or time consuming. With technology and intellectual property access through cross-licensing, licensing is used to neutralize potential blocking patents, to eliminate the need for design-around costs and delays, and to gain access to critical technology (and sometimes raw materials) for low cost. Licensing with the objective of influencing decisions made by customers, competitors, and suppliers as a means of creating a standard or expanding demand represents a strategic interaction. Finally, opportunistic licensing of technology and intellectual property that is not strategic to an innovator but valuable to other firms can be used to increase returns on R&D investment. This taxonomy spans the range of strategic objectives that can be served by licensing activities.

Historically, it was not uncommon for firms to pay little attention to licensing. Licenses, when they were granted, often were the result of the innovator reacting to an inquiry from another firm. Firms simply did not consider licensing a tool in their strategy toolbox. Thus, many valuable and strategic licensing opportunities were laid fallow and lost as technology became outdated or intellectual property rights expired.

The fundamental message of this chapter is that licensing can no longer be thought of as a peripheral activity. It maintains that the strategic use of licensing greatly expands the alternatives firms have for profiting from their technological innovations and intellectual property. Not only does licensing open up new profit making opportunities, but remaining competitive in today's global marketplace may demand that firms adopt strategic objectives only achievable through licensing. Indeed, those firms that do not fully ex-

ploit their technology, intellectual property portfolios, and innovation capabilities may not only limit their profitability but also decrease their chances for long-term survival.

This is not to say that firms should license out all technologies or that licensing should be the focal point of a firm's business, technology, and intellectual property strategies. Taken to an extreme, licensing may limit a firm to the role of a contract research center, ultimately destroying the value of its complementary assets and narrowing its set of core competencies. While a small number of firms can operate in this niche profitably, it is not the optimal strategy for most firms. Indeed, developing complementary assets and core capabilities and using them to commercialize innovations is likely to remain the most profitable strategy for many firms. Nonetheless, licensing can play an integral role in creating and capturing value.

In today's competitive environment it would be unwise for firms not to consider the strategic options made available to them through licensing. Licensing clearly intersects the nexus of business, technology, and intellectual property strategy. Firms that consider licensing proactively expand the range of commercialization strategies and can lower commercialization costs or expand market demand. Licensing thus broadens the business strategy alternatives available to a firm. Recognizing that technology can be licensed in or out can influence a firm's investment decisions. Why expend scarce resources re-inventing or inventing around a technology available through a license or cross-license when those resources might be better spent on developing technologies that are key and strategic? Thus, the identification of licensing alternatives and cross-licensing opportunities is an important factor to be considered in a firm's technology decisions. Furthermore, intellectual property strategy used to be a binary choice—patent every innovation or patent only those innovations with large expected values. Competitive analysis of a firm's patent portfolio vis-à-vis competitors and potential competitors for the most part was unimportant. By considering licensing, intellectual property strategy becomes multidimensional, requiring ongoing competitive analysis in order to inform both business and technology strategy. Firms must continually monitor competitor technology trajectories to identify changes in its patent position, provide input into the commercialization process about organizational options and other advantages gained through licensing, and recognize opportunities to lower costs or capture value by culling or licensing unnecessary intellectual property.

It is likely that the high-performing firms in the year 2000 and beyond will tightly link business, technology, and intellectual property strategies. Licensing is a tool that provides greater alternatives, opportunities, and flexibility to firms for gaining competitive advantage and capturing the full value of their innovations and intellectual property. The challenge for management is to make the transition from reactive licensing to proactive

licensing by modifying its internal management and planning processes so that licensing can take its appropriate place in their firm's strategy toolbox.

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