Figuring the Dollars in Negotiations

BY DANIEL C. MUNSON*

Economic analyses that can benefit both parties in a license negotiation; risks and rewards for both parties are considered

Many factors can influence the negotiational process of licensing technology, and many texts and articles present a long list of such factors. Discussions of the simple economics that apply have been relatively scarce, however. Such a discussion, hopefully complete with the needed qualifiers and caveats, is offered here.

The analysis will focus on the placement of risk, both technological risk and business risk, at each stage of the negotiational process. A series of hypotheticals seeks to illustrate these different levels of risk, and a simple method is offered to begin thinking about the proper compensation that might be accorded the contracting parties for taking on these risks. In addition, the principles discussed are also applied to the licensor's decision as to whether an exclusive license should be granted or whether a general offer of a nonexclusive license should be pursued.

Guidelines are presented here, general principles. Certain methods of accounting, certain rates of discounting are discussed, but none of them is endorsed as somehow fundamentally correct. Certain licensing negotiations can be heavily influenced by factors that are not discussed here. The general principles of economics and finance in a free society are immutable, however, and a simple discussion of how they might apply to technology licensing and intellectual property valuation might be useful.

The following is not written to the economist but to those industrialists and commercial law attorneys who seek some simple principles which might help them begin thinking about these matters. The mathematics used are in the favored industry form, and the mathematical details have been kept simple. They are used for purposes of illustration and not to promulgate any new economic theory.

BACKGROUND

Practical guides on the subject of patent and license valuation have been relatively scarce. Guidebooks are either too general to provide a concrete analytical framework or mathematically too complex to be of use to the contracting parties. Some sort of middle ground, laying out the general considerations but also supplying some analytical starting points, if offered here.

One of the problems faced by economists and theoreticians who wander onto this subject is the wide variety of considerations that apply in valuing intellectual property or setting licensing royalty rates.[1] Situations can be imagined that are simple to analyze, but in practice these ideal situations are seldom encountered. For instance, the value of a patent covering a cost-saving innovation capable of lowering the manufacturing cost of a good with a known, relatively fixed market demand can be easily computed. Patentees and manufacturers interested in employing the advance can readily compute the potential savings. Still, the total savings can seldom be known precisely because total demand usually depends on price. There is always doubt as to the validity of the patent and the claims made therein. Further, the partitioning of these "savings" between the parties is not obvious: Who should realize the greater share, the party with the new idea, or the party willing to commit capital to try to commercialize it?

Most real-world situations care more complicated: advances making possible new products with uncertain market demands, advances requiring new capital equipment of unknown reliability. Hanging over all these economic uncertainties are more nebulous technological "culture" factors: the desire on the part of certain firms to remain at the forefront in certain fields, technical staffs that are interested and eager to implement a certain new advance to perhaps "make their mark" in a new field. Some firms may see much broader technical potential for a certain advance than that envisioned by the licensor. It is simply impossible in most instances to say that a patent or invention has a certain economic value,[2] if only because a given license or royalty contract is never equally appealing to all industrial concerns. Valuation, and the process of negotiating technical licenses, is fact and party specific. Value here is truly "in the eye of the beholder," and cynics of the Oscar Wilde variety should be ignored.[3]

1. *e.g.*, *Chemical Engineering*, April 20, 1970, at 117: "How do you set royalties?" This question is asked at most meetings on licensing and is universally avoided because of its complexity. Quite often, the answer is 'Charge as much as you can get.' "

2. *Chem. Eng. Progress*, Vol. 68, No. 2, at 42: "[N]either I, nor anyone else, can provide a universal formula for determining the value of a license."

3. "What is a cynic?" one of Mr. Wilde's characters asks rhetorically in *Lady Windemere's Fan*. "A man who knows the price of everything, and the value of nothing."

*Intellectual Property Manager, Rockwell International Corp., Newport Beach, California; *reprinted with permission. Originally appeared in Patrick Sullivan's "Profiting From Intellectual Capital (New York: John Wiley & Sons, Inc. 1998, pp. 129.*

Rather than throw up our hands and offer the parties only a few general guidelines, it does seem possible to set out the financial factors that would be influenced by these different levels of risk and uncertainty. There can be no substitute for an intimate knowledge of the usefulness of the advance in question to the negotiating parties, but there might be some benefit to a quick review of some simple principle that might guide the decision-making process and the negotiations.

A FINANCIAL APPROACH

The general approach taken here will be to use the standrd capital recovery, discounted cash flow mathematics favored by business people the world over. We will start with a simplistic fact pattern and outline the financial factors that might be involved in analyzing this simple situation. Armed with these factors, we will change the fact pattern to add levels of complexity and uncertainty. With each addition we can suggest how these changes might influence the valuation process. In no way can we propose to outline all the factors that might permit a definite solution to the question of what a certain patent or license is worth. We can only hope to raise questions the interested parties should try to answer themselves. Again, valuation is very fact specific.

Our simplistic situation, our starting point, involves the negotiation for the exclusive right to use an implicitly valid "niche" patent. By "niche" we mean a patent of interest only to a single firm interested in producing a specific good for which there is a somewhat fixed total demand. This simplifies things in a number of ways. First, the licensor need not consider making available a general "royalty" contract initially because only this single firm is interested. Second, total value is easier to compute when total demand is not strongly dependent on price. Both of these conditions are violated in nearly every instance, but they at least get us started.

The core issue for both parties in this negotiation is the economic value of the advance under discussion in the hands of the licensee. This is where the value is created, and it is also why the valuation process is so fact-specific. Licensees are interested in employing their capital, and this capital base is endlessly variable. Even two companies with the same physical capital in the same business and making the same generic products will deploy their capital differently, have different levels of utilization and therefore different levels of interest in employing this new idea. Human capital also differs markedly between firms. Even within commodity-type industries, some companies more actively look to implement new technology, while others wait for their competitors to "prove out" new advances.

In the case of a "niche" patent or advance of limited industrial interest, it is critical that the patent owner or licensor approach their valuation analysis from the point of view of the licensee. An obvious enough point, but there are certain subtle reasons for this. First, the analysis will determine the amount of money that is "on the table." Licensees will readily compute the total profits they might realize through use of the advance, and they have no interest in communicating this quantity to the licensor, so the licensor is well advised to make an independent investigation. Second, every risk the licensor agrees to take along with the licensee should be reflected in the licensor's share of this money on the table. Recognition of these risks will improve the licensor's bargaining position.

Many texts suggest that an important consideration in license negotiation is the time and money expended by the licensor in developing the advance.[4] This is valid enough in many cases where development was undertaken with the encouragement of the licensee. In an arms-length transaction, however, these costs are not strictly relevant.[5] If the developing firm spent a million dollars perfecting an advance whereby manufacturers can save perhaps a dollar per unit in producing a product with a worldwide demand of only 1,000 units per year, the development time and money expended has simply been misplaced. This is not licensee's problem. This sort of completely misplaced development effort seldom occurs, of course, but in this discussion it will be useful to remember which party bears which risks at any point in time. Absent any agreement regarding the splitting of development costs, etc., the monies expended in development are not the responsibility of the interested licensee.

Licensee's interest in the technology, its general technical capabilities, equipment, current product offerings, distributional capabilities, all can enter into licensor's estimate of valuation. The factor of most interest should remain this potential marginal benefit to licensee's business of implementing the advance. Licensee will not be free with such economic information during negotiations, feeling the less licensors know about these benefits the less likely they are to ask for them. It is for this very reason, however, that it is clearly in licensor's best interests to estimate them.

These benefits should include any and all effects that might find their way to the "bottom line" of licensee's profit statement, both during the period covered by the agreement and even for some period afterward if benefits of the agreement might still be expected to be realized by licensee. These benefits can come in many different forms. Rather than list examples of the various forms of such benefits, any such list being woefully incomplete, and most of which are more a matter of creative cost accounting, it might be more instructive to analyze four generic situations that differ not so much in the nature of the benefits but in the

4. *e.g.* EINHORN, PATENT LICENSING TRANSACTIONS (1993), Section 3.01.

5. *Drafting License Agreements*. Epstein and Politano, 2nd Ed. (1994). Section 14.03: "An argument sometimes raised by a proprietor when it is offering an invention for license is that it has expended enormous time, effort, and money to create and develop the technology involved. A realistic counterargument is that these are sunk costs to the licensor that are irrelevant to the licensee, who is only interested in the future profitability the technology is likely to generate."

degree of uncertainty involved in their realization.

The most generally accepted financial mathematics will be used. The accounting structure of a license agreement is quite simple in principle. Consideration is given to licensor in exchange for rights to use the technological advance, and contractual terms may dictate future payments that are either fixed-dollar amounts at certain intervals or are in some way proportional to unit sales or dollar sales of the goods employing the advance. The more interesting side of the ledger is the invisible side, the benefits side accruing to licensee in the form of the saving of production costs, realization of additional sales, additional pricing power, etc. This is where the full benefits of the transaction can be seen and compared with the other, very visible side of the ledger.

Licensor should always attempt to trace these invisible benefits into monetary quantities, dollar benefits per unit time. The saving of production costs, the ability to charge a premium price are all capable of translation into cash flows. We have discussed certain other factors not precisely capable of such direct translation: licensee's interest in remaining a market leader, etc., and a licensor should keep these in mind, but as a first step licensor must make sure to know what the technical advance is worth in cold economic terms. Again, some creative accounting may need to be done to fully capture these benefits, but accountants and engineers have shown an ability to recognize even very indirect benefits traceable to the use of new technology.

Our approach here is more financial than economic, and financial analysis generally attempts to quantify these total benefits by "discounting" these periodic cash-flow benefits in the following manner.[6]

$$\textit{Total Benefits} = B_0 + E\,\frac{B_j}{(1+i)^j}$$

where the B's represent the series of monetary benefits[7] accruing in each time period, the j's the time periods (usually intervals of a year), and the i's the discounting-, or interest-rate. Discounting is done to account for the "time value of money," the cost of foregoing other uses of the capital employed. To illustrate how this simple expression might be used, we will examine four different situations of increasing complexity and uncertainty, and see how the mathematics would change.

FOUR HYPOTHETICAL SITUATIONS

The first situation concerns a licensed advance that offers the fairly certain prospect of reducing manufacturing costs for an item the licensee already has developed into a reliable business. No significant changes to the production operation, no significant capital costs, are needed to implement the idea. The product embodying the advance will not appreciably change.

The benefit to the licensee in this case is easy to quantify. If sales are currently 1,000 units/year and the licensed technology can save licensee $1/unit, the savings in the first year will be close to $1,000. If sales are expected to increase by 5% a year (by virtue of general economic growth) and if the term of the proposed agreement is five years, the terms in the numerator in this series are easy enough to compute:

$$\$1{,}000 + \$1{,}050 + \$1{,}103 + \$1{,}158 + \$1{,}216$$

The discounting of these future benefits, the terms in the denominator of our simple series, involves a more sophisticated set of considerations. Discounting is done to reflect what economists call the "opportunity cost" of any given action, which means the cost of not doing something else of a roughly equivalent nature with the time and money and effort expended. In this context it means foregoing other cost-saving alternatives or similar projects of an equally uncertain, risky nature.[8] We have posited here that the proposed cost saving alternative is easy to implement and the effect on total production costs fairly certain. If we assume the license offered is an exclusive license, we know that other companies in the business of producing the same item will not realize these savings and therefore downward price pressures will not change the actual savings estimated.

In a situation such as this, where the planned benefits can be fairly certain to be realized over the period of the license, the discounting should be mild, perhaps only reflecting the low-risk time value of money, say 1.05-1.07 per year.[9] Using a 6% rate, the discounted yearly benefits would be as follows:

$$\$1{,}000 + \$990.6 + \$981.2 + \$972 + \$962.8$$

Changing the situation only slightly, suppose the innovation offered in the license presents the prospect not of lowering the production costs of an existing product but of improving the product in a way that might permit the good to sell at a premium. Suppose we assume the premium is $1/unit, current sales are 1,000 units/year, and unit sales of the good priced up by $1/unit will increase at 5% per year. The terms in the numerator would then be exactly the same as in our first example.

In terms of risk, however, a number of things have changed: First,

6. G. THUESEN AND W. FABRYCKY, ENGINEERING ECONOMY, 6th Edition (1984), p. 35-50, 138-143. The mathematics described here, however, can be found in a more familiar form in most standard financial texts, *e.g.* R.D. IRWIN, THE STOCK MARKET (1973), p. 115-120.

7. By benefits we mean the revenues attributable to the licensed technology in excess of any expenses, direct or capitalized, incurred to implement the new technology. The decision as to how to allocate these expenses is a matter for the individual decision-maker and the accountants.

8. R.D. IRWIN at 112: "The appropriate rate for each investor in discounting the expected stream of earnings or dividends [in our case, benefits] is the opportunity cost of making the investment, *i.e.*, the expected rate of return on alternative assets of similar riskiness."

9. It might be argued that standard business risks are encountered in this example, justifying a higher discounting factor, perhaps 8%–10%. We are concerned in this example, though, with the marginal risk of employing the licensed technology, not with the total project. Licensees in this hypothetical are already taking most of the standard risks (manufacturing, distribution, inventory) when they choose to employ the licensed advance. The marginal risk involved in employing the licensed technology therefore should not involve these risks already assumed.

the ability of the goods to sell at a premium is somewhat speculative when compared with the first example, where the licensees merely assume they can sell the goods for the price and in the quantities at which they are already successfully being sold. Second, the rate of growth in total volume can never be known because this is a new product without a track record of yearly increases. The $1 premium may be conservative or it may be wildly optimistic, the volume growth might be slower than that of the generic good or it may be much faster. All this is by way of saying that the entire venture is more speculative than our first situation, and future profits more uncertain. However, if we do not really expect year-over-year unit volume growth to be any better than 5%, and we discount using a discounting factor of 1.08 to reflect this greater uncertainty in these future cash flows,[10] our five-year license will have a present value less than that in our first example:

$1,000 + $972.2 +$945 + $919 + $893.4

The third situation that might be useful to consider is one in which a new product idea offered by the licensor is a good fit with the capital equipment and technological expertise held by the licensee. The product idea, while new, involves process and/or sub-assembly equipment or techniques with which the licensee is very familiar. Licensee likes the idea, wishes very much to investigate all new ways in which the firm's capital and expertise can be employed most profitably.

Licensee's expertise and existing equipment actually serve to lower the risks otherwise involved,[11] but the risks are still significant. New product introductions always entail risks: the risk the product will not work as intended, or the product will not find a ready market due to alternatives the target customers feel are superior, or production difficulties, distribution errors, or the possibility the product will be improved upon by others. These are examples of various risks entailed in any new business venture, and they require that the pricing of the new product compensates the risk-taker.

Using our discounting format, we might assume initial volume estimates of 1,000 units per year, this time using year-over-year volume growth estimates of 20%, a fairly standard growth rate for a truly new product in its formative years. Recall that no extra capital equipment is needed, and that using some assumptions about the age and the fixed and variable-burden rate of the labor and equipment necessary, a sales price of $10/unit is considered practical and necessary to cover the $7.5/unit of expenses that can be allocated to the production of the 1,000 units. Now assume that the risk involved in this project is such that alternatives to the use of the capital involved of equal risk exist and would generate returns of 10% per year. In most cases, this involves analyzing the returns that could be realized by continuing to use the equipment in the same way it is being used now. This higher risk discounting results in discounted profits as follows:

($10 − $7.5/unit)(1,000 units) + $2,727 + $2,975 +$3,246 + $3,541)

It should be pointed out at this juncture that many other considerations other than simple five-year cash flow should enter the analysis. Unpatented technology cannot be strictly controlled by the licensor, and therefore a five-year contract will allow licensee to develop considerable goodwill and possibly even trademark recognition in the licensed product, with or without the actual licensed advance. This goodwill would remain with licensee after five years if trademark licensing is not part of the contract,[12] and profits associated with the project would continue for some period after the contract expires.[13] Again, recognition of all the possible sources of profit constitutes much of the gamemanship on both sides of the negotiation.

One more example. Suppose licensees have only interest and expense to apply. They have no related manufacturing business, no existing plant and equipment capable of use in exploiting the idea. Indeed, let us assume that the interested potential licensee is not unique in this regard, that the equipment thought necessary is not generally available. Often the analysis of this situation has already been done at the time the licensor enters negotiations with potential licensees because licensors' first thoughts concerning commercialization usually involve doing the production themselves. They have already looked at the capital outlays necessary and estimated the profit margins possible. They are interested in licensing because the barriers — financial, logistic — to their commercializing the idea are so formidable.

This situation, employing new capital to produce a new product, is clearly the riskiest of the four situations. The profits can be estimated based on certain hypothetical sales prices and using cer-

10. A higher discounting factor is justified on an opportunity cost basis. Other projects of an equally uncertain nature can then be compared, and these projects can in turn be compared with projects whose cash flows are either more or less risky, but changing this discounting factor accordingly. Every rational investor who looks at a series of projects with exactly equal undiscounted future cash flows would always choose the least risky, least speculative project. This would then be the project with the largest discounted cash-flows.

11. Indeed, the natural attraction of the two parties in this situation illustrates the salutary economic benefits of these sorts of contracts. Licensor avoids the large-scale production and commercialization problems they do not want to take on, but by contracting with licensee and taking advantage of licensee's expertise in such matters the risk involved in commercializing the advance is reduced.

12. This is the reason behind the general legal advice that licensor's should always consider requiring licensee's use of licensor's trademark in connection with sale of the patented good, especially where patent rights are not reliably enforceable in those jurisdictions where licensee is subject to service of process. This permits the licensor-patentee to sever use of the trademark along with use of the patented advance. Enforcement and control of the trademark is thought to be more reliable than enforcement and control of patents. See A. DAVIS, PRACTICAL PATENT LICENSING (1970), at 25-27.

13 This is possible where licensee develops the trademark independently. Where the trademark is developed by others and licensee's use is under contract, legal problems can easily result from licensee's continued use of the trademark on different, perhaps inferior goods.

tain hypothetical production efficiencies, but the compound effect of the uncertainties involved in these various estimates requires substantial discounting for this risk. If we assume we may be able to sell 1,000 units at a profit of $3/unit, with possible (*i.e.* projected) unit growth of 25% per year, and if we discount the uncertainty involved using a 14% discounting for alternative returns of equal risk, we get yearly discounted cash flows as follows:

$3,000 + $3,290 + $3,607 + $3,955 + $4,336

NEGOTIATING A SPLIT OF THE BENEFITS

All this is very interesting, but it is still also only preliminary. Assuming we can get an accurate estimate of the present value of these future cash flows, we still must answer the question of how these benefits should be split between the two parties. The above calculations all attempt to ascertain the present value to the licensee of the benefits of the project, but these benefits can only be realized using licensor's technological advance, something that is clearly licensor's property, licensor's asset. A license should properly be looked at as a joint venture, one in which licensor supplies some expertise and some intellectual capital and licensee supplies experience, physical capital and/or access to capital, and distribution.[14] How, then, are the benefits to be split between them?

The answer would seem to be that it should depend on the nature of the license contract and the way in which the contract apportions the risks of the enterprise between the two parties.[15] This apportionment of risk is one of the critical functions of the contract. Indeed, the spreading of research and development risks, the division of risks between developers and manufacturers, is thought by economists and legal scholars to be a critical commercial function that the technological licensing contract provides.[16] The contract can specify that a large lump-sum payment be made by the licensee to the licensor, or alternatively, only a nominal initial consideration but a substantial unit sales based royalty is involved.[17] These two situations re-

14. It has been argued by economists that where scale economies exist in the development of a "new product," these economies will always favor patentee's producing the new product themselves. 9 J. Law and Econ. 135, 137-142 (1966). The argument is as follows: A patentee will be able to charge a maximum royalty in connection with the production of this "new" product equal to the difference between the "demand price and the production costs at that rate." When patentee charges licensee this maximum royalty rate, licensee will then be tempted to reduce output so as to operate at a lower production rate that will raise the demand price and allow licensee to make a profit. In lowering production rates, however, licensee would be acting contrary to patentee's interests in not operating at patentee's profit maximizing production rate. Therefore, the author argues, this natural behavior by any rational licensee will lead any rational patentee to favor producing the patented good "in-house."

This analysis seems to ignore the risk-shifting benefits of licensing. The author has certainly correctly identified the "maximum royalty" a patentee would be able to charge, but the idea that a patentee-licensor would ever be able to negotiate such a royalty, the *entire* excess of price over production costs, strains credulity. The author assumes "there is no feasible way to produce the good without taking out a license" so clearly the patent is assumed to be of value and is perhaps responsible for much of the product profit. However, unless the author assumes licensee is a simple contract manufacturer, a bailee who transfers title to the produced goods back to patentee and is able to pass on all costs and risks and opportunity costs back to patentee in the form of fixed costs per unit, patentee will never be able to negotiate a royalty equal to this entire excess. The author plainly does not assume this, for the hypothesis goes on to allow the licensee to set output and price.

No "rational" manufacturer would ever agree to such a royalty, one in which they take all the risks of production, distribution, and sale while turning over to patentee the entire excess over their costs. The analysis, starting from the assumption that patentee will be able to exact such a royalty, naturally leads to the conclusion that licensee will reduce output and increase price in order to make a profit. The idea that licensee would allow patentee to choose price and quantity to maximize patentee's profits when licensee has contractual control of these variables is simply illogical.

15. *E.g. Drafting License Agreements*, 2nd Ed, at Section 14.03: "The element of risk is very important in determining which party should realize the lion's share from a licensing relationship. Normally it is the licensee who bears the principal risk... Where the principal input to the projected profitability originates with the licensor, where the licensor is indeed foregoing an opportunity it might well exploit directly, the balance shifts substantially in favor of the licensor."

Discussions of the connection between the risks taken and the actual splitting of the benefits have been unsatisfactory. Most approaches have been ad hoc, relying heavily on industry norms rather than economic analysis. *e.g. European Industrial Research Management Association-Working Group Reports No. 17*, at 38: "If the licensee is to have a share of the extra profit made, what is this share to be? A possible figure is one-third, but again one has to look at the contributions made by the licensor and what investment has to be made by the licensee before the licenses [s.i.c.] process can be used. Also, what is to be the duration of the license."

16.*e.g.* 67 Minn. L. Rev. 1198 (1983). The author suggests that antitrust, patent, and general commercial laws that control patent license terms ostensibly to prevent patent misuse often fail to recognize the salutary economic benefits of such agreements, chief of which is the spreading out of development costs and risks. The author concludes, at 1233: "The royalty provisions that have been disallowed by the courts could be used to minimize the risk of patent invalidation and infringement, thereby increasing the incentive to innovate."

17. Other possibilities exist. Where patentee has an established business in the licensed good, price restrictions have been used by some patentees to prevent licensees from "undercutting" patentees margins. Such restrictions, however, have often raised antitrust concerns in that "horizontal price-fixing" arrangements such as this have been construed as per-se "restraints of trade" and violations of the Sherman Act. Such arrangements can come under careful scrutiny for evidence that the terms of the arrangement extend the use of the patent grant beyond its legal borders. *e.g. United States v. General Electric Co.*, 272 U.S. 476 (1926).

Scholars have used economic arguments to suggest that patentees currently selling the patented good will always favor the use of high royalty rates over the use of resale price constraints to maximize their total profits. *e.g.* 76 Yale Law Journal 267, 331 (1966). The analysis leading to this conclusion seems to suffer from the same questionable assumption as was used in note 14; namely, that the "rent" charged patentee for the use of licensee's productive capital is zero.

The argument goes as follows: Where the patent in question has the effect of enhancing margins by some 15% (whether by cost savings or improved quality/sales premium is unclear), simple arithmetic dictates that patentee is clearly better off charging a 15% royalty to all licensees than they are charging a 5% royalty along with a price restriction requiring a minimum resale price equal to this 15% enhanced margin, a restriction that would protect patentee's margins on patentee's market share. Only by charging a flat 15% royalty can patentee realize the full "economic value of his invention." "In view of this inevitability," he concludes, "one would suppose that there was no need for prohibiting price restrictions; patentee would not use them."

Again, as in note 14, the objection must be raised that the 15% royalty rate that leads to this sanguine conclusion assumes that licensees will surrender the entire marginal profit of the patent to the patentee while license continues to bear significant risks. This amounts to an assumption that licensee's productive capital is available for use by patentee rent-free. But licensee is willing to take additional risk without any possibility of additional profit. Again, as in note 13, we have to ask why licensee would agree to this.

The foregoing analysis, and the precise points made by the author regarding the potential for patent misuse in terms involving such generous sales-based royalties, was very influential, and very controversial. *Zenith Radio Corp. v. Hazeltine Research, Inc., et al*, 395 U.S. 100, 133-140, 145 (1968).

flect two different levels of risk for each of the parties. In the case of a lump sum, the licensor takes none of the risk of business success or failure along with the licensee. Licensor's risk is exactly zero following receipt of the lump-sum payment. In the case where licensor takes a royalty based on sales of the licensed good, licensor participates in the enterprise and takes business risk along with the licensee. Here licensor has received only token consideration in return for the grant of the license, and in agreeing to this they reduce licensee's initial capital outlays and some of the initial financial strain to licensee. In such a situation licensor also participates with licensee in taking on the risks of the enterprise. It might be useful to think of this as what economists might like to call a "fixed-sum game." The risk of the enterprise is some finite quantity, and every risk that licensor takes on is a corresponding risk that licensee does not have to hear.

Licensors who take a lump-sum, and thereby none of the risks, should then be entitled to a smaller share of profits estimated above than if they bore some of the business risks involved. The "lump-sum" situation is analogous to the "hypothetical negotiation" used to award damages in patent litigation when awarding a reasonable royalty. As risk-free investors, lump-sum licensors are entitled to only that fraction of the profits the capital they supply would entitle them to when their capital contribution is compounded at modest, risk-free rates of return.[18] Conversely, licensors who settle for nominal initial consideration but wish to share in the possible business success or failure by taking a unit royalty or sales dollar-based royalty should be entitled to a larger share of the estimated profits.[19] Here licensor is supplying know-how and taking risk along with licensee, and should be rewarded for doing so.

The division of these benefits between the two parties should also reflect the value of the capital employed in the venture. In a case where the licensed know-how of licensor and the capital employed by the licensee are thought to be of roughly equal value,[20] the split of the estimated profits can be accurately estimated. For instance, suppose licensor is willing to settle for a lump-sum payment in exchange for the grant of an exclusive license, and suppose yearly expected marginal profits associated with the project are estimated to be a million dollars. It is then possible to suggest how these profits should be split according to the risks taken.

In this hypothetical, we must recall that at the time the negotiations are occurring the risks involved are mainly business and manufacturing risks. The advance in question has been perfected by licensor. Licensors' desire not to take any of these business risks, then should entitle them to only the risk-free share of these profits. If, as we assumed, the property employed by the parties is estimated to be roughly equal value, the risk-free share is somewhere between 1/3 to 1/5 of these $1,000,000 per year of total profits. The bulk of the profits should go to the party taking the risks of the enterprise, the licensee.[21]

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18. *Hanson v. Alpine Valley Ski Area, Inc.*, 718 F.2d 1075, 1077 (1983). The case involved application of the "willing licensor-willing licensee" rule to the illegal use by the defendant of plaintiff's patented snow-making machine. In applying the rule we imagine a negotiation between the two litigants at the time infringement began, a "hypothetical negotiation" in which the patent is assumed to be valid and in which the savings or benefits to licensee are estimated and a royalty or lump-sum is arrived at using the savings/benefits so estimated. The savings or benefits the infringer actually realized during the period of infringement are not strictly relevant.

It can be seen that application of this rule removes from plaintiff-patentee the business risk involved in exploiting the patented invention during the period of defendant's infringing activity. This fact then properly influences the share of the expected profits our "willing licensor" would have been able to extract in this "hypothetical negotiation." For a more complete discussion of this, see *Journal of the Patent and Trademark Office Society*, Vol. 76, No. 12, at 987.

19. Royalties should be distinguished here from periodic fixed payments. Licensors who agree to royalties agree to take the risk that sales of the licensed good or goods employing the advance will actually occur, which of course involves the risk that such sales will not occur. Periodic fixed payments are different, and might be more accurately characterized as installments of a lump-sum initial consideration.

Lump sums and periodic fixed payments can be regarded as roughly equivalent when the risk of licensee bankruptcy or default is considered to be very low. They can be compared using the simple discounting method described earlier. When risk of licensee bankruptcy or default is nonnegligible, however, licensor should be regarded as participating in the enterprise and taking risk along with the licensee, rather like the banker to a fledgling enterprise, or the holder of subordinated bond. In this case, discounting of the future fixed periodic payments should be done using higher rates.

20. A method of estimating these relative values might be as is routinely done on Wall Street. Investment bankers increasingly prefer to value productive capital by examining the returns it is possible to realize using that capital, rather than using some measure of actual asset cost or "book value." They use terms like "earnings per share," "free cash flow," and "EBIT" (earnings before interest and taxes), to gauge proper price levels for the business assets in question, assets often represented in the prices of the corresponding common stock. The company capitalization is often discussed as a certain multiple of such earnings, or cash flow, the multiple often then compared with other firms with similar capital in deciding whether the company and its assets are valued properly.

Using this approach, if the capital stock licensee plans to use can be utilized in another, standard way to produce a standard whose market price allows for a 10% return using some accounting method, and the product improvement possible through the use of licensor's technology will improve these returns to 20%, then the intellectual capital supplied by licensor, as applied to licensee's capital stock, has a value roughly equal to that of licensee's contributed capital stock. That is, the 20% return can be looked at as a 10% return on the total applied capital supplied by both parties.

This arithmetic, however, is only this simple where the risks involved in the use of this capital have not changed significantly when redeploying licensee's capital in this way to take advantage of the licensed technology. Thus, the arithmetic above only works out this nicely in the case where the license involves some cost-saving measure, our first hypothetical. Where the risks have changed, because the product is new and/or the capital equipment must be used in a different way, the "enhanced" returns must be discounted at a higher rate. A full discussion of how this might be done is beyond the scope of this paper.

21. This follows from standard risk-reward economic theory. A way of quantifying this ratio is by comparing the returns accorded low-risk and business-risk investments over time. Many studies have been done comparing these returns, in some cases over periods as long as 50 years, and they generally find risk-free investments (insured bank deposits, government bills, short-term commercial paper) produce returns only 1/3 to 1/5 those involving ownership of business assets (stock certificates). An example of such a study might include: McGINN AND TUTTLE, MANAGING INVESTMENT PORTFOLIOS (1990), at Ch. 2-10, covering the period 1926-1988, in which short-term risk free treasury bills returned 2.5% while stocks returned 8.8%. If a dollar of profit were to be split between parties making analogous investments, one risk-free and the other involving business risk, our risk-free investor would receive $0.22 (2.5/(2.5 + 8.7) and our

In our hypothetical, suppose our licensor were to agree to roughly 1/4 of the benefits as a lump sum. Assuming a 5-year license, with expected profit growth rates equal to the discounting interest rate, the present value of licensor's share of these profits is 1/4 × $1,000,000 × 5, or $1,250,000. Again, these are all figures estimated at the time of contracting, and licensee bears the entire risk of earning more or less than the $3,750,000 they estimate they will make after paying off the licensor.

In the case where licensor agrees to a simple royalty based on a sales percentage, these same profit estimates should be used by the licensor to exact a royalty rate that should increase the potential reward. Using the above figures and adding the assumption that the yearly profits of $1,000,000 derive from a total sales base of $10,000,000, our licensor should be entitled to a sales dollar-based royalty of something over 2.5%. Why? Because 2.5% is what licensor was entitled to when taking no risk at all. Now, licensor is asking for no lump-sum advance and is willing to wait until sales actually occur before triggering monetary demands. Licensees' risks are correspondingly reduced in that they need not pay licensor any money up front, thereby limiting their initial capital outlays, and by the fact that they are not obligated under the contract until they have made sales and perhaps even profits. If the two parties were to agree that such a sales dollar-based royalty arrangement would evenly split the risks between the two parties, licensor should ask for exactly half the expected profits, or what amounts here to a 5% royalty.[22] Licensor's choices are thus between $1,250,000 now or a 5% royalty, possibly totaling as much as $2,500,000, payable as sales are actually made.

These are very simple examples. Most royalty negotiations are filled with other issues: the splitting of development costs, competing technical art, the possibility any patent at issue might not be valid, etc. The list is long. The art in negotiating truly effective licensing agreements must involve assessing the technical fit of the offered advance with licensee's operational and marketing expertise, the reciprocal financial needs of each party, etc. Tremendous "synergism" is clearly possible, however. As simple as these examples are, however, they do permit creative people to abstract the simple risk principles involved and apply them to their own superior understanding of a set of facts.

PATENT VALUATION

The foregoing lends itself to a discussion of the process of patent valuation. Firms actively engaged in the business of developing, selling, and/or purchasing patent rights are naturally interested in valuing them accurately. The negotiational process can obviously make use of such values, but valuation might also be done in order to take full advantage of the rules governing corporate taxation.

The argument thus far suggests, however, that valuation might be difficult to do in a simple and consistent manner. The idea of valuation implies some sort of market consensus, so that in the absence of concrete dollar offers for the property or a ready market, any dollar value placed on a property must seek to estimate price in which there might be general commercial agreement. Much of the argument advanced here suggests, however, that valuation depends on the capital base, existing product lines, the interest and expertise of potential licensees, etc.

To illustrate the difficulty, consider as an example a patent covering a cost-saving improvement on the general design of and method used for assembling an automotive transmission. The parties who might be able to take immediate advantage of the patented technique are few. If they are approached and do not have any interest in licensing the patent — perhaps because they have recently made investments in another method, or they are not convinced the patented design and method constitutes an improvement, the possibilities are many — what can we say about the value of the patent? The potential savings are real, the economic value is real, but such value may not be easily realized.

The foregoing analysis suggests approaches to the job of valuation, but it raises questions as well. The four paradigmatic situations previously discussed can each be examined, or "tried on for size." If ideally positioned potential licensees cannot or do not want to realize the savings or product advantages using their existing capital base (situations 1 or 2), the valuation can be done by considering the returns that could be achieved by firms willing to purchase additional capital and/or using their existing capital to produce what is for them a new product (situation 3). As a final possibility, patent owners can compute values by doing the arithmetic involved in exploiting the patent themselves (situation 4). Each situation becomes increasingly risky for the parties involved, and discounting of potential profits should therefore be done using escalating rates.

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business risk investor the remaining $0.78. In such a way can benefits be split between a lump-sum licensor and licensee taking the full business risk.

This numerical result is very similar to the "25% Rule" discussed by Epstein and Politano in *Drafting Licensing Agreements*, Section 504.18. The authors, in negotiating on behalf of American licensors, often start negotiations with a demand for a 25% share of expected profits, translating this percentage into a lump sum. "The licensees all earned about a 20% pre-tax profit on sales and each paid a 5% royalty on sales — or 25% of the pre-tax profitability rate."

The authors continue: "Having noticed this empirical relationship whereby there was a 25-75 split in the pre-tax profitability rate in a series of successful licenses, the writer has developed a methodology that has proven its worth over the years in commercial negotiations. One starts with a 25% split to the licensor and then either 'tunes' this figure up or down, depending on the peculiar circumstances of each case, including the significance of the intellectual property portfolio and the location of the principal burden of risk."

The "25% Rule" approach offered by Epstein and Politano yields numerical results very similar to those suggested by the above "money market informed" analysis.

22. This is also true only because we assumed initially that the licensor's patent, or know-how, was of approximately equal value to the productive capital supplied by the licensee. If these two were not thought to be of equal value, the splitting of the profits would not be exactly 50:50 but would be adjusted pro-rata in favor of the party employing capital of greater value.

The fourth situation — assessing value assuming the use of new capital (either new or newly purchased) — acts as a final, residual method. Where licensees with capital and/or expertise are unwilling to deploy these assets to take advantage of the patented art, patentee can always "run the numbers" using this fourth method. This is often a completely unsatisfactory option from patent owner's perspective, and the greater risks and discounting rates involved will generally result in lower valuations, but without interest on the part of other firms or where there are no other options, it may be the only true measure of value.

A few points should be raised in defense of this fourth method. First, this is the valuation method most likely to result in an appraisal that could be considered a "market value" of the patented art. Since no capital base or applicable manufacturing expertise is assumed on the part of the potential buyer, any firm is a potential buyer at this price. Therefore, what this method might lack in appraised value it might make up for in market consensus.

Second, this method is often the most accurate in the particulars. The marginal benefits the patent might have for other firms using their capital base are necessarily imprecise. Any negotiations that may have occurred are almost certain not to concern precise estimates of the benefits of the patent on licensee's "bottom line." Conversely, "in-house" estimates concerning potential capital costs, margins, and the enhanced margins that could be garnered through use of the patent are necessarily more precise than those arrived at by educated guesswork.

In this context the question of barriers to entry very quickly arises. Such barriers — required production capital, distribution chains, retailing outlets — can be significant, and may make the valuations obtained by this fourth method somewhat academic. Indeed, academicians often ignore such barriers, and in the opinion of the author this can lead to economic conclusions never reached in practice.[23]

It is perhaps useful to remember that the exercise of valuation, in the absence of a ready market or a willing buyer/licensee, is somewhat academic by definition. Indeed, pragmatic investors have been encouraged for years to ignore corporate balance sheet accountings of intangible assets, specifically those made for patents.[24] The only truly important patent valuations are those placed on the property by interested buyers and sellers.

OTHER CONSIDERATIONS

It is also possible to use the above arithmetic to allow licensor's to make some preliminary business decisions regarding the nature of the license to be offered. Specifically, all licensors want to know whether to offer certain parties an exclusive license,or in the alternative to "shop" the advance to all interested parties in return for a standard front-end payment or royalty contract. Again, as in all the foregoing, good economic information is necessary to make these decisions with certainty, but it is possible to lay out the economic considerations that apply.

The main attraction to licensees in the offer of an exclusive license is the chance to control the market for the goods produced using the advance. Licensees with some understanding of the supply-demand curve for the product can set the price so as to maximize their total profit. They control supply, so they can choose to "intersect the demand curve" at whatever price they like. A nonexclusive license does not present this same opportunity because no single licensee can now control the total supply, and therefore cannot control supply so as to maximize profits. Licensor must realize this, and must attempt to guess at the response customers will have to varying amounts of total supply.

Would the additional supply be readily absorbed by the market? Is total demand for the good potentially very large, and can this additional quantity be produced and marketed without much of a drop in sales price? Phrased another way, will additional supply sharpen demand, or will it simply drive down prices? If demand is potentially very large, or if prices can be maintained with additional supply, multiple licenses are clearly preferrable. The payments and/or royalty rates in each of the nonexclusive license contracts will perhaps be smaller because the grant to licensee is not as strong, but in the case where additional volumes would more than compensate licensor for the lower rate, or where licensees are confident they can maintain healthy margins even with a nonexclusive license, licensor would do better granting such nonexclusive licenses.

Is the good to be produced one for which demand is fairly fixed? Here the grant of an exclusive license to a single licensee is perhaps preferrable. In such a case there is little benefit to increasing total supply. Such added supply would simply drag down prices. Licensor is better off allowing a single licensee to control supply to their mutual advantage. In the case where licensor has great faith in licensee's understanding of the market and its ability to operate the business for maximum profit, licensor might even agree to a royalty contract based on some form of

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23. *Supra*, notes 13 and 16. In both articles, the analysis assumes the patentee will be able to charge a royalty equal to the full economic benefit the patent may have for an existing commercial operation. This royalty rate (a much higher rate than is usually encountered in industry) then drives a series of economic conclusions with public policy implications. Again, the assumption that patentee will be able to charge a royalty equal to the entire marginal benefit that the patent will have on licensee's commercial operation implies that licensee will allow patentee the free use of licensee's productive capital. This ignores the capital costs associated with entering the business, costs often referred to in other contexts as "barriers to entry."

24. This is the advice of legendary investor and author Benjamin Graham in his short book, *The Interpretation of Financial Statements*, 3rd Edition (1975), at 35: "Patents constitute a somewhat more definite form of asset than goodwill. But it is extremely difficult to decide what is the true or fair value of a patent at any given time, especially since we rarely know to what extent the company's earning power is dependent on any patent that it controls. The value at which the patents are carried on the balance sheet seldom offers any useful clue to their true worth."

profit-sharing.[25]

There are, again, many other factors influencing the choice between exclusive and nonexclusive licensing: industry custom, the difficulty of policing the terms of the agreement, etc. Further, the economic details discussed above in relation to the introduction of genuinely new products are often necessarily speculative and not capable of exact analysis. Asking the right questions, however, is usually a necessary first step in the process of arriving at useful answers.

CONCLUSIONS

The rudimentary economic discussion presented here sought to illustrate how licensing terms might be analyzed for risk, specifically which parties bear which risks. These risk levels can and should be used in arriving at the monetary terms in the agreement. Discounting of future profits should take account of the general risk level of the project, and the terms should be analysed for risk, with royalty rates adjusted accordingly.

Both parties can benefit from performing the sorts of economic analyses described. Licensors can benefit by analyzing closely the benefits accruing to their licensees, and by looking closely at the risks they might agree to take and how they might be rewarded for taking on these risks. Licensees can look to these same principles to choose whether they want to reduce their risks by agreeing to a royalty contract, or whether by taking risks they are already in the habit of taking they should be entitled to a generous share of the benefits of the licensing agreement.

25. The generalrule is that licensor should avoid constructing royalty contracts in which payments depend on licensee's profits. See *European Industrial Management Association - Working Group Reports No. 17*, at 38: "It is not recommended to base royalties on actual cost savings or on a share of profit since such methods lead to endless and often acrimonious disputes about the accounting methods used to determine the figures. Rather the licensor and licensee should estimate the likely savings and decide a royalty rate and base which will give such a return."