High Technology As A Commercial Asset

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Companies must go beyond own needs, find nontraditional technology transfer plans, to make most of asset

When I started thinking on this paper, I was puzzled by the subject given to me and especially by the title. What really bothered me in "High Technology as a Commercial Asset" was the word "high."

My next statement may surprise you, coming from the representative of an organization (Battelle) whose main activity is as a "developer of high technology" (we would prefer the term "advanced," "improved," or "new" technology), but a recent article of the International Herald Tribune on Venture Capital trends in Japan indicates that I was in good company. It convinced me to raise the issue.

My point is that technology does not necessarily need to be "high," as far as successful commercialization is concerned. For many, high tech is synonymous with complexity and sophistication. These attributes are not prerequisite, nor are they sufficient conditions to ensure a profitable valorization of technological assets.

In the context of this presentation, a technology to maximize its chances as a "commercial asset" primarily needs to be "new" (sometimes equated to "innovative"), proprietary, cost effective, and to fill a real market need.

If to the well known "market risk" is linked to new technology, we can avoid adding the "technological risk." So much the better! The confusion in some people's mind between "high tech" and "valuable tech" probably stems from the intuitive feeling that, because it is sophisticated, high tech must have been expensive to develop, therefore its value.

I am, of course, not advocating against high tech per se, nor denying its importance in today's global socioeconomic development, as well as in a given company strategy. But with the recent craze there is a need to remind ourselves of the existence and the merits of "medium and low tech."

Perhaps I can best illustrate what I mean by using a recent example of technology that has just been developed at Battelle. Our food scientists have found a way to increase the resistance of chocolate to heat. They have invented a chocolate that melts at a higher temperature than "traditional" chocolate, while having the same composition, structure and flavor. Our slogan is, "It melts in your mouth, not in your pocket," and we call it the "Summertime Chocolate." It has specific marketing advantages (i.e. for the consumer), as well as for the producer in handling, storage, distribution, etc.

The secret lies in how to incorporate minute quantities of water in the chocolate in the molten state, so as to end up creating a network of non-fusible crosslinks with the sugars and polysaccharides of cacao. This network will "trap" the fatty phase in a manner such that subsequent melting of this fat will no longer result into collapse of the chocolate structure.

The solution found is elegant, innovative and cost effective, but I would certainly not use the term "high tech" to qualify it. Nevertheless, from the response received so far, our Summertime Chocolate may very well turn out to be a very valuable "commercial asset."

So much for my title, which now will be: "Technology as a commercial asset!"

A GLOBAL APPROACH TO THE VALORIZATION OF TECHNOLOGICAL ASSETS

Strategic management of technology goes beyond the mere acquisition, development, and use of technology for the company's own needs. Other avenues are opened that have the particular characteristic of:

- Providing positive technological feedbacks for the company.
- Allowing the company to obtain a "leverage" effect from its technology asset.

These avenues are not limited to the traditional technology transfer agreements. They also include such schemes as:

- Joint ventures
- Spin-offs, start-up acquisitions or participations.
- Collaborative R&D agreements (including contract research).
- R&D Limited Partnerships.
- Participation in government or EEC funded R&D programs and other international programs (whether at the "precompetitive" stage or not).

The above schemes differ from the direct commercial route. They obviously have a direct impact on the company's technology generation process and include to a large degree reciprocal exchanges of technology. They represent alternatives within what may be viewed as an "extended concept of technology transfer and exchange" inasmuch as they offer companies new opportunities to valorize and make use of their technology base in exchange for direct and indirect benefits. Indeed, from the techni-

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cal assets that they bring to the table when entering into such agreements, companies can expect tangible and intangible "returns," which will show on the company's technological "balance of payments" and ultimately on its bottom line.

It is in with this broader approach integrating these various possibilities that companies can achieve a wider if not full use of their technology as a commercial asset. Time will not allow us to analyze in more detail these schemes and their effects.

TECHNOLOGY TRANSFER

The issue of technology transfer and its role in company strategies as an additional vehicle to technology valorization has been dissected and studied at length. So I will highlight certain points that may be significant and relevant in the context of a broader approach.

It occurred to me when drawing up my thoughts on how to address the subject of technology as a commercial asset that most if not all of previous work has concentrated on the technology transfer process essentially for the same uses than those for which the technology has originally been developed and utilized.

A large area of potential use of a company's available technological assets is more rarely tapped. That includes through technology transfer, all the uses and applications that are "peripheral," "lateral," "additional" to the company's own production (including those that the company has consciously decided not to pursue for business reasons). The existence of a vast reservoir of alternative potential uses of technology suggests that companies should consider such an approach to their strategy of technology valorization.

There are three main reasons for this:

The first obvious one, of course, is to generate additional income that may not otherwise have been generated.

The second one, which is especially true for large corporations with a complex structure (by business units, divisions, etc.) is that these companies may very well discover through this process, opportunities to optimize the use of their own technology portofolio by their own divisions. In other words, they would be doing "internal" technology transfer, and in some cases they would discover "latent demand" opportunities.

A third less obvious reason is that, as for most technology transfer exercises, the process will induce positive effects on the transferor himself and on his technology. This will be even more so in the present case because, the technology to be transferred will be at a less advanced stage (for the new applications) or will require further adaptations and improvements.

Indeed, experience also shows that the technology transfer process overlaps with the transferor's technology generation process through access to technical improvements made by the transferee, reciprocal exchange of technology, etc.

THE CROSS-FERTILIZATION MODEL

Is there a method or an organizational set-up that can stimulate the identification of these alternative opportunities?

In the R&D jargon, the term cross-fertilization is used to describe the process by which a technology, idea, process, initially developed and used in a given area, or for a given product/application, ends up being used in another area or for another application. The term does imply a creative step in identifying the "connections" and opportunities and in some cases a synergistic effect with another technology. The results include new uses for the original technology and improved or new products/process that otherwise would not have been identified and developed.

The cross-fertilization process can be key to the implementation of a comprehensive valorization plan of technological assets. It is striking to observe how scientists and technicians can efficiently be its main actors provided that the company has "institutionalized" the process. This includes:

— A clear definition of the company strategy and goals in this area.

— A setting up of objectives together with an incentive/reward system.

— A constant awareness to market constraints (best achieved by a permanent interaction between scientific and marketing staff.

◄ Another Facet ►

The latter point is another facet of the issue all companies face in their effort to effectively manage technology — striking the proper balance between the so-called "science and technology-push" model and the "market-pull" model.

Companies that have introduced similar programs (although partly for different purposes) are finding that this process can help generate business opportunities at a low incremental cost, at least up to this stage of the process.

This is a process that we are currently using at Battelle as a part of our own technology commercialization schemes. Let me give you some examples of actual cross-fertilization cases.

Needle-type Impact Printer

The concept developed combines an electromagnetic actuator with mechanical design features allowing performance at low power and high frequency (the impact occurs at the highest speed of the needle). It is now successfully used for the high frequency pre-selection of circular knitting machine needles producing Jaquard fabrics.

One-Side Galvanization

This process was initially developed for one side coating of sheet metal essentially for the car industry. It makes use of "surface-tension" phenomena to produce a so-called "Meniscus-effect" allowing the deposition of a uniform and controlled layer of molten metal on a substrate.

It has been transposed to high-speed production of "lead frames," which are conductive frames on which microcircuits are connected on printed circuit boards.

Ice and Frost Detector

An ultrasonic measurement method to continuously monitor and measure even very thin layers (coatings, deposits, etc.) was developed initially to monitor wax coatings on car doors. It is now being developed to be used as an ice and frost detector for aircraft where onset detection of ice and frost is of prime importance.

THE LONG WAY TO COMMERCIALIZATION

I mentioned earlier that the identification of business opportunities could be achieved with minimum expenses. However, this is just the first step. There are more to come before reaching commercialization.

As an illustration to some of these steps, let me briefly review the phases of the intellectual property valorization program that we run at Battelle. Although applied in a different context, it does provide some indications relevant to this discussion and can be transposed to the case of a production company.

INTELLECTUAL PROPERTY VALORIZATION PHASES

1. Identification of need.
2. Preliminary internal research—creation of IP.
3. Validation.
4. Development.
5. Evaluation - Technical
   - Market
   - Financial.
6. Protection.
7. Definition of commercial strategy.
8. Commercialization.

Our policy is to initiate internal research on selected identified needs for which we believe our know-how, expertise and multidisciplinary capabilities offer reasonable chances of finding a solution (1, 2).

After a first preliminary phase, results and findings, if any, are validated (from the technical and market point of view) (3) before deciding whether to discontinue the case or pursue a further development phase (4).

An evaluation then takes place, which includes technical, market and financial aspects as well as patentability (5).

Patent protection is secured if feasible (6).

A commercial strategy is developed through iterations with potential clients in the market and commercialization of the IP case is initiated.

The whole process is iterated in whole or in part. The commercialization phase can follow different paths, the most frequent first step being contract research tied in with "field-of-use licensing" with or without territorial limitation.

Technical results improvements and new inventions arising out of the research will be owned by Battelle and will be licensed back to the client in the licensed field of use. This allows us progressively to strengthen our knowledge base.

The whole process is a risky one requiring close monitoring, frequent market validation, and the ability to pull the plug if necessary. The rule of the game is to share that risk at some appropriate point in time with a commercial client, after having first supported a limited risk. (This client could be a business unit inside your company, a supplier, or a customer outside your company).

In certain cases where we will have been able to develop a technology package to a more advanced stage while retaining sufficient industrial property rights, joint-venture and spin-off of stand-alone companies would be considered.

Let me now mention a few other characteristics, issues and pitfalls of the process.

One characteristic lies in the fact that the technology is being marketed and transferred at an early stage of development, and/or with requirements for additional R&D work. This results from the fact that adaptation to the new applications will be needed. A larger degree of uncertainty and risk until final commercialization will exist as compared to traditional cases of technology transfer. This will have to be taken into account when drafting the transfer agreement. For instance, special provisions can allow for certain conditions, such as royalty rates, diligence clauses, etc. to be agreed at a later stage.

VALUATION AND PRICING

In a more-or-less formal way, most of us involved in the pricing of technology transfer agreements use a mixture of the three property valuation methods:

1. Cost approach
2. Market approach
3. Income approach

The cost approach consists of determining the cost that would be required to recreate the technology in a similar state.

The market approach is based on the actual price at which similar technologies have been transferred in arms-length transactions.

The income approach will attempt to determine the present value of the total future income for the transferee.

In practice, the income approach will be the preferred one for pricing the technology with the two other approaches providing limits or reference figures. Methods have been proposed to rationalize the determination of the value of intellectual property assets, and consequently of royalties and other consideration. They are badly needed by negotiators striving to reach an agreement with something better than "rules-of-thumb."

One such method that goes up to the point of providing a useful instrument for negotiation has recently been described by D.J. Neil in the issue devoted to Technology Transfer and Licensing of the "International Journal of Technology Management" (Vol. 3 - No. 1/2 - 1988). Mr. Neil discusses the use of cash-flow earnings for assessing capital projects and for valuating intellectual property, based on the application of discounted cash flow (D.C.F.) analysis to cash flow projections. The D.C.F. analysis can then be used to set price limits for the negotiation in the following way:

Each party computes the Net Present Value (NPV) of its investment, (the NPV being the present value of the streams of cash flow, during each period of the expected life of the commercialized technology, minus the initial investment).

The buyer first starts the computation of his NPV assuming, in his cash projections that the technology is transferred free of charge. He then adds costs for the technology up to a point where his NPV tends to zero. This level of cost will be the maximum that he can afford.

The seller will also compute his NPV assuming the technology is transferred free of charge (which should lead to a negative figure). He then introduces revenues from the transfer of technology until his NPV tends to zero. This level of revenue will be the minimum he can accept.

There is room for negotiation when the buyer's maximum exceeds the seller's minimum.

Without ignoring the difficulties and uncertainties inherent in the evaluation of the different components of cash-flow projections (production costs, sales price/elasticity, market penetration, etc.) the choice of discount rates, such a method can be of real assistance to the negotiators.

The method does lend itself to situations like those we have described, i.e. new products/applications with additional R&D expenditures to be expected as both parties can include the projected expenses in the calculation of the NPV. It must be recognized, however, that the uncertainties will be even higher for such cases.

The method can also take into account other types of incremental expenses or revenues on both sides in schemes such as those mentioned earlier.

A few more points on this subject:

The uncertainties of these evaluations on the complexity of the models used are not sufficient reasons to discard these quantitative methods. After all, companies do go (or should go) through similar exercises before embarking on capital investments using, when appropriate, probabilistic techniques and taking into account qualitative factors and the so-called "expert advice." There is no reason why technology acquisition should not be handled in a similar way, and I could very well imagine that a computerized "expert system" could be developed that would contain all the available data in its so-called "knowledge base."

I would concur with D. Neil's recommendation that parties disclose to each other their assumptions, data and calculations, preferably at an early stage of the negotiations.

Finally, for deals involving nonmature technology and/or requiring further developments (i.e. where uncertainties and risks are highest) upfront payments should be kept to a minimum and, as mentioned earlier, the parties should agree to determine certain terms such as royalty rates, diligence, minimum payments, etc., at a later (but already defined) time that is when the degree of uncertainty will have narrowed.

In the well-known situation where the buyer does not yet believe — and cannot yet believe — in the value of the technology he is buying, while the seller is trying to convert what may still be a liability into an asset, such conditions can be seen as a reasonable way of approaching the transaction under a risk-sharing partnership concept. It should be kept in mind, though, the percentage royalties are by definition a form of consideration where the seller does share the risk with the buyer.

CHAMPION NEEDED

This leads to another point that I cannot overemphasize. Technology transfer is not the sale of a finished, off-the-shelf product. Although this may seem obvious to many practitioners, misconceptions in this area are still frequent and hinder the process. It is vital to recognize that the transfer is a dynamic, continuous process involving people and requiring numerous iterations, feedbacks and literally the transfer of knowledge to the receiving party and its understanding of that knowledge. The process is more than just the transfer of a black box.

In every successful technology transfer operation, one can identify what we usually call a "technical champion" on the transferor side who has fiercely struggled for the upshot. Chances of success are increased when a champion is also present on the transferee side, which is the best indication that the N.I.H. ("not invented here") factor has been overcome.

Despite hundreds of newsletters, directories, data bases, technology exhibitions and the assistance of consultants and brokers, the market for technology transfer remains an unstructured one in which dozens of contacts seem to be necessary to get to the good one with the feeling that it was a stroke of luck. A lot of attention has been given to this problem by the LES Technology Directory Committee. I do not have any ready-made solution, but I would have two or three suggestions to make in the context of this paper that would help to narrow the span of inquiring third parties to those most likely to be seriously interested.

1. Companies that wish to develop proactively their technology transfer program should take the burden of identifying specific application opportunities themselves through the cross-fertilization method and not expect their prospective clients to do it.

2. Technologies (for licensing in or out) listed in directories, data bases, etc. should be described more accurately.

3. Technical staff should be involved at an early stage. The additional expenses will be more than recovered by shortening negotiations that would fall through anyhow.

4. All the parties should agree on a "code of conduct" whereby they would refrain from using the system as a source of information when they do not really intend to acquire technology.

CONCLUSION

The message that I have tried to convey is that an optimal commercial valorization of technological assets, require that companies not only extend the use of these assets beyond their own production needs, but also beyond the traditional technology transfer schemes.

Factors such as rate of change of technology (and obsolescence), competition, rising costs of technology development, accessability to new or complementary technology, impose on companies to have recourse to an ''extended concept of technology transfer and exchange,'' which basically combines technology commercialization with technology acquisition.

From joint ventures to collaborative R&D agreements, from acquisitions to participation in international R&D programs, each of these arrangements constitute vehicles for the commercial valorization of the company's technology base in a broad sense.

At the same time, these schemes provide technological feedbacks to the participating company. They respond to its needs for technology maintenance, improvements, generation and development. They should therefore be integrated in the global management of the company's technological assets.

The use of the so-called ''cross-fertilization model'' has been proposed as one mechanism to help identify alternative opportunities applicable to the extended technology transfer and exchange process.

A few issues related to the process itself, have been mentioned and the case has been made for a special approach to pricing which appears appropriate to ''extended technology transfer and exchange'' transactions. In closing, I would like to recall one vital point: the role of the Champion.

Words such as ''mechanisms,'' ''schemes,'' etc. should not make us lose sight of the fact that, in technology management even more so than in other areas of management, the human factor is predominant. Creativity, initiative, perseverance and motivation are vital ingredients for the processes described.