Triggering Technology Transfer

By Thomas P. Evans

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ABSTRACT

Technology transfer — the movement of new product and process ideas from seller (usually an inventor, a university or a research institute) to buyer (an industrial organization or company) — is a potentially important instrument of commerce which needs cultivation and encouragement. Many problems, some real and some imagined, prevent wide acceptance of the concept today.

The triggering of technology transfer requires buyer and seller attitudes which are more closely attuned to each other; mutual understanding of and respect for each other's problems can provide the necessary spark to initiate beneficial interchanges.

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A display of its identifiable products usually gives an accurate image of any particular company; the products largely reflect the corporate philosophy, the personality of the marketing department and the manufacturing tools and skills available in its production plants. The products or processes which "fit the company" are the ones which find their way from conception stages through research and development and prototypes to production and marketing and general use.

Corporate organizations are formidable fortresses, and relatively little transfer of technology takes place between companies or to or from other outside institutions. When transfer does take place, it is usually in the form of a finished product to strengthen product lines or a proven process intended to reduce production costs or meet competition. Perhaps surprisingly, a corporation rarely seeks or accepts outside technology merely because it is the least expensive way to acquire certain new product/process concepts and research and development.

The movement of technical ideas and know-how from a conceiving organization (the seller) to a user organization (the buyer) is TECHNOLOGY TRANSFER . . . at any stage of research or development. While TECHNOLOGY TRANSFER is a rather unusual experience for the buyer, it is also often confusing, mystifying and uncommon for the seller and, more broadly, can have wide social and economic effects which extend to world trade and standards of living.

The case can clearly be made for acceleration of technology transfer, but the means by which the buyers and the sellers can be encouraged and emboldened are not obvious. The synergism of technology transfer which has actually taken place — where the transfer has brought product or process results which are substantially more valuable than would have been possible in the buyer's or seller's domain alone — suggests the prerequisite for success and an underlying triggering mechanism: somehow, in some way, the two parties in every successful technology transaction have developed an understanding and a sympathy and a respect, one for the other.

By first examining separately the attitudes, the hopes, the expectations, the frames of reference and the different environments of potential buyers and sellers of technology, it is possible to begin the process of fostering more and better transfer of technology, secure in the knowledge that the mutual respect and understanding which stem from such examination and which are vital to that process will provide the trigger for successful results.

The two parties to transfer: buyer and seller

The buyer of technology is usually a corporation. As such, he will likely have a split personality — that is, several different views of new technology will surface from within the same organization. The Board of Directors, as any one of its members will quickly tell you, is ALWAYS interested in new products and processes; unfortunately, no Board member has ever found one suitable for the company, for no proposed new product or process has yet met all of the model specifications of the Board:

- It must be a completely new product which no other company has.
- It must be protectable against imitation or substitution by competitors, in the U.S. and abroad, by strong patents and know-how. It must be absolutely exclusive.
- The product must be cheap to make, habit-forming for the buyer, non-durable (it must wear out).
- The product/process must be producible with no capital investment.
- Firm orders should be in hand before products are sold (no inventory).
- There must be no research or development risks, no marketing risks, etc.

A second view of acceptable new technology is held by the President: his outlook is usually somewhat more moderate than that of his Board, for he has the practical problem of getting results — demonstrating accomplishments. The President of a corporation which may be seeking new technology from outside his company is generally looking for products/processes not too different from those which his company already sells, or which "fit" well with his various departments (promise a minimum of upheaval everywhere) — so as to minimize the risks of time and money and prestige for the company. At least, he is not expecting that new technology can be injected into his company with ZERO risk!

The various departments within the corporation have their own slants on outside technology, and all of them are prejudiced against triggering any transfer. The Marketing Division has very definite ideas as to what products/processes may be salable (and with the least effort), what sort of appearance and color the product should have, what the customer wants, the type and intensity of advertising and promotions which it likes to run and which will surely be successful with a new product, and so forth. Such thinking leaves very little room for new technology from outside the company, for all of the thinking is geared to existing products and product lines.

The Production Division is ever more inclined to resist any change whatsoever in its operation, unless it is to discontinue a few products and processes with which it has always had trouble. Engineering has scarcely recovered from its flurry of tooling and methodizing for the last "new product" (which, they will hasten to tell you, was a flop — even though it has just gone on the market), so THAT Division doesn't want to have anything to do with ANY new product — particularly one from outside the company — unless it is just like one now being produced.

The Research & Development Division of the potential buyer's organization is often the group with whom the seller of technology makes contact and expects to react. Examination of the motivations of and the management expectations for an industrial R&D operation, however, yields the same negative likelihood of of the triggering of technology transfer from any source external to the company. The rejection of "not invented here" (N.I.H.) is no less real because it stems from complex motivations, pride and corporate expectations rather than from simple pigheadedness. R&D might consider a new product/process idea from an external source IF the division could get corporate credit for a masterful job, and IF the risk to its prestige and its budgets were close to zero. Nobody wants to be responsible for a failure!

To summarize the characteristics of the would-be buyer of technology: he is many-headed — and each head has different reasons for saying NO. Basically, the buyer is seeking minimum exposure, minimum risk and maximum return. Perhaps to such a degree that he is overlooking tremendous opportunity.

The technology seller may be too shortsighted, also. We shall proceed on the assumption that he has a good idea to transfer to a company which can use it; the seller nevertheless often vastly underestimates the difficulties and the costs in time and dollars to bring his technologically advanced product/process to the point where it can be marketed or otherwise usefully employed. Even with a working prototype and, perhaps, a product design concept for mass production, the seller is not likely to have any realistic feel for the agonizing laborious product development, evolution, marketing test stages, appearance models, engineering designs, production drawings, tooling arguments and agreements and procurements, quality control standards development, marketing program creation — and finally, production start up and sales introduction involved in just getting the seller's baby launched into a hostile world!

The technology seller with a good item for which he, himself, has no particular use (the usual case) and in which he does not intend to invest his own development, production and marketing dollars has definite feelings about the worth of his technology to others who may be in a position to use it. Since he doesn't recognize

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either the complexity of the job or the risks which the buyer assumes when he makes the decision to proceed with development of an item of new technology, the seller practically always has a highly-inflated idea as to the value of his technology to others. He drastically discounts the risks inherent in new product/process development and marketing — risks which are invariably financial and which often involve unavailable technical skills or undeveloped production methods as well.

The would-be seller of technology, then, can be satirically characterized as the owner of a sure-fire item which anyone in his right mind KNOWS will be successful, and which is worth a fortune because it can be produced for a nickel and sold for a dollar and can be put into production next week (after special new machines are purchased and installed by the Manufacturing Department of your company, of course!).

The transfer gap

If there were few differences between the thinking of buyers and sellers of technology, there would be little need for concern about triggering technology transfer. But the buyer is a very different animal from the seller; one is over-reluctant to take risks and the other is over-confident of the value of his technology. The width of the gap can be described in a series of contrasts between the thinking of buyer and seller:

1) The gap between IDEA and PROTOTYPE; the seller maintains that an idea is all that is necessary — that the buyer is a fool if he can't readily envision the benefits which will flow from the new technology which is represented by the concept he is expected to be eager to embrace. The buyer, on the other hand, is anxious to make the best possible investment of his funds and his manpower and facilities resources; he must minimize his risks, and therefore seeks only those ideas which have been translated into prototype products or pilot-plant processes. The seller generally cannot afford to develop his idea into one or more prototypes, and he likely does not have the expertise to do this in any event. Thus occurs a very wide gap between the two parties — one which must be bridged in some manner before transfer can be accomplished.

2) The simple communications gap between organizations: "Who to talk to" in a company or in a university is always a dilemma. When potential seller wishes to explore items of technology transfer with potential buyer, who gets together with whom? The seller is not going to get anywhere with the buyer's R&D Department, for N.I.H. will quickly squelch any idea-transfer conversations. Moreover, the resources-planning decisions of the buyer must all be made at a high corporate level, so it is practically essential that the seller communicate first with such decision makers. The buyer, for his part, may be dealing with an inventor, a consultant, a research laboratory, a university or another company; he must be able to recognize a seller-communicator who can speak authoritatively about the item or items of technology for sale, and who is going to follow through on inquiries and decisions. In most universities it is exceedingly difficult to find a seller-communicator who is willing to concede that he has the necessary authority and who is willing to use it! Transfer simply cannot occur until or unless "the right people" are in communication with each other.

3) The disparity between the buyer's concept of WORTH of new technology and the seller's opinion of its VALUE has been discussed; the gap is almost invariably a wide one. It probably causes as many transfer failures as the N.I.H. factor. Bridging this gap requires a great deal of patience and open-minded give and take on the part of each party to any negotiation, and, of course, is crucial to transfer. The basic secret for triggering technology transfer is mutual respect and understanding; that respect and understanding begins with the discussions between buyer and seller on WORTH vs. VALUE.

4) The would-be buyers and sellers of technology either never begin serious discussions about new items or abruptly interrupt such talks with great gnashing of teeth on both sides because buyers refuse to recognize that outside technology can be valuable to them. Often, the buyer could profit immeasurably from infusion of techniques, design concepts and products from outside the normal view of his business. The problem which makes technology transfer difficult is the well-known "N.I.H.," NOT INVENTED HERE; it affects, in varying degrees, practically every organization of every type — the unwillingness to admit that someone from outside the business might have some creative and ingenious ideas about the business which we had not thought of ourselves. Such idea-interjection attempts are inclined to be summarily rejected without rational consideration.

5) A gap common to most negotiations between buyers and sellers of new items is a biased interpretation of the RISK vs. RETURN axiom. Naturally, the buyer stresses the tremendous risk and the need for handsome return (to him), while the seller sees the new product risk of his new technology to be minimal. The seller seeks sub-

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stantial compensation (to him) for his low-risk idea which he believes will soon put the buyer at the top of the FORTUNE 500 list. Both parties need some education on the matter of new products — the cumulative investment curve as market introduction approaches (which would be an eye-opener for the seller, no doubt) and the history of companies which are too inflexible to change products and lines or are too conservative to risk resources on new technology which can drastically affect the nature of their products or services.

6) Most buyers of technology will find it difficult to believe that the sellers oftentimes have a peculiar, curious, problem. A university or a company or a federal agency may generate new technology as a regular thing, though as a by-product of its basic functions and/or outside of its normal interests and needs; such an organization is likely to have many individuals in its employ who are not convinced of the value and importance of selling its technology to those who can put it to use. In some instances the sale or licensing of new ideas is even discouraged by official policy. Until this attitude can be changed, there will be many, many items of new technology languishing in graduate theses, in professors' desks and heads and on university and government laboratory benches. Though the result is the same, a large number of companies have a somewhat different internal problem to resolve: do we want to sell some of our technology, and if so, how and to whom? Incredulous as it may sound, the first step in triggering technology transfer must frequently be one of convincing the owner of such technology that everyone's best interests may be served by transfer of his new, unutilized products/processes to those who can put them to good use!

To bridge the differences between buyer and seller, it is necessary to recognize that differences exist, then consciously seek to minimize them one-by-one. If a few of the highest hurdles can be cleared away, those remaining inevitably appear to be less formidable. As a start, the tremendous IDEA to PROTOTYPE barrier between buyer and seller can be tackled if each party will shift his position slightly; the seller could assume some of the development risk (and learn a bit about the buyer's problems at the same time) by investing time and energy and modest funds in designing and producing a prototype or two. Even though the seller's prototypes might not be most appropriate for the buyer's purposes, the evidence of seller's willingness to meet the buyer further down the road will have accomplished much.

At the same time, the buyer could assign the responsibility in his organization for the risk-taking of investment in new products/processes to a special group having the introduction of new products and new lines of products as its major responsibility and loyalty. Such assignment would immediately reconcile the buyer/seller gap caused by the infamous NOT INVENTED HERE syndrome and would also help to alleviate the WORTH vs. VALUE, RISK vs. RETURN and the communications problems which beset the potential transfer of technology from seller to buyer. A buyer who can uncouple his risk-taking on new technology from his marketing and production and R&D department has gone a long way toward meeting the seller on more mutually understandable terms.

If the seller would consider developing prototypes and the buyer would isolate an "outside investments in technology" person or group, two useful steps could be taken toward bridging the transfer gap. These steps can cock the trigger for technology transfer; they are two steps toward the prerequisite mutual respect and understanding between buyer and seller.

Advice to the buyer

It should be quite clear to all concerned that the triggering of technology transfer on a regular basis will require substantial changes in buyers' and sellers' attitudes — changes which are entirely feasible, but which may be hard to implement because habit and outlook are often difficult to alter. If only a part of the advice is heeded, the words of admonition will have been worthwhile.

From the sweet and bitter experiences of one who has been both a buyer and a seller of new technology, the words of advice which can help to trigger technology transfer for the buyer include the following suggestions:

a) Take a hard look at the absolute cost, the ongoing commitment and the cost effectiveness of your RESEARCH (not your DEVELOPMENT) operation. Try to estimate the research cost of each new product/process (if any) which has evolved from this operation. Do not include "warmed-over" products. Has your research operation produced <u>new</u> new products/processes at some sort of reasonable intervals and at an acceptable cost?

b) Turn on your imagination and your ingenuity! Open your eyes and ears to outside new product/process IDEAS and to new components which may become useful in new products. Don't wait for working models and prototypes before making assessments of the impact of new technology items on your business.

c) Develop a plan and a budget for risk-taking on new products/processes in your company. Establish some financial objectives and some numerical new product objectives. Don't be afraid to buy outside ideas when they sound promising.

d) Keep your R&D Department and your Production Department away from new outside technology item evaluations. Don't let your New Product Evaluation Committee near them, either — a sure way to develop instant resistance to anything from outside the company is to ask any of these groups to determine the suitability of outside technology for you! The NOT INVENTED HERE psychology is hard to overcome.

e) Assign the responsibility for looking at outside new product/process ideas to the President or to an imaginative Vice President — someone in the organization who knows the corporate philosophy and who can make decisions stick.

f) There are hundreds of people who, when confronted with any new idea, can explain why it won't (can't) work; try asking yourself and others around you HOW IT <u>CAN</u> BE MADE TO WORK.

g) Challenge yourself to imagine what you would do, and how, with a new product/process for which you have no use, but which should be of value to another industry. Put yourself in a seller's place.

h) If your company hasn't already done it (or hasn't done it well), try to decide objectively what your company is in business for (don't say "to make money" — if that were so, you could do much better by investing in AAA bonds, at much less risk).

Advice to the seller

If the buyer takes some of the advice which has been freely offered, he will have moved positively toward respect for and understanding of the seller and his way of thinking. To push the seller in the general direction of the buyer, with the expectation that the two will reach a common understanding and the transfer of technology will result, the following suggestions are offered:

a) DO try to make a working model of your product or test out your process on a small scale. The buyer usually won't have a very good imagination, and needs reassurance that your item of technology is practical.

b) Don't be coy with a prospective buyer — explain what you have. Don't withhold vital information or detail.

c) Recognize that a reputable company has far more to lose by stealing your idea than have you; if you have a good item of technology, have faith and trust in the integrity of well-known potential buyers. There are simple ways to protect your interests.

d) Try to estimate the cumulative cost to a buyer of product development, testing, market tests, production tooling, and so forth, necessary to bring your product to market. Ask the potential buyer for his figures, and use various references which are available for typical product development. Then multiply this cost by the accepted number of failures per successful new product introduction to obtain a quantitative ideas to the financial risk which the buyer will be assuming if he takes on your product/process.

e) Share the buyer's risk by investing whatever you can in proof of product/process performance and effectiveness and economy before you present your item for transfer to others. Your investment will be evidence of your own confidence in the technology you are selling.

f) Let potential buyers know what you have to offer — what it will do, what it replaces, why it is better — in simple, non-technical language. Leave the technical detail for in-depth explanations when requested.

g) Do not hesitate to seek foreign buyers when domestic companies will not listen to your technology item description; in many countries, imported technology is common and companies openly seek new ideas from abroad.

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h) Make a list of all of the steps which you think a buyer of your technology would be likely to go through before he would be able to start collecting income from the item. Check it out with one or more prospective buyers.

i) Challenge yourself to imagine what you would do, and how, if you were the president of a company doing very well at the business of making glass jars and bottles, and a seller of a new biodegradable plastic jar and bottle material offered you a non-exclusive license for a $500,000 fee plus 10% royalty on your selling price for all containers sold. If you don't like that example, set one up for yourself — but DO try to imagine yourself in a potential buyer position.

Corollary: what would your reaction be if the seller offered you the plastic material but was unable to tell you whether it would make good bottles and jars?

The final word: the secret ingredient

The summary of "Triggering Technology Transfer" is relatively succinct:

- Technology transfer is worthwhile, a) to the buyer (industry, generally) and b) to the seller (an individual, university or another company); it needs to be encouraged and broadened.
- The triggering of technology transfer is difficult, to understate the situation. The problems in broadening such transfer to the point where it will become common practice are substantial, for most of them involve changing the attitudes of would-be buyers and sellers of technology.
- The secret ingredient of a successful technology transfer, the trigger, is mutual respect and better understanding between those having technology for sale and those who can use it. The transfer gap — sharp differences in the backgrounds and points of reference of potential buyers and would-be sellers — can be bridged, though the parties must devote serious attention to the problems, and they must want to succeed with technology transfer.
- A raft of specific points of counsel for the buyer and another, separate list for the seller have been formulated to give the technology transfer participants some insight into each other's framework of reference for buying and selling. This counsel can, indeed, lead to the triggering of technology transfer by supplying the secret ingredient.

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