The Importance of Managing Innovation

In large organizations the management of innovation is not an option — it is an obligation

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Managing innovation may appear to be a contradiction in terms. "Managing" implies dealing with known quantities, following procedures, observing rigid orders. "Innovation" suggests ventures into the unknown, techniques that are unconventional, breaks in known patterns.

Management in large organizations is frequently accused of a lack of innovation, yet it is precisely in these organizations that high-technology innovation is most frequently found. Therefore, despite apparent contradictions, managing innovation is not a management option — it is an obligation. Management must deal effectively with innovation, and innovation must be channeled toward profitable ends.

The joining of management and innovation, like any union, requires definition, understanding, and often adjustment by both profit-minded managers and technology-oriented innovators. Management, comfortable in the day-to-day arena of the familiar and the predictable, must learn to deal with *undefined* problems, where decisions and solutions are not always based on convenient rules developed through experience.

Management must face these problems in such a way that the problem itself is solved, not a symptom of the problem. Both managers and technical innovators must have the flexibility to work out alternate solutions, and be ready to modify these solutions as conditions change.

A clear understanding of innovation is critical. Innovation is not simply an increase in efficiency that results in only limited, short-term growth. Nor is innovation the same as discovery (invention), which is, for the most part, unmanageable. A discovery happens unexpectedly and may or may not be useful.

And neither is innovation synonymous with technology, although the two are closely related. Technology takes new knowledge, places it in usable form, and then mixes combinations of new and existing knowledge to isolate and solve problems.

Innovation is a diffusion of discovery. It applies technology to societal needs, and exerts powerful influences on the future. It is intentional and purposeful, and contains a wide spectrum of activities — searching, selecting, incubating, developing, commercializing, and diversifying.

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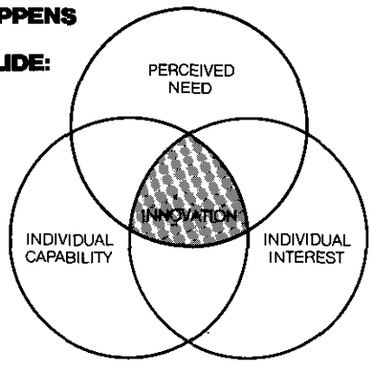
Innovation is not an accident. Its existence depends on the interaction of three elements. This interaction can be a managed process, with each element a complex entity in its own right.

INNOVATION HAPPENS WHEN THREE ELEMENTS COLLIDE:



Needs usually arise from the convergence of societal and technological trends. At the present time, to take an obvious example, cheap, abundant energy is a prime societal concern. Experiments in biology and biochemistry are hinting at previously unknown methods of producing energy. When these two trends are understood and related, a need is perceived. The process of perception — not always this obvious or easy — involves the highest order of individual management skill. Most simply stated, it is the description of bona fide and highly desirable results which we do not know how to achieve, but which — if we had them — would fill important needs.

Capability is not merely the existence of technical expertise. Needs must be stated in many disciplinary and technical "languages" and from a variety of viewpoints. Electrical engineering and biology can approach the same need, but they will do so from different directions and because of different motivations. These directions and motivations must be clearly understood by individuals who expect to manage the innovation process.

Interest, and its corollary, involvement, comes from many individuals. Since it is not possible to predict who will produce an innovation, the widest possible variety of potential innovators must be approached. These innovators will be found in diverse disciplines, from pure science to marketing. They must be able to sustain their interest over long periods of time, often in the face of extreme discouragement.

An organization interest is also required. It is rare for an organization to develop enough pressure from within its ranks to produce an important innovation that may bring uncomfortable change. "The priesthood seldom in-

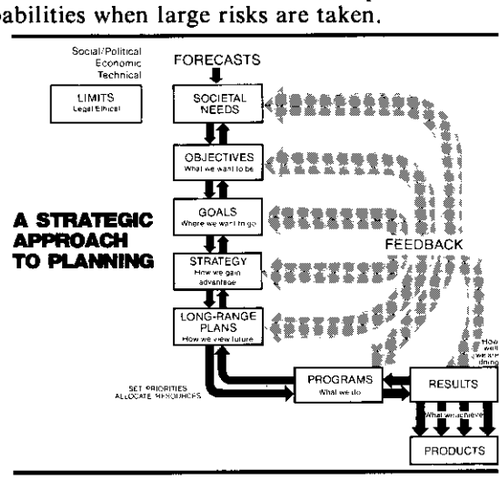
itiates its own reform" is a common slogan we must manage to disprove.

A collision of perceived need, individual capability, and individual interest does not guarantee that innovation will occur, but it does increase the probability.

In order to manage innovation once it has been ignited, a strategic approach to planning is needed to observe, correlate, evaluate, and test innovative ideas. This strategic approach is cyclical.

The elements of the collision that produces innovation are now modified by specific trends and limits. A projected technical capability may be overshadowed by economic prohibitions. Certain areas (human genetic experimentation, for example) may be related to some societal needs, but investigation in these areas is subject to a host of constraints.

Once societal needs and objectives have been defined and judged desirable, an orderly procedure is required if the end results and products are to meet the needs as originally perceived. Systematic planning is not an attempt to eliminate risk. It is an attempt to assess future probabilities when large risks are taken.



Feedback is the key that permits the intelligent altering of strategies. Without feedback, there is no measurement, no evaluation, no way to judge process — or the lack of it.

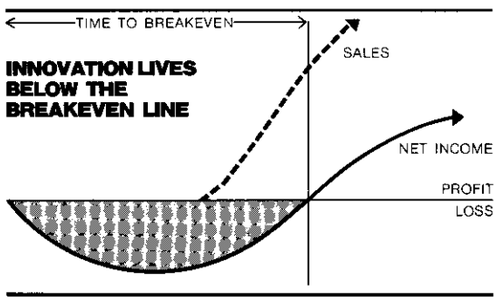
This strategic approach to planning is what makes innovation possible in large, technology-oriented organizations. Without it, innovation will disintegrate into a haphazard pursuit.

Given the intricate interrelationships required to make innovation happen and the complexities of strategic planning, it seems remarkable that a rationale for innovation can exist at all. Particularly in large organizations, there is a basic, psychological conflict between the demands of long-range strategic planning and the constraints of day-to-day thinking.

But not only must large organizations do innovation and planning, they must do them well. The difference between doing and doing well is the difference between remaining consistently competitive in a market, and earning and exercising market leadership. The latter requires a higher level of effort, dedication, timing, flexibility, and, above all, the ability to deal with uncertainty.

Enterprises which achieve positive results because of technology share common features during the innovative process: Technical programs are intimately meshed with clearly defined business goals. Funding is consistently more than adequate for program needs, regardless of corporate profit results or laboratory findings. A proprietary technical position is secured and exploited to develop a proprietary market position.

Even when all these optimums are present, those in the innovative process — as well as those who support it — must not only be willing to exist below the profit line but must also vigorously defend their fair share of the red ink on the corporate balance sheet.

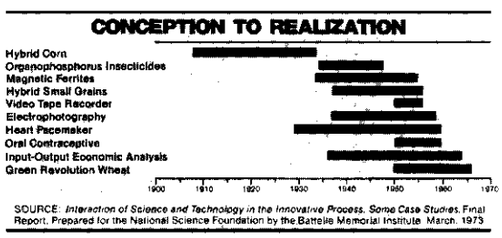


The shaded portion of the illustration above contains more than the research that led to the first faint "Eureka!" and to the development activity that proved it out. There are also plant construction costs, commercial development costs, manufacturing, and management costs.

An activity that only lives below the profit line is suspect, even in the best of times. When total corporate net income is threatened, such activities are truly an endangered species. It takes individual tenacity to continue in the face of inhibiting circumstances, major obstacles, and the outright death wishes voiced by "the experts" ensconced on the top side of the profit line.

To support this individual commitment, there must be a corporate commitment based on the prospect of future profits which will more than offset the losses incurred during the innovation process.

While a prime objective of strategic planning is a reduction in the time needed to bring an innovation to realization, this process takes far longer than most managers realize. In the illustration below, the average time from first conception to first realization is 19.2 years, a time span longer than many managers would tolerate financially if they understood the duration before they became involved.



SOURCE: *Interaction of Science and Technology in the Innovative Process. Some Case Studies.* Final Report. Prepared for the National Science Foundation by the Battelle Memorial Institute. March, 1973

If the time to break even from the first research and development explorations to true profitability is forbidding, so too is the delicate and precise timing needed for market introduction of an innovation. Timing is frequently the most important factor in the ultimate commercial success or failure of an innovation.

Technology must be ready at about the same time as the market — never early, and better late than never. History is replete with mismatches. Technology was ahead of the market with Chrysler's Airflow car, with coal hydrogena-

tion, and with protein-enriched foods. The market is still ahead of technology with a cancer cure, a heart disease preventative, and low-cost, effective water treatment.

Management's ability to pace the development of an innovation, particularly in the later stages required in the strategic planning cycle, can mean the difference between success and disaster. The importance of this fine tuning cannot be overstated, but it is often underrated.

Predictability is a complex factor from which management cannot escape, and it requires a high degree of flexibility. Laboratory predictability is another way of saying experimentation. We accept the cost of laboratory failure not only because it is a traditional part of the innovation process, but also because it is a private failure.

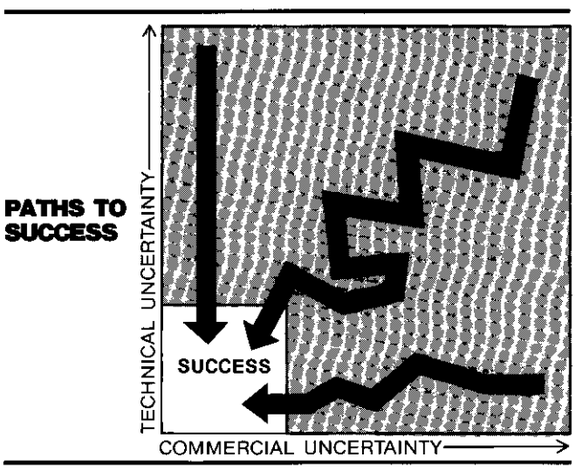
Marketplace failure involves public experimentation and its cost is measured in prestige and opinion as well as dollars. This public cost can take on such importance that it is avoided entirely. Thus we tend to rely on the private technique of market research instead of early selling trials to discover market trends accurately. Statistical extrapolation can have validity, but never certainty, and inaccurate market predictions can throw off timing, confuse long-range plans, or misdirect products.

It is probably impossible to make any market/product interface completely predictable, however hard we try. The most profitable outlet for an innovation is frequently not the one first projected or practiced.

Artificial turf surfaces now common in professional and collegiate athletics were initially developed as portable playground coverings. Xerography failed initially in office copying and was used instead to make multilith masters and engineering drawing enlargements from microfilm. Only much later did it reenter office copying as a success.

The lack of complete predictability, which is always present, requires flexibility, and it is wise not to program application research so tightly that the wild idea never has a chance. If it had not been for some sophisticated developments in silicone polymers, the children of today would not have Silly Putty.

Uncertainty adds another dimension to the process of innovation. It is a condition requiring action but defying risk analysis. Of all the functions large enterprises do not do well, dealing with uncertainty heads the list. Uncertainty can be defined by type and exists in time, permitting construction of a matrix, below.



Projects that are the result of the innovation process are located throughout the shaded area, and the arrows indicate typical paths to success. The farther to the right and the higher a project is, the more uncertain it is of reaching success. The more complex the path to success, the longer the time period will be. In actuality, paths to success are much more complicated than those shown on this chart. They often double and redouble back on themselves many times before reaching the lower left.

Progress becomes smoother and more direct when a program is located close to one of the axes of the chart. When only technical uncertainty is involved, the path is usually direct, since the problems to be overcome are well defined — although not necessarily easy to achieve. When there is technical certainty but commercial uncertainty, the path is somewhat more complex because technical adjustments are required to achieve commercialization.

The coordinated effort each project necessarily involves becomes increasingly expensive as the project progresses from the outlying corners toward the lower left of the uncertainty chart. At the lower left, it has accumulated the four required skills of a successful business venture: technology, management, manufacturing, and marketing — all in proper balance.

Every well-known product or business arising from innovation was once in the shaded area of the chart. So too were many products which have never seen the light of the marketplace. Knowing when to stop a project from moving about on this business chessboard requires as thoughtful a management decision as the first one which encourages an innovation. Projects eliminated from one corporation's uncertainty chart have appeared on another's and have been carried through to success.

The management of innovation is one of the most demanding tasks faced by a large organization, and it is in groups of this type that most technology innovation occurs.

In the beginning, selection must happen not by accident, but with perception of a mixture of technical and commercial needs.

Management becomes more uncertain and difficult after need identification, when a project begins its unique — and unpredictable — route through the uncertainty chart. Without total commitment over an extended period of time, projects cannot survive in this environment, and this becomes a management responsibility.

Then, as a project nears the end of its exploratory journey, management must become critical and rigid before massive numbers of dollars and large numbers of individual careers are infused into the program.

Without unduly restricting individual capability and interest, a method or frame must be provided in which the ultimate goal of the innovation activity is considered. This frame is the strategic planning process, which must be adhered to whether business is good or bad, whether there is an obvious need for such planning or not.

The innovation process must exist within a system which encourages product conceptualization, development, testing, growth, and finally, maturity. This system must reduce the time from first conception to first realization, within the constraints of market introduction timing.

If the management of innovation is to be a success, those concerned with planning must relate the organization to

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countries, and grant a license permitting the use of the patent in one or more, but not all, of those countries. In a negative sense — and perhaps this is what Mr. Stern meant by the term — these may be considered to be territorial limitations since they represent a 'failure' to grant use of *all* of the licensor's patent rights worldwide. But they are not limitations, not restrictions, and not restraints on the use or enjoyment of the property that is licensed; the licensee can use the property *licensed him* without any material restriction being placed upon him. Of course, it is also possible that a patent license may contain an express limitation or restriction against practicing an invention in one or more specified countries where corresponding patents are owned by the licensor, rather than just omitting reference to certain countries, but this probably is a very rare practice if employed at all."

In my view, use of the word "restriction" in connection with a positive grant such as "a nonexclusive license to make, use, and sell in field 'A' " is not restrictive in any dictionary sense. It yields exclusivity in a limited area. It is a limited grant but it does not prohibit nor restrict manufacture, use or sale in any other field. The only limitation with respect to other fields follows not because of any contract or implicit understanding, but because of the existence of a patent. The problem of infringement existed before the license. It has been removed in the license field. No change has occurred in all other fields; the infringement problem remains. The restriction, if any, has been not created by, nor affected by, nor made legally important by, the license provision. Hence, it is improper to impute restriction to the license term.

Misuse of the term is not limited to government. Two examples of the use of "restriction" to cover simple grants are found in Peter D. Rosenberg's "The Metes and Bounds of the Defined — Field Patent License," 53 JPOS 555 and Professor S. Chesterfield Oppenheim's "The Patent Antitrust Spectrum of Patent and Know-How License Limitations: Accommodation? Conflict? or Antitrust Supremacy?" *Les Nouvelles*, Vol. 6. No. 3 page 80.

To argue that a mere grant of permission to infringe within an area of extent less than the total area covered by a patent is more than semantics. It is a distortion of word meaning and should not be countenanced by license drafters or parties to a license.

This is not to say that a license never contains prohibitions. Licenses can and do — in which case, assuming the patent rule of reason running from *Bement v. National Harrow* through General Electric, Talking Pictures, Ethyl Gasoline and, now Ciba is properly invoked, antitrust reasoning is applicable.

The problem may be that the Department of Justice, which denies the existence of the patent rule of reason acknowledged in the above-cited cases looks only to the anticompetitive aspects of patents. The Court in Ciba correctly stated, "Any limitation contained in a patent license, by definition results in a restraint of trade. The restraint inheres in the grant of the patent itself which by its terms conveys the power to exclude. Therefore, it seems fruitless to attempt to judge the legality of a particular limitation contained in a license in terms of the competition it prevents from coming into existence. Rather, the legality of a limitation or series of limitations can only be judged with reference to the scope of the monopoly created by the letters patent."

Too many of us have unthinkingly fallen into a trap by accepting the word "restriction" as an accurate description of positive, but partial, grants of a license. We must insist on using "restriction" or analagous terms only when the grant positively forbids or restricts. Otherwise, we find ourselves unfairly and needlessly on the defensive — a burden has been shifted to the licensor.

As a group most involved in licensing, LES and its members, in particular, have an obligation to use words with care and accuracy and to challenge those who don't.

The word "restrict" could be used reasonably accurately to describe a grant. For example, the court in the Ethyl Gasoline case said that a patent owner "may grant licenses to make, use or vend, restricted in point of space or time, or with any other restriction upon the exercise of the granted privilege ..." This is not the same thing as claiming that such restrictions are equal to prohibitions.

"Restriction" has become ambiguous and indefinite. It is up to us to restore precision in our usage of the word.

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volving the ongoing transfer of technological improvements in design, production techniques, et cetera), trademark rights, nor a commitment to purchase resultant product. Instead, it is my understanding, based on information available in the public domain, that Fiat assisted in setting-up the plant and putting it on-stream; but that it has not updated the technology transferred. Consequently, the Fiat arrangement is no exception to the Soviet penchant for avoiding the type of sustained relationships being sought with Western firms by their Eastern European neighbors (and comprising the focus of this paper).

8. CMEA, or the Council of Mutual Economic Assistance (also known as COMECON) was created in 1949 as a Soviet counter to the Marshall Plan and as a tool of integration. Current members are the U.S.S.R., the Nations of East Europe plus Mongolia, Cuba, and associate members Yugoslavia and Finland.

9. This program is a concomitant to the emphasis placed on improvements in such sectors as housing, roads, sewage systems, and public buildings. See, for example: U.S., Department of Commerce, Domestic and International Business Administration, *Five Year Plan Summary: Poland,* Pubn, No. OBR 73-29B (July 1973).

10. Poland, Ministry of Machine Industry, *Poland-1973* (Warsaw: 1974), p. 1.

11. "Reaping Profits Around the World," *Financial World* 140 (23 January 1974): 23.

12. Ibid.

13. U.S., Congress, Senate, *Multinational Corporations: A Compendium of Papers,* 93rd Cong., 1st sess., 1973, pp. 178-85.

14. U.S. Department of Commerce, Domestic and International Business Administration, *Five Year Plan Summary: Romania,* Pubn. No. OBR 73-29G (December 1973).

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the larger environment in which it exists. They cannot close their eyes to the fact that the long range is becoming shorter all the time. All too often, the management responsible for an organization cannot trust itself to be objective. Most managements of most organizations spend most of their time on yesterday's problems or in striving to maintain the status quo.

This does not alter the fact that senior management in a large organization holds the prime responsibility for making innovation happen, for approaching planning strategically, for dealing with predictability and uncertainty. No other group has the required overall perspective. No other group can manage innovation.