TECHNOLOGY MANAGEMENT

Making the Most of Research and Technology Investments

by Alan R. Procter

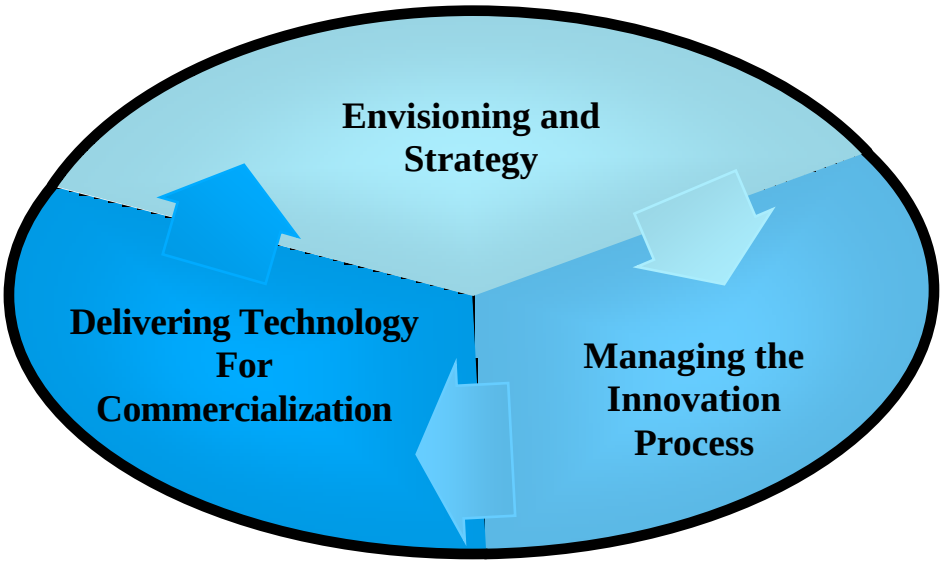
Editor's Note: The following article is a summary of an on-line distance learning course entitled "Managing Technology for Value Delivery" offered through the University of British Columbia. The eight-week course is being conducted between March 6 and April 28, and will be offered again this fall. A demonstration web site is located at http://www1.cstudies.ubc.ca:8900/public/RMTD/. For more details, including procedures for registering for the course, e-mail the instructor, Alan Procter, at a.r._procter@telus.net.

The management of technology is of obvious importance to industrial companies because technology directly affects competitiveness. It influences the quality of a company's products, the way those products are manufactured, the range of company services, and the manner in which information is handled and communicated within the company.

In short, technology affects most of every company's operations. In addition, although technology is important in itself, it cannot be considered in isolation. The development and use of technology must be managed effectively if it is to provide benefits. The challenge for today's technology manager is to get more out of less (or the same) investment in research and technology (R&T) acquisition activities. The difference between well-managed and poorly managed technology functions is huge in its impact.

There is no single "best" route to superior research and development. There is no prescription, no computer model, and no mechanical application of rules that will ensure success. Every company, every competitive environment, is unique. However, it is important to recognize and then apply certain guiding principles and hard-won experience to the specific identity, culture, and will of the company or organization in its individual competitive arena.

The broad context of "technology management" covers three major issues: 1) envisioning and strategy development, 2) managing the innovation process, and 3) delivering technology for commercial application. These three big topics represent a "technology management cycle" and as a whole contain the elements needed for the value delivery of technology. Value delivery means maximizing the return on the technology acquisition investment–finding ways to improve efficiency and eliminate waste.



The technology management cycle also has a time dimension–it is evolving, with progressive refinement of the overall technology strategy each year. As new information is developed or becomes available, the big picture strategy is adjusted. This is most conveniently done at each annual planning cycle. In this way the technology strategy is kept current and "tuned' to deliver maximum value.

Envisioning and Strategy Development

The following "expert" predictions of the future underscore the importance of envisioning and strategy development:

"Everything that can be invented has been invented."
--Charles H. Duel, Director of U.S. Patent Office, 1899

"Sensible and responsible women do not want to vote."
--Grover Cleveland, President of the United States, 1905

"Who the hell wants to hear actors talk?"
--Harry M. Warner, Warner Bros. Pictures, 1927

"There is no reason for any individual to have a computer in their home."
--Ken Olsen, President, Digital Equipment, 1977

"640K is enough for anyone."
--Bill Gates, Microsoft Founder, 1981

Deciding the direction of a research program is one of the most important factors in successful technology development, yet this front-end analysis often gets the least attention. This is probably because it is difficult and time consuming to do it right. It is common practice to follow the herd or listen to an "expert" in setting strategic goals for research or deciding technology acquisitions.

Consequently, many organizations work on the same things, reducing the chances of coming up with proprietary technology. Furthermore, key "trend-break" issues are missed—for example, the rapid rise in the use of recycled fibers in the 80s and the dioxin and forestry issues of the 90s.

Future awareness and scenario planning are tools that can be used to inject some discipline into strategic thinking and achieve a common language between all stakeholders. When this is done well, there is a greater chance of being the first to develop the leading strategic technology or the significant new product. It can also guard against being surprised by unforeseen trend-break events.

Having developed plausible future scenarios that address a focus question or issue, the next step is to link this to a business strategy and hence to a technology strategy. The technology strategy will be designed to maximize the odds of developing and successfully exploiting competitive technologies and minimizing the risks of poor technology decisions and blind alleys, regardless of which scenario or combination of scenarios unfolds. Included in this analysis is a balancing between a shorter-term "bread and butter" technology focus (low risk for failure, but usually modest rewards), with a "big hit" technology focus (higher risk, but huge rewards).

Managing the Innovation Process

In the management of a research and technology (R&T) program, what is important is its make-up, its balance in priorities, how it is to be funded, and tools to ensure built-in value. The technology program portfolio is defined as the mix of individual research and technology programs, projects and services within the whole R&T program. Development of the portfolio requires team structures, using well-tried tools, to arrive at a game plan that maximizes value for the dollars to be invested.

Appropriate organization structures also are needed to ensure that optimum value is delivered in the execution of a technology program portfolio. There should be a particular emphasis on teams and team functioning. Disciplines and best practices for program and project management should be in place. Research program management disciplines are important for the individual researcher, the program team and the sponsoring organization in order to ensure that the ongoing management of the research effort is focused, on track, and optimally using scarce resources. The commonly used tool of stage gate project management is used to plan for speed and critical path delivery of the technical results. Of particular importance is the discipline of early termination of projects that have become low priority.

Best practice technology management principles set standards and guidelines for all practitioners in the technology innovation process. Many of these process issues are people skill related–from how to behave in a team environment, to communications, networking, and leadership. These issues are fundamental to the successful execution of a research project or technology acquisition process.

Historical wisdom indicates that the main distinction between successful and unsuccessful projects has little to do with the sophistication or elegance of the research or technology, and everything to do with people issues. Good people skills cannot be overemphasized for their contribution to successful technology development and delivery for commercial implementation. In order to extract maximum value from the research management process, it is also important to identify sources of waste in the R&T system.

Delivering Technology for Commercial Application

Maximizing value from R&T requires that some form of value measurement be made on a regular basis. Measuring value is difficult because it involves judgment. Keeping a credible R&T system scorecard is important. Costs are highly visible; the benefits also should be visible. The value of the R&T system also includes the management of proprietary or strategic technologies and the licensing opportunities that these might afford.

All stakeholders must have a long view on the value of R&T, and view it as a “built-in” value issue rather than as an afterthought needing an audit. As a consequence, they must also see technology as a means to achieve and sustain a competitive advantage. Measurements are needed to reach this state.

The volume of available information in today’s world is doubling every few months. The consequence of this is that we have to unlearn some of the paradigms we use for accessing and using information. This includes the manner in which we approach technical problem-solving and innovation. The new paradigm says, “somewhere out there lies the solution to almost any problem,” and the trick is to first recognize and then to access that “solution”.

Put another way, you don’t necessarily have to find the “solution” yourself because someone else has probably already found it in some other context. This approach to problem-solving for technology acquisition is likely to be more efficient for resource utilization in the R&T system. It can be summarized as “the skillful adaptation of known technology to new

applications.” This needs appropriate (and often different) organizations, protocols and skills to optimize the R&T system for this method of problem-solving and technology acquisition.

Alan R. Procter, former research director at MacMillan Bloedel Ltd., is an adjunct professor specializing in the field of technology management in the forest products industry at the University of British Columbia. He can be reached at 604-822-5936.