Realizing the Power of Technology

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Companies everywhere are concerned that the return on their investment in technology development (which includes R&D) is inadequate. Their strategies go awry in a number of ways. Technology developed by Xerox or AT&T brings profit to Apple or Sony. Technology developed by General Motors lies fallow. Technology collaborations created to make necessary investments both affordable and lucrative end up in costly litigation, while back at home the central R&D laboratories seem to be hemorrhaging money. And companies wrestle daily with issues of choice and balance: How much to invest in process technology and how much in product technology? Which technologies to make and which to buy? How porous should the membrane be between suppliers' organizations and the parent company?

While there is no easy way through this thicket of thorny issues, our experience in helping clients apply the concepts of the High Performance Business[1] suggests that two principles can be helpful guides to the effective use of technology:

• The power of technology becomes real when – and only when – it creates value for the stakeholders of an organization – principally its customers, employees, and owners.

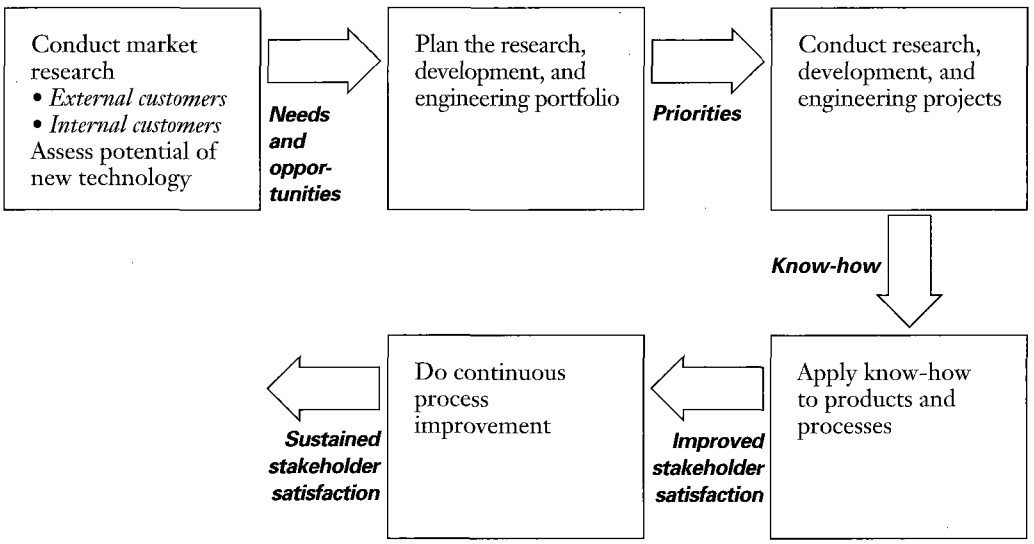
• Value can be created in one of two ways: by improving the perceived value of the products and services that are sold or by improving the work processes that go into conceptualizing, creating, and delivering these products and services, in order to realize value not just for customers, but for employees and owners as well[2]. Process improvement makes the work processes effective, efficient, fast, flexible, adaptable, enjoyable for the employees, and safe.

These seemingly mundane principles suggest a number of useful operational guidelines for companies that want to use technology more effectively to become High Performance Businesses.

First, *technology development should be viewed as a process that culminates only when it creates value* rather than when it emerges from R&D or Engineering (Exhibit 1). (Henceforth, I will use the word *know-how* to describe what emerges from these functions.) In recognition of this principle, Japanese companies are now defining their core technologies in terms of current and potential markets (see the article by Atsuro Kokubo on page 13 of this issue of *Prism).* But it is useful also for those who are responsible for the early stages of technology development (i.e., those in R&D) to keep in mind not only the company's paying (external) customers and the products and services they might want, but the owners and implementers of the company's work processes. For this idea to work well, it is imperative that the company designate and give power to owners of its key work processes.

Exhibit 1

The Continuous Process of Technology Development



In addition, close collaboration between those who create know-how and those who use it can substantially enhance its value. This collaboration is beginning to occur in manufacturing, where technology will make a dramatic impact in the next decade (see the article on this subject by Peter D. Hilton and F. William French on page 69 of this issue of *Prism*). It is much less common with the most pervasive technology of modern times – information technology. Hence the immense waste of investment in this technology (see the article on this subject by Edward T. Choate on page 37 of this issue of *Prism*). What's called for is an effective collaboration between the information technologists and the process owners, with the process owners in the driver's seat. In the long run, however, one would expect that those who do work (or manage it) will become knowledgeable enough about information technology to select what makes sense and implement it, without help from a staffy group of experts.

Since collaboration improves with physical proximity[3], the days of the typically remote corporate R&D center may be numbered. A common justification for centralized corporate R&D has been the economies of scale and breadth of application it can yield; however, these are often more than outweighed by the difficulties of integration. The other argument for centralizing R&D has been that the corporation as a whole should bear the risk, rather than individual business units. However, there may be more effective approaches to handling risky R&D, such as outsourcing and collaborations with government, academia, or other companies. (For a discussion of the issues involved in managing such collaborations effectively, see the article by Ronald S. Jonash on page 23 of this issue of *Prism;* for a discussion of the role of government, see the article by Ashok B. Boghani and Ronald S. Jonash on page 53). Companies ought to conduct a rigorous value analysis of centralized corporate R&D, taking into account the probability that the know-how developed there will be successfully applied.

Second, we know from our work on improving processes for our clients that *processes improve fastest when those involved in the improvement effort understand the whole process rather than just their piece of it.* Since technology development is a process, the scientists and engineers involved in it ought to understand the key work processes into which their know-how will feed. Perhaps they should even participate in those processes, so that they can put themselves in the shoes of their „customers." Conversely, those downstream „customers" who execute the key work processes should also understand something about the process by which scientific and engineering know-how are generated. What's needed is a two-way street for process education.

Third, *the value of know-how depends on a company´s ability to apply it to usefully differentiate its products, services, and processes from those of its competitors.* Without differentiation, value perceived by stakeholders does not increase; instead, as performance improves, expectations rise and perceptions stay constant. This argument suggests that the internal development of know-how should focus on those areas in which the company generates the highest stakeholder satisfaction per unit of investment, i.e., stakeholders' „excitement wants" and some of their „performance wants," leaving to suppliers the satisfaction of other performance wants (i.e., those not emphasized in the strategy of the company) and „threshold wants"[4]. These concepts are embodied in the Kano diagram, shown in Exhibit 2. The argument also suggests that unless there is a way to make know-how differentiating, the company should not invest in it but rely instead on suppliers.

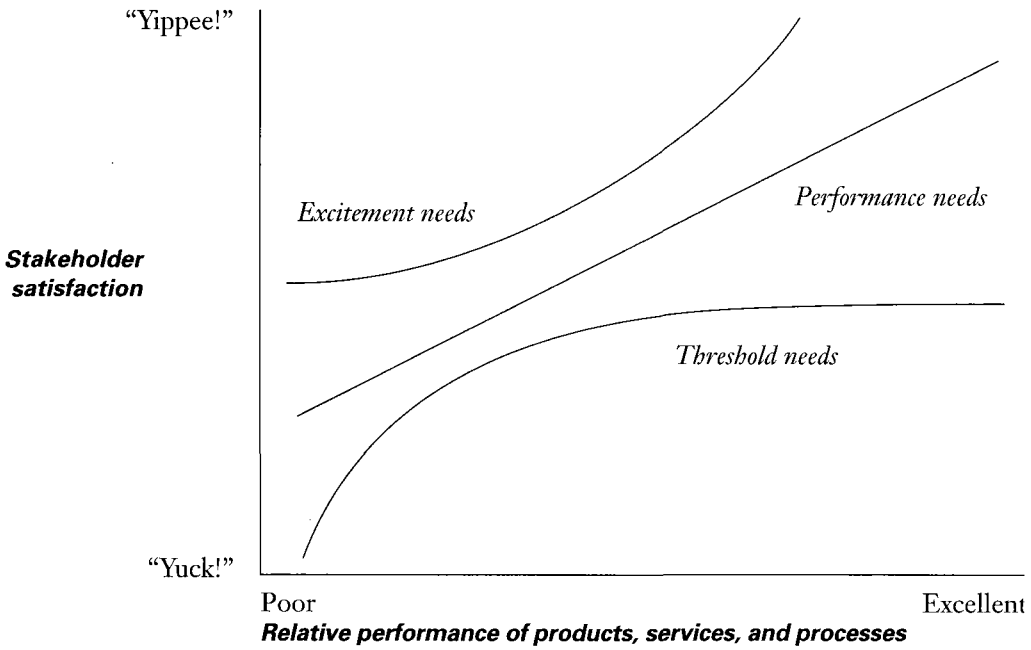
Know-how can be differentiating in one of several circumstances: when it is secret; when it is proprietary (i.e., patented); when a company has access to it earlier than its competitors do; and, finally, when the company knows how to apply the technology more effectively than its competitors (for a related discussion, see the article by F. Andrew Anderson on page 81 of this issue of *Prism).* Technologies that are still in the very early (basic research) stages of development tend not to be differentiating because during the lengthy time that will elapse before application, access to the know-how is likely to become widespread. Collaborations among companies, universities, and government agencies may be needed for the creation of emerging know-how.

Fourth, *the agenda of know-how development must be broadened to reflect the needs of a company´s multiple stakeholders, not just its external customers.* While it is now commonly accepted that R&D should address both products and processes, the set of processes that people think about needs to be enlarged to include, for example, know-how development itself, supply chain management, human resource development, and customer service. Also, the performance of every process needs to be assessed and enhanced from the viewpoint of the multiple stakeholders of the company: Is the quality good? Is the process efficient and environmentally sound? Is the work safe and enjoyable?

Finally, if one views technology development in the light of value creation, then clearly *technology development continues while a work process is improved.* In this sense, the factory and the R&D laboratory can be seen as an integrated organization. As we have noted, moderately complex technologies rarely emerge from laboratories pure and perfect. They need to be used, and while they are being used, they need to be observed by intelligent and enquiring minds that persist in looking for ways to improve them. As the learning curve eloquently testifies, the effectiveness of a technology can be so greatly improved through application and learning that the ability to learn faster than the competition becomes a remarkable way to achieve differentiation – and therefore value – from technology.

Exhibit 2

Three Kinds of Stakeholder Needs



[1] P. Ranganath Nayak, Erica Drazen, and George Kastner, „The High Performance Business: Accelerating Performance Improvement," *Prism,* First Quarter 1992.

[2] Robert M. Curtice, Laurence P. Chait, and Anthony J. Lynch, „Process Thinking: Today's Path to Improved Performance," *Prism,* First Quarter 1992.

[3] Oscar Hauptman, „Making Communication Work," *Prism,* Second Quarter 1992.

[4] Nayak et al, op. cit.

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