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Wake-up Call for General Management: It's Technology Time (II)

Common Pitfalls in Technology Management - And How To Avoid Them!



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The first installment of this two-part series on technology and its management pointed to the wide divergence in corporate abilities to capitalize on technological opportunities and to navigate the ever-present threats of technological change. In this follow-up installment I shall identify seven common pitfalls which must be studiously avoided if technology is to be seen as an opportunity for growth and progress and not as a threat to survival.

Pitfall 1 – Misallocating Resources between Product and Process Innovation

Many companies, and many R&D managers, overspend on product innovation in periods when heavy process innovation is really called for, and/or overspend on process innovation in periods where new product innovation is what is needed. They simply do not understand the timing of strategic shifts that periodically go on in all industries between periods of “divergence” (requiring major product innovation), and “convergence” (increasing product standardization requiring process innovation). Arguably, Henry Ford failed to recognize that the automobile industry in the 20s was shifting from mass production to innovation through market segmentation, as General Motors introduced cars for each price bracket.

To avoid this pitfall, innovation priorities must be geared to strategic priorities and thus to the continual monitoring of industry turning points and breakpoints and their strategic consequences. Intel is an outstanding example of good practice in this respect. Each successive wave of major product innovation is closely followed by a massive effort to move down the experience curve and reduce costs.

Pitfall 2 – Defining Technological Innovation too Narrowly

Many companies believe that managing technology is synonymous with managing R&D. For them, the technology capacity of the enterprise begins and ends with a new product creation process, and as long as there is a stream of new products emerging, performance is assumed to be satisfactory. But this begs the question of developing or acquiring the fundamental long-term technological positions which will assure new products, new processes, and even new business opportunities in the future. The US consumer electronics industry provides a classic example. While US manufacturers were developing new versions of existing products (mostly TV and radio related), Japanese producers were investing in the key and pacing technologies which gave birth to whole new industries. Miniaturization was a key technological element in all this.

To avoid this pitfall, it is important to recognize that technology pervades many key functions of the enterprise, of which R&D is just one. It can fundamentally affect manufacturing, distribution, supply chain management and, through IT, key management processes themselves. Technology is thus an asset to be

managed as promoting the competitiveness of the enterprise rather than a functional component. The growing importance of the CTO (Chief Technology Officer) in many technology-based enterprises is a testimony to this distinction between product innovation (centered often in the R&D function), and technology innovation (centered in the CTO office) and managed as a key corporate asset. ABB is a shining example of a company that manages technology as a corporate asset. And in fact, in the industries they compete in, technology is a key component of the corporate intellectual capital driving future market success.

Pitfall 3 - Underestimating the Role of Company Culture

Like the human being, each single enterprise is unique. As personality is to the human being, corporate culture is to the enterprise. And understanding and eventually influencing corporate culture is an indispensable prerequisite for successfully leading any enterprise.

Technology-intensive enterprises are no exception. But, by dint of their scientific or technological preoccupation, their corporate cultures are sometimes too product-driven and too inward-looking. The "old" Brown Boveri prior to the merger with ASEA to form ABB was considered by some observers to be too technical, too "heavy", too slow, and not sufficiently market-driven.

All this changed with the merger. Under Percy Barnevik, ABB integrated the two companies in more than 50 countries, created 3500 profit centers, executed programs to increase productivity, realized numerous strategic alliances, and despite cost reductions, maintained a high level of innovative capability.

These fundamental changes were accompanied by investigations as to what extent the company culture responded to these changes. To this end a concept of company culture was developed as shown in fig. 1. Two main dimensions of cultural orientation were distinguished, namely internal orientation vs. external orientation, and stability/control vs. flexibility/individuality. The results of the study are interesting: Whereas in 1990 the company culture focused on internal orientation and stability/control, a distinct shift towards external orientation and flexibility/individuality could be observed in 1993.

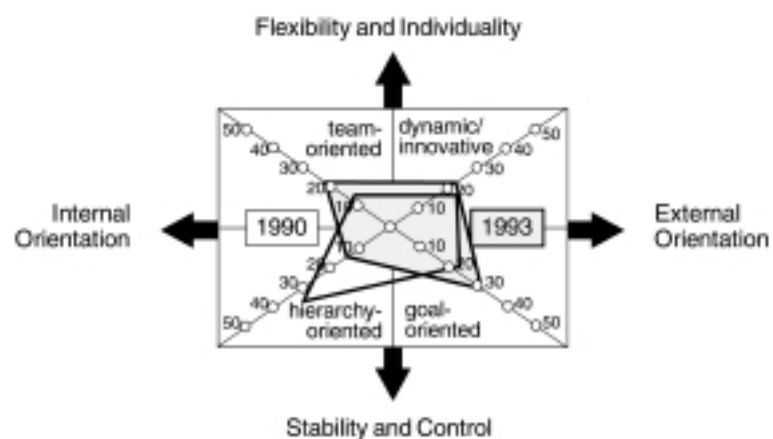


Figure 1: Investigation on Cultural Change at ABB

Pitfall 4 – Ignoring Important Technological Options

Strategic technology planning as part of business strategy planning implies making three basically different but mutually complementing decisions: A first decision ("Which Technologies?") originates from an extensive analysis of current and future products with respect to the major technologies determining

the product performance and the process technologies required for product production and infrastructure operation. This analysis should be based on so-called technology intelligence activities which include branch-overlapping search of current technology, technology forecasting and technology assessment. Based on this overview a decision has then to be made as to which of the available and yet-to-be developed technologies, beyond the company's current technological repertoire, are required for the continuous development of the enterprise. In total their conjunction will represent the mentioned technology potential of the company.

The second decision ("Make or Buy?") is concerned with the question as to whether the required technologies are to be made available through acquisition, collaboration with other companies or through in-house development.

The third decision ("Keep or Sell?") deals with whether available technologies are to be applied exclusively for company purposes or can - or even must - be made available to other companies.

These three decisions are tightly interdependent and together represent the "trilogy of strategic technology decisions" (fig. 2, top).

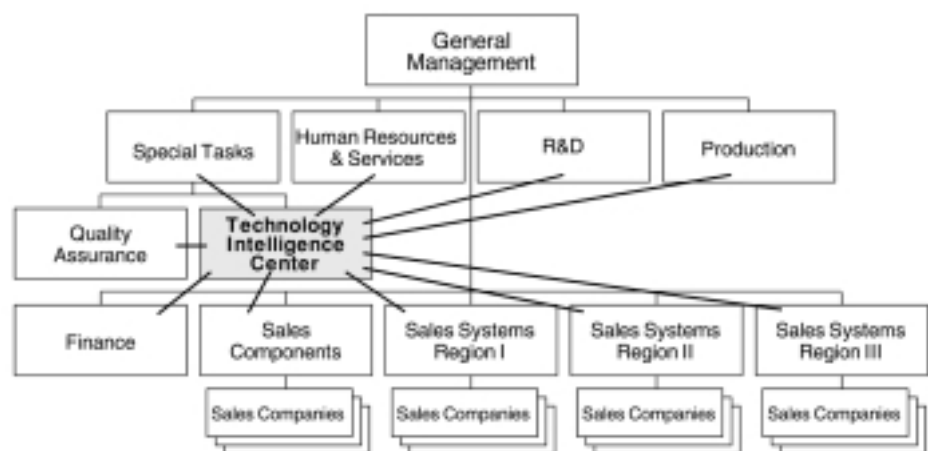
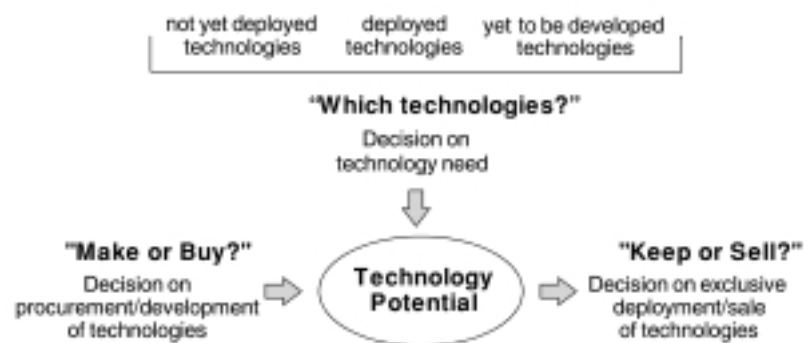


Figure 2: Trilogy of Strategic Technology Decisions and Its Structural Implications

Keeping this trilogy in mind and working on the three decisions quasi-simultaneously offers various advantages. Above all it facilitates productive use of information since all three decisions rely on mostly identical information concerning technology performance, technology application, technology forecasting, technology assessment, technology users, and technology providers. Then, an increased coherence of the three answers is to be expected which certainly contributes to the quality of strategic technology planning. Finally the trilogy concept leads to innovative structural solutions. It consists of combining the buy and sell activities of technologies within an organizational element which can be called "Technology Intelligence Center". Its basic task, to work on the trilogy of strategic decisions, can be enriched, for example, with the establishment and operation of a company-specific technology early warning system, with the actual execution of buy and sell negotiations of technologies, and finally with the elaboration of proposals for technology strategy decisions. This concept is in sharp contrast with classical company organization, where the procurement department and the marketing units are usually widely separated entities.

This so-called functional integration might manifest itself in practice as a central unit bringing together - mostly temporarily and partly permanently - representatives from R&D, production, marketing and finance and carrying joint responsibility for periodic elaboration of strategic technology decisions. Such a solution is shown in fig. 2, bottom.

Working on the trilogy concept leads further to the hypothesis that in future technology-intensive companies will need to position themselves in two quite different market domains: the traditional supplier-consumer market and the technology supplier-technology user market (fig. 3). This still visionary concept of technology marketing has to be investigated further under the assumption that its systematic implementation will contribute considerably to successful technology management.

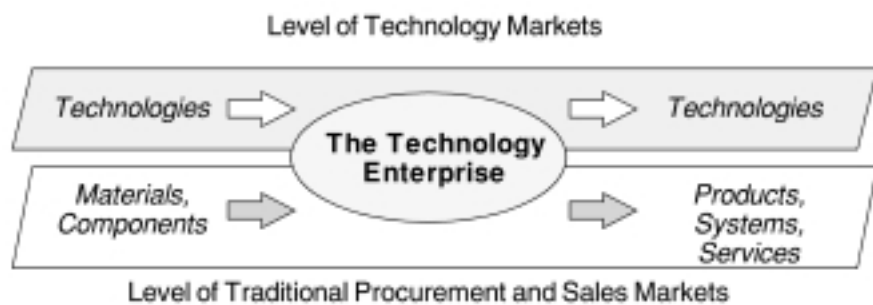


Figure 3: Prospective Two-level Market Activities of the Technology Enterprise

Pitfall 5 – Overconcentration on Existing Technologies in Portfolio Management

One instrument of technology management which has gained rapid acceptance is the Strategic Technology Position Portfolio. Technologies are rated and positioned on a chart according "to their" attractiveness (in terms of business opportunity) on the one hand, and according to the company's relative strength in that technology, on the other. The problem with this approach is that it overlooks the future importance of totally new technologies, and by definition the company's complete lack of participation in them. This information is of significance, because the future promotion of new technologies will use company resources as well as the promotion of existing technologies. In order to include this information within the technology portfolio as well it is suggested to use the "Dynamic Technology Portfolio" (fig. 4, right) instead. In addition to the traditional portfolio it is extended by the column „New Technologies" and at the same time by the line "Mature Technologies" which allows additional compilation of information on technologies which once had been part of the company's technology activities.

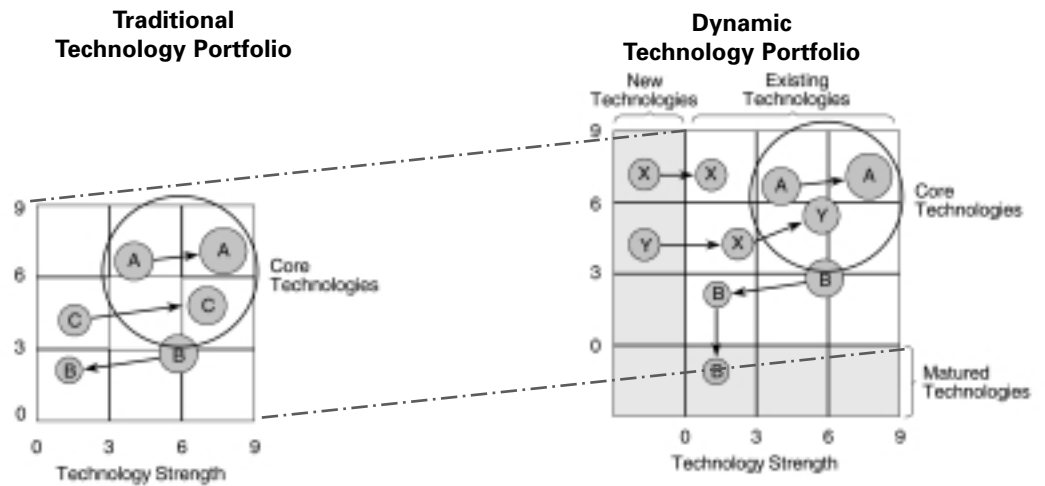


Figure 4: From the Traditional to the Dynamic Technology Portfolio

Pitfall 6 – Failing to Give Technology its Proper Weight in Strategic Planning Processes

It is fashionable to give special attention to such burning issues as quality management and risk management by creating special management structures for their implementation. To do the same with technology management is to relegate technology to a problem rather than to see it as an opportunity and a strategic driver for competitive success in the marketplace.

For this reason, the prime goal ought not to be to create a fully developed technology management hierarchy equipped with separate management instruments but rather to close the obvious “technology gaps” within the structures and instruments of general management. A first example - the postulated introduction of the CTO - has been given above. Other examples of typical gaps to be closed are company policies without proper reference to their importance to technology; strategic planning procedures without taking into account essential cross-relations between product and technology planning; controlling reports which focus only on financial and marketing issues; restricting business intelligence to economical information and not including technology-related data.

Pursuing this procedure, starting with the strategic planning process, appears to be particularly promising. Whatever the strategic planning method used, steps such as definition of strategic goals, environment analysis, enterprise analysis, strategic options, strategy decisions and strategy implementation and controlling are involved. On this basis, companies are open to persuasion that somewhere in the various stages of the strategic planning process there are “gaps between the company’s planning method and its specific technology reality” which need to be closed (fig. 5).

These gaps are typically informational and are apparent in the following areas: technology forecasting and assessment; technology networks relating technology and business units or relating product technologies to process technologies; market-product-technology analysis; defining technology potential; identifying the strategic technology position portfolio; specifying strategic technologies and, correspondingly technology strategies; defining technology projects consisting of R&D projects to develop product and process technologies; and, finally, the technology calendar, which represents a schedule for technology introduction.

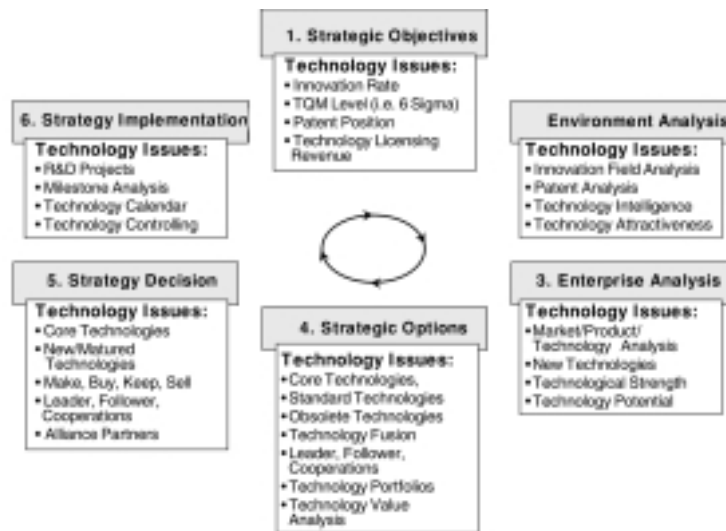


Figure 5: Typical Technology Issues to be Integrated into Strategy Planning

Pitfall 7 – Leaving Technology to Technologists

As a consequence of technology change and its inherent - often existential - success and failure potential a well balanced representation of technological and non-technological competences to make original business decisions is required. This point was already mentioned in the first installment. In this context, the composition of the board of directors and the top management group is of prime importance. An oft-chosen solution is to nominate a Chief Technology Officer (CTO) as a member of the top management group. Whereas this solution - according to a study done by Roberts from MIT in 1993 - is realized in over 90% of Japanese companies, the corresponding figures for Europe and the US are 50% and 20% respectively.

In recent years the CTO position has been introduced by an increasing number of enterprises. Salient examples are IBM, Silicon Graphics, Sun Microsystems Computer Company, Novell Inc., Nasa Headquarters, City of Seattle, AT&T Laboratories, Ascom and Gretag Imaging Company. The main CTO tasks include responsibilities for internal and external communication of technology matters, developing strategic technology elements to be integrated into the strategic business planning process, coaching R&D managers methodologically, managing centralized R&D activities, etc.

Above all, technology must be viewed as a key challenge and responsibility for general management, and at the corporate level, the CEO. Technology is not simply a functional support to business. In more and more cases it is the very business of business.

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