

Editorial

High technology management

High technology fever is spreading like wildfire; ignoring "post-industrial society", propelling new industries into unprecedented socioeconomic prominence, reviving entrepreneurial spirit across the country, foreshadowing new societal orders...

What is *high* technology? How does it differ from "technology" or "appropriate technology"? Does anybody care?

Business is booming, not only along Route 128 outside Boston, in the Silicon Valley near San Francisco, or in Research Triangle Park in North Carolina, but also in Dayton, Ohio, the Upper Hudson Valley and the Tri-State Area (New York, New Jersey, Connecticut). New York State has a new magazine, *Technology NY*, originating from Rensselaer Polytechnic Institute, and there are new, nationally distributed magazines such as *Technology*, *High Technology*, *National Productivity Review*, *Journal of Japanese Trade & Industry*, as well as *Technology Illustrated* and *Technology Review*. Also, many states are preparing tax measures and cooperative ventures to encourage high-technology industries to grow.

Business and management curricula are being restructured and redirected: courses in management of technology are offered at MIT, Harvard, and Carnegie-Mellon; Fordham University and North-eastern University are launching a program in *high technology management*, and Rensselaer Polytechnic Institute, Worcester Polytechnic Institute, and others, are expanding their engineering curricula by including business and management courses.

What are some of the new concerns and topics? One can list *productivity management*, *robotics*, *computer-aided design (CAD)*, *computer-aided manufacturing (CAM)*, *Theory Z management*, *optical-disc technology*, *teleconferencing* and *telecommunications*, *strategic management*, *decision support*

systems (DSS), *risk-taking and entrepreneurship*, *zero-defects quality management*, *management of innovation*, *consensus management*, and many others. Technologically, the major concerns revolve around optical fibers, industrial ceramics, bioengineering, magnetic memories, intelligent electronics, computer graphics, solar and alternative energies, and so on. In short, a fundamental restructuring of traditional business education is required to match the profound changes in the turbulent, high-technology dominated environment.

High-technology industries are neither labor-intensive nor capital-intensive (to evoke traditional clichés), instead, they are *knowledge-intensive*. High technology does not simply refer to a piece of hardware, nor does it refer to "hardware *plus* software" – it refers to both of these, plus the evoked organizational, administrative and cultural structure of relationships, rules, covenants, and adaptations. That is, it includes "brainware" as its crucial component and, as such, *it must be managed*.

Introducing high technology does not allow that "business as usual" can be carried on, merely faster and more efficiently. High technology affects the organization itself; it redefines the work contents, changes managerial styles and culture, reshuffles power hierarchies, and spawns a series of both man-designed and spontaneous adaptations. We could refer to this complex of effects as the "*support net*" of a given technology.

It is useful to identify high technology as requiring re-structuring and reorganizing its support net, while "technology" simply speeds up and intensifies the constitutive processes of the support net, with its basic structure and organization remaining intact. "Appropriate technology" then can be viewed as having only minimal impact on the support net. Obviously, each historical circumstance has its high technologies, technologies, and appropriate technologies. These categories are

being continually redefined and their *relative* impact redirected in conformance with the evolving nets of support.

There is a large degree of spontaneity and self-organization characterizing technology support net emergence. Management can recognize these spontaneous tendencies and enhance them accordingly, or it might insist (by design or through inertia) on maintaining the support net fixed and unchanged; or it may even impose an artificial, contrived support net of its own. That is, high technology may cease to be "high" if "married" to a wrong or ossified support net: any high-technology item becomes a "piece of junk" in the wrong organizational setting, wrong culture, or wrong system of goals and objectives. In essence, we can talk about misplaced technology, misused technology, inadequate technology, or "window-dressing" technology.

Thus, there is a big difference between transferring high technology, and transferring high-technology hardware. Acquiring an expensive "piece of junk" is what many recipients end up with, if the appropriate support net is not allowed to develop in a naturally complementary fashion. What good are personal microcomputers in a centrally controlled hierarchical institution? How "high" is the technology of xerography in countries where its "unofficial use" is against the law? What good is it to improve the productivity of the secretary, when it is her boss whose productivity really matters?

The support net is important because its changes and adaptations have a reciprocal effect on the high technology itself, making one better fitted for the other and vice-versa. This "high technology-support net" mutual co-evolution effectively transforms high technology into technology and, ultimately, into appropriate technology. The endless cycle of such transformations is then repeated. What characterizes our age as the high-technology age is not the concept of high technology itself, which has historically always been with us, but the extent of the parallel emergence of many high technologies at the same time. This simultaneous and mutually self-reinforcing emergence is new and largely unprecedented, with the possible exception of the industrial revolution. The swiftness of the upcoming transformations is, however, entirely novel in character. One-career, one-profession, one-expertise lives are becoming an exception; retooling, retraining, relocation and reassign-

ment are characteristics of this transition. "He who would pause for just a while, already stands a crowd behind"—holds true for individuals, companies, and nations in an increasingly frightening realization.

Interestingly enough, the high-technology revolution has not been accompanied by a corresponding management revolution. It is as if the global support net of high technology as a whole has not been allowed to respond, and maintains its structures through the inertia of entrenched practices, philosophies, and education curricula. American management is clinging to quarterly financial reports, bottom-line analyses, selling campaigns and image-making; while neglecting strategic thinking, entrepreneurship, research and development, and risk-taking. Business and general education are similarly unresponsive; students are being trained to master specialized techniques and practices to enable them to become even more specialized "soldiers" in huge corporate hierarchies. Their education is severely lacking in developing their critical and ethical abilities, decision-making powers, entrepreneurial and leadership attributes, and intellectual curiosity. A generation of relatively unsophisticated and technology-shy students is being produced, a "to-be-bypassed" generation in terms of managerial responsibilities and leadership in the twenty-first century corporation.

High technology is actually accelerating the trends toward a more decentralized, do-it-yourself, less service-oriented, more humane and human-oriented society. The development of user-friendly, user-oriented, or human technology reflects the industrial response to such demands. One can "rent" a bank's computer to do all the banking chores from one's home, consumers become producers as they acquire direct access to the reprogramming of a company's robots (which they essentially "lease" for their own product design and production), tele-shopping and computer-bartering effectively eliminate middlemen (as well as market research services), do-it-yourself technology and know-how are becoming increasingly popular. If I require a service, and you develop a technology which requires a specialist (i.e. some other person) to deliver that service to me, then you better think it over; sooner or later somebody else will develop the right, user-friendly technology for me: the one I can use myself without becoming, or needing, a specialist.

High technology, because of its support net, poses new challenges to marketing, finance, accounting, production and other functional areas of business. Their sharp delineations become fuzzy or even disappear in a more integrated high-technology dominated corporate environment. To devote one's time to climbing a corporate ladder will become impossible because the ladders themselves will fade away. Instead of hierarchies, high-technology corporations will be more and more organized as *cooperative associations* of professionals. More emphasis will be given to cross-functional managerial skills: leadership, decision making, strategic thinking, problem solving, human

resources development, risk and productivity management, and so on. The know-whats and know-whys will become more important than the know-hows.

High technology management cannot be further delayed or avoided. It is needed now. How to manage high technology and how to manage under the conditions of high technology really implies asking: "How to manage at all in the twenty-first century?"

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