Editor's Comments

Education: A Sustainable National Competitive Advantage

In the emerging global marketplace, countries will compete on level economic playing fields. Trade barriers previously protected country markets from more efficient, or subsidized, international competitors. Facing lowered barriers, each country must now seek to build sustainable national advantage from its store of distinctive competencies. The distinctive competencies of the past have included access to raw materials, fertile lands, sources of energy, deep-water ports, or skillful application of the technologies of the industrial revolution. In a knowledge-age society, national advantage will instead increasingly be derived from an educated and empowered work force that can quickly adapt to the dynamic requirements of a changing world.

Workers of the industrial age were often viewed as mindless cogs, required for repetitive production or clerical functions. Knowledge-age workers will instead be valued for their creativity and adaptability. Well educated, and armed with powerful information-based tools, knowledge workers will be rotated among virtual teams that will span organization boundaries and, at times, the globe. Virtual teams will manage change over short cycle times while turning to information systems, or low cost labor markets, to supply low, value-adding, repetitive production needs. Information technology will permit expertise, and often work, to be instantly transported anywhere in the world.

Sustainable advantage will be enjoyed by those societies (and companies) that best elicit value from human resources. This will require a progressive education system and an approach to human resource management that is predicated on continuous change and human development. It will also necessitate significant investment in the tools required to empower, interconnect, and motivate knowledge workers.

Nations that neglect education will wither economically. Domestic businesses may be compelled, due to a shortage of skilled workers, to improve local education systems; this is already common in the United States.[1] But in a world of dismantled trade barriers, there will be few domestic firms left with the resources required to help re-engineer local education systems or to underwrite remedial education programs. It remains to be seen whether the transnational firms that replace them will exhibit loyalty to any single country. Instead of back stopping an inferior national or local education system, these firms may be required by stiff global competition to seek out lower cost sources of expertise from elsewhere in the world. Computer and communications technology will weave these dispersed human resources into an integrated worldwide fabric.

National education policies influence both the availability and allocation of educational resources. The U.S., for instance, has long been a leader in educating its citizens. Today it has a quality university education program, but primary and secondary education programs have been allowed to languish. The percentage of the federal budget devoted to primary and secondary education in the U.S. dropped 2.5 percent from 1980 to 1991. U.S. high school students' standard test scores have fallen alarmingly since the mid 1960s[2] and now compare unfavorably with those of students from Japan, Canada, South Korea, and Western Europe.[3] Japanese students spend 33 percent more days in school per year than do their

[1] See, for example, "Business-like with Business's Help, Cincinnati Schools Shake off Crisis," *The New York Times,* August 20, 1992, A14 and "Saving our Schools," *Business Week,* September 14, 1992, pp. 70-78.

[2] "Losing an Edge," *Time,* July 20, 1992, p. 19.

[3] O'Reily, B. "America's Place in World Competition," *Fortune,* November 6, 1989, pp. 83-88.

U.S. counterparts,[4] while western European students are far more likely than U.S. students to become proficient in a second or third language and to take more courses in math and science.

Doing right by our own kids won't be enough. Who will our well-educated offspring manage, sell to, or serve if national policy results in human resources that are disadvantaged in the world labor market? And who will pay the social costs associated with the poorly educated's inability to effectively contribute? Over 60 percent of the U.S.'s one million plus prison inmates did not complete high school.[5]

Fortunately, investments in education provide impressive paybacks. A Princeton University study of 250 pairs of twins found that each additional year of education produced a 17 percent increase in annual wages.[6] Education, despite increasing costs provides a first-rate return on investment.

Computer and communications technology will be a major component of knowledge-age education programs. Information technology permits us to tailor programs to the individual, to physically and temporally decouple teacher and student, to provide more opportunities for one-on-one student/teacher interactions, and to engage students in exciting new ways. EDS and scientists, for instance, have teamed up to let hundreds of thousands of school children accompany Jason Jr., a deep-diving robot, as it investigates the ocean floor.[7] Without leaving their dorm rooms, students could observe the world's greatest scientists carrying out live science in archeology digs in Greece, the space shuttle, or the eye of a real hurricane. Or teams of students from around the world could work together, via communications linkages, on projects intended to promote cross cultural sharing and understanding. Researchers, for instance, are developing technology that would permit students from business schools located throughout the world to analyze together an international business case study.[8] Students from around the world are already collecting and analyzing rain samples that are then combined into a shared database where they are available for studies of acid rain.[9] The same graphic and simulation technologies that get kids so committed and involved in the arcades could be used to make the study of physics or genetics a joyful and personal experience.

Such opportunities are no longer limited by technology. Rather, they may be constrained by a poor appreciation of the value of education, under-investment in educational R&D, and bureaucratic inertia. The universities are the research and development arms of the education system. In the U.S. at least, universities reward faculty for developing new knowledge in their disciplines and for teaching students. Faculty are less likely to be rewarded for creating, or be encouraged to pursue, innovative mechanisms for the dissemination of knowledge in their area of expertise. Research that pushes forward the frontiers of education (as opposed to disciplinary expertise) is the responsibility of the education departments or a few other specialized departments within the university. Educational innovation is not yet an overarching mandate of U.S. universities. Progress, therefore, tends to be slow and uneven. Here a nation could use policy and investment to refocus scholarly attention toward innovations in knowledge dissemination.

The world has an unquenchable thirst for education. That thirst deepens as industries recognize the need to continually re-educate their employees. It will also increase as nations recognize the value of human resources in the knowledge age. We can therefore anticipate that new products and new market mechanisms will evolve to support innovations in education. These will pleasantly differ from the tradi-

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[4] "Japan Gives Students a Break: A Saturday Off Every Month," *The New York Times,* September 11, 1992, pp. A1, A7.

[5] Terry, D. "More Familiar, Life in a Cell Seems Less Terrible," *The New York Times,* September 13, 1992, pp. A1, A15.

[6] Corcoran, E. and Wallich, P. "Doubling Up on Payoffs for Schooling," *Scientific American,* July 1992, p. 113.

[7] Capowski, G.S. "Education Takes a Dive," *Management Review,* November 1991, pp. 6-7.

[8] Hashim, S., Rathnam, S., and Whinston, A.B. "CATT: An Argumentation Based Groupware System for Enhancing Case Discussions in Business Schools," *Proceedings of the International Conference on Information Systems,* December 16-18, 1991, pp. 371-385.

[9] For a variety of rich examples see, Soloway, E., "Quick, Where do the Computers Go?" *Communications of the ACM,* February 1991, pp. 29-33.

tional books, lecture room, and exams that many of us are too familiar with. It remains to be seen, however, whether they will center around the schools, universities, teachers, and text book publishers that have for so long dominated the education process. Education, an industry based on knowledge, seems likely to be reshaped as the tools of the knowledge age emerge.

The provision of these tools within organizations will be high on the agenda of information systems managers. An illustration is the first place winner in the Society for Information Management's 1992 paper contest, published in this issue. That article looks at PRISM, a Federal Express system for facilitating human resource management. We hope that article and this essay will encourage other investigations focused on education and human empowerment systems within organizations.

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Finally, I am most pleased to welcome to the *Quarterly's* editorial board Lynda Applegate of Harvard Business School, Michael Earl of the London Business School, Brent Gallupe of Queen's University, Joey George of the University of Arizona, Kalle Lyytinen of the University of Jyvaskyla, and Ron Tarro of Ernst & Young. Detmar Straub will also be moving to the editorial board from his previous position as our associate publisher. We all thank Detmar for both his past contributions and his commitment to the journal. We are also indebted to Michael Prietula of Carnegie Mellon University for serving as a guest associate editor.

—Blake Ives