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ABSTRACT

Technological innovations are giving rise to structural changes in the economy that are in turn creating profound changes in the nature of work and work organizations. Predicted changes are: traditional hierarchical organizations in the workplace will give way to network or weblike forms of organization; customary vertical divisions of labor will be replaced by horizontal divisions characterized by collaboration among autonomous teams; customized manufacturing will replace mass production; new service industries and occupations will evolve; the numbers of specialists and integrators will increase; and a "freelance economy" will emerge. The following are some implications of these changes for education and training: more occupations will deal with abstract information and procedural or mathematical reasoning; preparation for work will include formal education plus contextual or craft knowledge; formal education may impart just a disciplined way of thinking and the habits/skills of lifelong learning; the increased value of experiential learning will require new forms of tech prep and apprenticeship for youth and adults alike; and individuals will need to develop new attitudes about the cyclical nature of careers, career paths, and continuous learning. (An annotated list of 17 related publications is included.) (MN)

ERIC Clearinghouse on Adult, Career, and Vocational Education

TRENDS AND ISSUES ALERTS

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by Sandra Kerka

New Technologies and Emerging Careers

"We are, right now, in the very early stages of a new economy, one whose core is . . . fundamentally different from its predecessor's" ("The New Economy" 1994, p. 36). Technology is the heart, though not the only driver, of this new economy. Just as technological change renders some occupations obsolete, it brings other careers into being. Trends in the relationship between new technologies and careers and the issues they raise for education, training, and career development are the focus of this publication.

Technological innovations usually give rise to new jobs, and this era is no exception. The Institute for the Future (1990) predicts that virtual reality parks, "lifestyle protection programs," environmental services, and the burgeoning electronic marketplace are some of the areas where new occupations will emerge. Other examples of new careers are work flow analyst, network security manager, biophotographer, and cytotechnologist. However, some argue that technology is now causing a fundamental shift in the economic infrastructure from an economy centered around electric motors and engines to one based on computers, which take over work that can be routinized and perform coordination functions (Barley 1992; Kiechel 1993). This structural change will do more than create new occupations: It will profoundly change the nature of work and work organizations. The following technology-driven trends are reshaping the workplace (Barley 1992; Kiechel 1993; "The New Economy" 1994; Paracone et al. 1991; United Way 1988; Zemsky and Oedel 1994):

- Traditional hierarchical organization will give way to various forms, especially the network or web.
- Vertical division of labor (in which authority and expertise increase at higher levels) will be replaced by horizontal, in which expertise is vested in individuals with specialties, not in positions. Collaboration among autonomous teams will replace chain-of-command management. The division of labor between manual and intellectual, acting and reasoning, is disappearing.
- Mass production will be replaced by customized manufacturing; new service industries and occupations will evolve.
- More companies will shift some inhouse functions or services to "outsources" (external providers); smaller firms will increase in importance.
- Two *types* of occupations are emerging: specialists and integrators (highly educated generalists termed "gold-collar workers" who add value to products and services).
- "'Technization' of work may not only enhance the importance of the horizontal division of labor, but also seems to engender a new breed of occupations" (Barley 1992, p. 15). Technical occupations (the "new crafts") will become the new elite.

The emerging pattern has been termed the "freelance economy" (Kiechel 1993), in which multiskilled, flexible, entrepreneurial workers derive pay, prestige, and status from their specialties or skills. Their commitment may be somewhat divided between their employers and their specialties. Some assert that the concept of "job" may disappear and be replaced by "meaningful, market-driven work assignments in post-job organizations" ("The New Economy" 1994, p. 44).

The education and training issues associated with these changes include the following (Barley 1992; Kiechel 1993; "The New Economy" 1994; Zemsky and Oedel 1994):

- More occupations, including current blue-collar ones, will deal with abstract, symbolic information and procedural and mathematical reasoning.
- "The new crafts challenge the tradition of managers being educated at universities while workers below them rely solely on high school education" (Gapper 1992, p. 2). Preparation for the new kinds of work will include formal education plus contextual or craft knowledge—"the most valued skills appear to be those developed in a hands-on conversation with materials and techniques" (Barley 1992, p. 15).
- Formal education may impart just a disciplined way of thinking and the habits and skills of lifelong learning.
- Higher education may be able to confer status on the emerging new occupations by providing new credentials and degrees.
- The increased value of experiential learning suggests a need for new forms of tech prep and apprenticeship, both for youth and adults in career transition.
- Individuals will need to develop new attitudes about the cyclical nature of careers, career paths, and continuous learning.
- New organizational forms will necessitate learning new ways to manage (coordinate) autonomous teams.

Print Resources

Barley, S. R. ***The New Crafts: The Rise of the Technical Labor Force and Its Implications for the Organization of Work.*** Philadelphia, PA: National Center on the Educational Quality of the Workforce, 1992. (ED 358 321)

The trend toward an increasingly technical work force has not only necessitated better educated workers but has challenged the ways in which the work force and the workplace are conceptualized and organized.

Barley, S. B. ***What Do Technicians Do?*** Philadelphia, PA: National Center on the Educational Quality of the Workforce, 1993.

By 2000, professional and technical occupations will be the largest occupational sector. The division of labor between technicians and professionals is more collaborative (horizontal) than hierarchical (vertical) and the two groups command substantively different knowledge and skills.

Coates, J. F.; Jarrett, J.; and Mahaffie, J. B. ***Future Work: Seven Critical Forces Reshaping Work and the Work Force in North America.*** San Francisco: Jossey-Bass, 1990.

Examines trends and implications around seven themes: diversity, family-work relationship, global economy, restructuring, knowledge-based work, rising employee expectations, and corporate social responsibility.

Dosa, M.; Farid, M.; and Vasarhelyi. P. "From Informal Gatekeeper to Information Counselor: Emergence of a New Professional Role." 1988. (ED 322 908)

Explores the emergence of information counselors, a type of professional gatekeeper who adds value to user-oriented information systems and services.

Further Education Unit. ***The Key Technologies: Some Implications for Education and Training.*** London: Further Education Unit, 1988. (ED 294 012)

Key technologies that are likely to affect existing products or lead to new products may be classified in three groups: materials, components, and manufacturing and process. They have the potential to improve competitiveness.

Gapper, J. ***The Challenge: To Understand How the Growth of Technical Jobs in the Middle of Organizations Is Changing the Traditional Ways of Teaching Skills and Managing Work.*** Philadelphia, PA: National Center on the Educational Quality of the Workforce, 1992. (ED 349 420)

Predictions of occupational growth to 2000 show the importance of new technical workers, who need a different blend of formal education and continuing training. Educators must prepare students for jobs that do not fit the old categories of managerial or entry-level work.

Gradler, G. C., and Schrammel, K. E. "The 1992-2005 Job Outlook in Brief." ***Occupational Outlook Quarterly*** 38, no. 1 (Spring 1994).

Presents future employment prospects for 250 occupations in 12 clusters, including major trends since 1950 and uncertainties about the future.

"Information Technology/Special Report." ***Fortune***, July 11, 1994, pp. 44-144.

Looks at how network technology changes organization and management, innovative companies developing goods and services needed by networks, and changes in desktop computing and telecommunications.

Institute for the Future. ***1990 Ten-Year Forecast.*** Menlo Park, CA: Institute for the Future, 1990.

Presents core forecasts in seven areas: demography, social, labor force, economy, technology, environment/energy, and international. Discusses issues for consumers, employees, managers, investors, and government.

Kiechel, W., III. "How We Will Work in the Year 2000." ***Fortune***, May 17, 1993, pp. 38-41, 44, 46, 48, 52.

Identifies six trends shaping the workplace: smaller companies, networked or webbed organizations, technicians as the new elite, horizontal division of labor, shift from products to services, and redefinition of work, including continuous learning and higher-order thinking.

McGregor, E. "Emerging Careers." ***Occupational Outlook Quarterly*** 34, no. 3 (Fall 1990): 22-25. (EJ 417 725)

Although technology is fostering the evolution of new occupations, identifying them is challenging because of the difficulty of distinguishing between new careers and existing careers being changed by technology.

"The New Economy/Special Report." ***Fortune***, June 27, 1994, pp. 36-100.

Describes the new economy as a tectonic shift and explores the changes through these topics: service occupations, government role, educational innovation, productivity, geographic booms, and new ideas about globalism.

Paracone, C.; Schiavone, N.; and Uberto, F. ***Description of a Framework of Macroprofiles (Archetypes).*** Berlin: European Centre for the Development of Vocational Training, 1991. (ED 338 859)

The new conception of work as a permanent creative process has implications for job skills, labor relations, and training. Emerging skill needs are of two main types: specialist and integrator.

Stanton, M. "Health Jobs You Might Not Know About." ***Occupational Outlook Quarterly*** 35, no. 4 (Winter 1992): 2-11. (EJ 442 424)

New health occupations described are biomedical equipment technician, perfusionist, orthotist, biocommunications manager, biophotographer, health sciences librarian, instructional designer, medical writer/editor, and medical artist/illustrator.

U.S. Department of Commerce. ***The Status of Emerging Technologies: An Economic/Technological Assessment to the Year 2000.*** Washington, DC: DOC, 1987. (ED 339 793)

Describes emerging technologies and their future impact on the economy in seven categories: advanced materials, electronics, automation, biotechnology, computing, medical technology, and thin-layer technology.

United Way of America. ***The Future World of Work.*** Alexandria, VA: United Way, 1988. (ED 304 521).

Describes eight trends centered on family concerns; underused groups; education, training, and retraining; corporate environment; small businesses; global marketplace; automation; and employment prospects.

Zemsky, R., and Oedel, P. ***Higher Education and the Changing Nature of the American Workforce.*** Philadelphia, PA: National Center on the Educational Quality of the Workforce, 1994.

Describes three labor market trends (service-sector shift, small firms and labor market churning, and the rise of technical crafts) and their implications for higher education, including the role of the college credential, job-related skills training, and the struggle to balance changing labor markets and enrollment pools.

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