

Successful worker training programs help ease impact of technology

Fast pace of technology proves need for skill upgrading and worker retraining; labor contracts and State initiatives can be models for such programs

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The impact of technological change beginning with the large-scale introduction of factory automation in the 1950's and 1960's has sparked major interest in worker training and retraining. Many Bureau of Labor Statistics studies have explored job displacement, job changes, and the impact of technology upon the work force.¹ In the 1960's, substantial growth in public sector and service sector employment made some of the factory dislocation effects appear less serious at the national level. However, extensive application of microelectronics since the late 1970's has increased interest in upgrading workers' skills and retraining employees for job shifts.

The dislocation phenomenon has been of substantial magnitude, particularly in traditional manufacturing, but in non-manufacturing as well. Studies by the Bureau of Labor Statistics and the Office of Technology Assessment have documented the seriousness of the problem and the great need for retraining efforts.² As the issue of worker retraining gains more attention, it is critical to explore successful efforts at technology planning and worker retraining in order to assist in policy formation and program developments. This is especially important since the growth of high tech jobs is modest and the evidence suggests a preponderance of new job creation is in low-paid employment.³ The impact of

technological change upon employment, skills training, and the work environment will continue to be a major theme in the coming years.⁴ This article highlights some innovative and important approaches to employee training and retraining in anticipation of and in response to technological change. These include both collectively bargained arrangements and new State initiatives that are suggestive for future developments.

Aerospace

Worker retraining needs are most understood in industries where the technology has changed dramatically, like the aerospace industry. Anticipating change is part of ongoing corporate planning and the best use of new technology is a high priority in the scheme to remain competitive. Involving the work force in this planning and gearing up in advance for retraining have been built into the arrangements at Boeing Aircraft Co. and the International Association of Machinists and Aerospace Workers (IAM). Their contract states:

Section 20.2 Technology Briefings.

In order that employees can better prepare themselves for the skill requirements of the future, and in fulfillment of its obligation to provide information to the Union, the Company will, not less than annually, provide a briefing to the Union of the company's plans for the introduction of new technology which may affect the employees. For the purpose of these briefings, new technology shall be defined as industrial robots, flexible manufacturing systems, CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) and graphite composite automation. . . . During these briefings, the Company will inform the Union of anticipated

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schedules of introduction of new technology, and will identify areas of skill impacts and any intended training programs associated with those impacts. Additional related subjects may be added to the briefings upon mutual agreements, and established technologies may be deleted. The Union, and its representatives, will protect the confidentiality of Company sensitive and proprietary information disclosed in the briefings.

Section 20.3 Training Program.

Section 20.3(a) Joint Training Advisory Committee. A joint training advisory committee shall be established, composed of three representatives of the Company and three members of the Union's Staff designated by the Union. Within one year from the date of this agreement the Training Advisory Committee will develop a recommended training program for current and laid-off Company employees who desire to become better qualified for employment by the company in jobs involving new technology as defined in Section 20.2, or other skills identified by the Company (Collective Bargaining Agreement, 1983: 117-18).

New technology has reduced Boeing's work force and changed its skill requirements. Numerical control machines in shop production and computer-aided designing have resulted in critical job shifts for workers.⁵ The Boeing-IAM training program was negotiated with the hope that a jointly supported effort would upgrade employees' skills, making those with obsolete skills once again employable by the firm. It is still too early to measure the results, but communications between the company and the union seem to be proceeding well, and the initial assessment of skill needs and training suggests that the program is properly focused and potentially valuable.

One of the more interesting International Association of Machinists and Aerospace Workers cases occurred at the U.S. Naval Research Lab in Annapolis, MD. There, the union succeeded in building into the collective bargaining agreement technology-relevant language, which provided for no job displacement because of technology and also prohibited time-motion studies and electronic workplace monitoring. In the conversion of the machine shops to numerical control machines, all workers were given numerical control machine training and the union worked with management to redesign the machines both for productivity and worker consideration. The training, conducted by Arundel Community College, shifted from direct training of machinists to a "train the trainer" effort so that upgraded workers would constantly be able to train other workers. This concept is one that is deserving of broader attention by other companies and unions.

Also, the union has moved to implement technology training at its national education center. All union members who participate in educational programs receive computer instruction. In addition, special programs on technological change are being developed to prepare union officials to respond effectively to such change.⁶ This is a critical part of the International Association of Machinists and Aerospace Workers strategy to represent its membership in the context of technological change. The philosophy of the union is

contained in its "Worker's Technology Bill of Rights,"⁷ which is a cornerstone of its approach to dealing with job security, retraining, and the broader issues of job protection for its work force and economic health of the country.

Auto assembly

The automobile assembly industry also has undergone enormous changes in the application of technology, production systems, and corporate restructuring. Early automation in the 1950's and 1960's offered a preview of the widespread changes in the late 1970's and the 1980's. Technology, job skill obsolescence, and retraining have been longstanding issues in the industry. In 1982, both Ford Motor Co. and General Motors negotiated agreements with the United Auto Workers (UAW) union calling for worker retraining programs, to be financed by an employer contribution of 5 cents per hour. This amounts to about \$10 million yearly for Ford and \$40 million for General Motors. The 1982 negotiations also established the UAW-Ford National Development and Training Center and the UAW-General Motors Skill Development and Training Center. The February 13, 1982, letter of understanding between Ford and the UAW suggests some of the retraining objectives:

Provide individual and group training, retraining and development opportunities to enhance the dignity and on-the-job skills and abilities of employees which can lead to greater job security and personal development.

Seek ways of arranging (and, in some cases, providing) for training, retraining and development assistance for employees displaced by new technologies, new production techniques and shifts in customer product preference.

The 1982 Ford-UAW agreement states:

In view of the Corporation's interest in affording maximum opportunity for employees to progress with advancing technology, the Corporation shall make available, short-range, special training programs for those employees who have the qualification to perform the new or changed work, where such programs are reasonable and practicable (Agreement, 1983: 432).

One of the most heralded success cases of a joint company-union effort concerning job dislocation is the Ford-UAW program in Milpitas, CA.⁸ Like other successful training programs, this one was well funded, jointly administered with a union, extensive in its range of programmatic activities, and within the broader company-union employee involvement bargaining agreement and philosophy.

In 1982, Ford announced that it would begin to close the Milpitas plant in 1983 (finally closed in 1984). The advance notice given the work force was required by contract, and the posture of the company was one of cooperating with the union and government to best provide the needed support services, counseling, basic education, skills retraining, and job search training for the more than 2,000 affected employees. The work force at this plant was overwhelmingly male and married, had an average age of 42, and had an average of almost 16 years service among the hourly work-

ers; furthermore, more than one-third of the workers had less than 11 years of schooling. In short, it was a highly stable work force with modest work experience and training outside auto production—something characteristic of much of the displaced worker population in the United States in recent years.⁹ The advance notice and careful planning allowed for the development of a placement center with both financial and technical support from the UAW–Ford National Development and Training Center and, in this instance, also from the Job Training Partnership Act Title III, Trade Adjustment Assistance, and the State of California Training Employment Panel (a State-funded program in operation since 1982 designed to assist and train workers who are displaced or likely to have major job impacts as a result of corporate restructuring and technological change).

The Ford–UAW program started with the testing and counseling of affected workers and the provision of in-plant planning seminars and basic adult education; then, the program continued helping to identify opportunities for targeted vocational retraining, including the negotiated tuition payment for such institutional training. Finally, training in job search skills was given and targeted employment opportunities with on-the-job training were provided.¹⁰ The United Autoworkers Union reports that 2,800 persons enrolled for in-plant vocational training orientation sessions, and 750 enrolled in full-time vocational retraining programs, with 500 receiving technical training. Furthermore, 438 employees went through a job search skills workshop, and 800 took adult basic education courses with 183 completing high school diplomas or equivalents.

An updated report to the U.S. Department of Labor confirms that only 17.6 percent of the Milpitas displaced workers remained unemployed 2 years after closure; also, a strong correlation exists between participation in the testing and assessment programs (70 percent) and the education and training programs (30 percent) and success at gaining new employment and in obtaining higher wage positions after termination at Ford. On-the-job training opportunities led to the greatest post-layoff employment and suggest the importance of linking job retraining to real employment opportunities.

More than 84,000 UAW–General Motors dislocated members have received services since the early 1980's, and more than 81 percent have found employment either within or outside General Motors. Initially, most programs were targeted for dislocated workers, but the emphasis has shifted to providing services for active General Motors employees. At Ford more recently, the emphasis has been increasingly on skills enhancement, life/education planning, educational and training assistance, targeted training, education fairs, and so on.

Telecommunications

American Telephone and Telegraph (AT&T), prior to its division into separate companies in 1983, was the world's largest private employer and considered by many analysts as

a model of corporate efficiency and economic health. In recent years, the telecommunications industry has gone through dramatic changes in technology resulting in major shifts in occupations and job tasks. For example, in 1950, there were 250,000 telephone operators; by 1983, this number had dropped to 83,000 and was declining further, while the amount of telephone service had expanded.¹¹ Starting with the 1980 contract with the Communications Workers of America (CWA), the employer was required to give at least 6 months' advance notice "for any major technical change (including changes in equipment, organization, or methods of operation) which affects employees represented by the union." This agreement was renewed in 1983 and 1986. Between 1982 and 1984, employment in telecommunications declined 11 percent, or 114,000 workers, and by 1985 the decline was 13 percent.¹²

Few industries have had a more dramatic development and application of new technology than telecommunications. Added to that has been the substantial corporate restructuring and new competitive environment. The 1983 AT&T–CWA contract, recognizing that technology was having a profound impact on jobs, included a key section on retraining. Equally important, the contract also recognized that "technological change" was likely to result in some layoffs or other adverse effects and established programs to protect employees. Under that contract extending the 1980 provision, an employee laid off because of technological change is eligible for severance benefits that can amount to up to 2 years' pay, depending on the worker's length of service. It also enabled displaced workers who are preparing for other lines of work to receive up to \$2,500 in relocation and retraining costs, with a continuance in their health insurance coverage.

At the bargaining table in 1983, the negotiators agreed informally that \$36 million was to be spent by AT&T and the Bell companies for retraining employed workers over the 3-year life of the agreement. Although the money was not contractually stipulated, some impressive programs were developed over those years in which the company and union actively, and in a cooperative fashion, developed retraining programs designed to upgrade skills in anticipation of the technological shifts in the industry.¹³ The training programs initiated by management, with Communication Workers of America oversight through a joint union-management Training Advisory Board, included a mix of home-study (basic skills and electronics to increase women's opportunities) and college training, but concentrated heavily on the former.

Some of the best training programs have been strongly based upon a joint labor-management approach,¹⁴ coupled with the larger quality-of-working life approach the company and union have developed since 1980.¹⁵ For example, Northwestern Bell, based in Omaha, NE, has a joint labor-management training board that contracted with 43 community colleges and vocational–technical schools in the region to provide career counseling and training. More than one-

third of the eligible employees enrolled in counseling, training, or both, and the college course dropout rate was less than 5 percent. The program also provides career counseling prior to substantive courses. Open-ended career counseling broadens the repertory of courses that might be selected and thus, provides training for employment beyond the Bell company; however, it is not as open ended as some programs, such as the United Auto Workers union plan with Ford and General Motors. The emphasis in all of the CWA-AT&T-Bell Companies retraining programs is for employed personnel and not displaced workers, although there was a 14-percent job loss between the 1983 and 1986 contracts.

Another of the success cases in the telecommunications industry involves training employees in cost accounting, new billing procedures, and electronics. This effort at Pacific Northwest Bell has been highly cost-effective for the company as it provided an expansion of contracted services and thus, helped to assure job security for the work force.¹⁶ This effort went beyond the contractual obligations of the company in the 1983 agreement, but the program is an illustrative and useful model for the post-1986 contract and the new jointly administered training program funds.

In 1986, the Communications Workers of America negotiated separately with AT&T and the Bell operating companies. In most of these contracts, the companies agreed to fund off-hours training programs. The contract with AT&T provides \$7 million per year to the CWA-AT&T Alliance for Employee Growth and Development, a jointly owned and administered corporation, to provide career counseling and retraining efforts for active employees and those who are laid off, providing they enroll within 6 months. The training will be delivered by schools and colleges. This effort targets the 155,000 CWA-represented employees at AT&T; somewhat similar efforts are built into the contracts with the Bell operating companies, although the contracts do not call for the creation of independent jointly administered training corporations. Career counseling, general skills training including basic and remedial education, and job-specific training both for the company and any new employer are to be included in these programs. The high participation rates and low dropout rates in experimental training programs in the industry are encouraging. The move to a jointly run labor-management program with AT&T, well funded and heavily designed to improve job security and skills upgrading, suggests that this effort may reap solid benefits in the near future.

Human Resource Development Institute

The Human Resource Development Institute is the employment and training arm of the AFL-CIO and has operated a number of programs since the 1960's. In 1982, substantial programs focused on displaced workers and the Human Resource Development Institute had a field staff of 100; this staff was drastically cut back because of slashed Federal expenditures for employment and training and the shift from the Comprehensive Employment and Training Act to the

Job Training Partnership Act. With a small staff, the Human Resource Development Institute runs workshops on developing an effective model program, and targets training of labor union members for Job Training Partnership Act committees and as staff for displaced worker programs. Most of the programs are "tier one" level, meaning that labor union members participate in peer counseling, labor market and job analysis, vocational testing and counseling, and referral to job training.

Fundamental to the Human Resource Development Institute operation is a philosophy that accents peer counseling, noting the success in such efforts with alcohol and drug treatment, runaway youth programs, and so on. The Human Resource Development Institute Job Clubs use trained displaced workers as counselors for other workers; the assumption is that affected workers know best what is involved in the job, including the necessary skills and technical knowledge. This program also "reaffirms the value in 'workers' work" and rejects the implicit assumption that after 20 years in a steel plant, a laid-off worker's life has no value—something that the Human Resource Development Institute staff believe contributes to self-depreciation and demoralization.

A major thrust of the Human Resource Development Institute in the past year or so has been assistance to unions pushing for career development within union collective bargaining agreements. Out of a computer-aided instructional model in their Job Training Partnership Act Title III program in Baton Rouge, LA, the Human Resource Development Institute is getting various employers in the steel industry (LTV and Bethlehem, among others) and the United Steelworkers of America union to include such career development and training in their contracts, anticipating both continuing employment loss in the basic steel industry and the need for skills upgrading in response to the technological changes in basic steel and steel parts production. Laid-off steelworkers will thus be eligible for company-financed job retraining, building upon job skills and work experience.¹⁷

One of the "second tier" training programs that the Human Resource Development Institute has developed has been the Southeast Wisconsin Displaced Worker Center in the Kenosha, WI, area. Here, American Motors Corp. went from 7,000 employees to 2,800, with additional layoffs expected. In contrast to the United Auto Workers union agreement with General Motors and Ford, at American Motors no training fund was established. Therefore, in 1985 as the situation became more severe, the United Auto Workers moved to set up an assistance program. American Motors provided \$1,600 to get a grant proposal writer, provided through the Human Resource Development Institute, enabling the first Job Training Partnership Act Title III funds to come in October 1985. The Human Resource Development Institute did staff training (9 out of 12 staff are displaced American Motors workers), and 1,700 displaced workers attended the opening meeting in January 1986. From January to September 1986, 48 4-day job search workshops were conducted dealing with stress and coping skills.

The first targeted group were those who enrolled and had to quit due to financial constraints; 823 were certified eligible and 780 enrolled under the Job Training Partnership Act auspices. On-the-job training has been contracted with the State job service; classroom training has taken place at Gateway Technical Institute and the University of Wisconsin at Parkside. The Southeast Wisconsin Displaced Worker Center must operate under Job Training Partnership Act guidelines; for example, wages must be 60 percent of those received before layoff (about \$13 per hour). Thus, to receive \$8.60 plus per hour, many of the trainees have to commute substantial distances to new jobs, because the immediate area is experiencing a highly depressed wage market with high unemployment. A job developer was added to the staff in June 1986, and after a needs assessment revealed that 1 person out of 5 in Kenosha County is functionally illiterate, a literacy council was started. Most autoworkers needed little educational background for their employment and virtually no on-the-job skills were learned at American Motors. The program has identified those who need special remedial skills training so that they may reenter the labor market and successfully compete.

The United Auto Workers union has sought to obtain Trade Adjustment Assistance Act support to complement the Job Training Partnership Act funding for the Southeast Wisconsin Displaced Worker Center. This allows for up to 2 years of stipends for training, something disallowed under the Job Training Partnership Act. Also, a special grant for on-the-job training was provided for fall 1986 in anticipation of some worker recalls as Chrysler planned to lease the facility from American Motors. But, the Job Training Partnership Act limitations (no stipend, but support services such as mileage, day care, small assistance for tools and relocation) were a serious challenge for this program. The Human Resource Development Institute and local project staff emphasize that new technology requires more training with longer training periods and that Job Training Partnership Act Title III is limited in this regard. Thus, they have done some slotted training in the technical school and sought second-year funding through the Trade Adjustment Assistance Act and the State of Wisconsin so that displaced autoworkers may learn police science, nursing, and other fields that require more training. Some of the technical college programs teach machine operators numerical control machine, computer repair, engineering, and matched skills that lead to ongoing career development training. This project concludes that "short-term training (Job Training Partnership Act) leads only to short-term jobs."

State initiatives

The cases reviewed thus far are private sector negotiated cases involving employers and unions. In addition, there have been some interesting new initiatives taken at the State level, typically in partnership with labor and management. California and Massachusetts provide good illustrations and possible models.

California. The State of California experienced a substantial number of plant closings starting in the late 1970's and accelerating in the early 1980's, a pattern similar to that in much of the country. Many of the plants were large manufacturing facilities for Fortune 500 corporations including Ford, General Motors, Kaiser, Firestone, and Atari. Mainly as a reaction to the challenge of retraining displaced workers and upgrading the skills of the work force because of technological change, the State created the California Employment Training Panel in 1982. It is funded by a tax on employers linked to unemployment insurance payments and has had \$55 million annually to spend on retraining programs. The Employment Training Panel "states that a principal goal of active retraining is to encourage the adoption of new technology, thus helping California businesses to stay productive and competitive. The effect, besides avoiding immediate loss of jobs, is to make future employment more secure."¹⁸ This makes the Employment Training Panel different from the Job Training Partnership Act Title III programs because eligibility for the Title III programs is displacement or announcement of layoffs.

The initial impetus for the Employment Training Panel legislation was the rash of plant closings, mostly affecting blue-collar production workers in the late 1970's and early 1980's; however, one-third of the Employment Training Panel programs have been targeted towards white-collar workers. The electronics firms in Silicon Valley have experienced a changed economic climate due to international competition, and a recent report states that 17,500 jobs have been lost in the past 2 years with more losses predicted.¹⁹ The theory and the practice of the Employment Training Panel, according to one evaluation, is that "the availability of Panel funds provides companies with the incentive to retrain a work force with outdated skills, rather than laying off employees. Companies are encouraged to take a long-range view towards their employees."²⁰ The reality in the electronics industry is harsher and the evidence shows considerable variations between employers that have attempted to avoid layoffs and those companies that have moved to hiring temporary employees and have provided no advance notice or retraining options to employees who have been terminated or given extended layoffs.²¹

The enabling legislation makes it clear that targeted workers include those whose jobs are vulnerable as well as those who have been displaced; it allows for up to 18 months of training.²² The California evidence suggests that it is 30 percent more expensive to train persons who are unemployment insurance recipients (those out of work) than employed workers who are likely to be displaced.²³ This conclusion, more than likely, holds true for most cases and gives strong support to the move to provide training prior to layoff and in anticipation of employment changes.

Massachusetts. In the 1970's and 1980's, the State of Massachusetts suffered substantial job losses in declining

industries, losing more than 30,000 jobs from 1981 to 1984. While only 12 percent of all State workers are within those declining industries, in some communities such industries account for more than one-half of the work force.²⁴ In that context, the State passed Chapter 208, "An Act Alleviating the Impact of Major Dislocations of Employment and to Assist in the Reemployment of Dislocated Workers." This law was passed in 1984 with \$15 million in State funding designed to assist workers and communities affected by plant closings and major layoffs. It became operational in January 1985, and thus has a short history to judge its success. Furthermore, the economy of the State shifted dramatically, and Massachusetts now has the lowest unemployment rate of any major industrial State in the Nation and is near the bottom of all 50 States in total unemployment.

The 1984 Act established the Industrial Services Program (ISP) to provide statewide technical assistance and financing to businesses, workers, and communities. First, it offers funding through the Economic Stabilization Trust to assist in corporate restructuring, change of ownership, employee buyouts, and other efforts to save jobs. Second, an early warning system exists to analyze State economic trends and to monitor industries and businesses likely to experience plant closings. Third, the Industrial Services Program oversees and coordinates dislocated worker programs through Job Training Partnership Act Title III. State funds are used to provide programs for worker assistance, emergency assistance, and industrywide job creation programs. This legislation and program activity are broad and integrated and seek to both ameliorate the problems of dislocation and to prevent economic difficulties. A summary flyer on the program reveals the comprehensive nature of its objectives:

The goals of the ISP are to integrate capital financing resources with reemployment resources, and to adopt an active role in identifying and assisting firms that are, or are likely to be, in financial difficulty. Additional ISP goals are to expand the capacity of the employment and training system through additional funding and a wider array of program options; to use resources to actively promote economic growth in the state, through productivity increases, improvement in workers' earnings, education curricula to upgrade work force academic and occupational skills, and development of new products, markets and ownership structures to improve the long term viability of firms.

Part of the 1984 Act established the Massachusetts "Social Compact," whereby all employers are encouraged to provide 90 days' advance notification in the event of an extended layoff or plant closing. This was based on the evidence that such advance notice is critical to successful adaptation by the work force to gain reemployment and for the agencies involved in worker assistance, job retraining, and job search and placement. Firms that fail to give such notice are then expected to provide some continued pay as severance. A provision of the law mandated that 90 days of continued health benefits would be available to those covered after the job loss.

In addition to programs targeting displaced workers, Massachusetts sought to engage State funding in linked programs of training and economic development. The Bay State Skills Corporation Act states, "It is an important function of government to increase opportunities for gainful employment, to assist in promoting a productive and expanding economy, to encourage the flow of business and industry support to educational institutions, and otherwise to improve the prosperity and general welfare of the inhabitants of the commonwealth."²⁵ Out of this approach the Bay State Skills Corporation was created, as one mechanism for the State to foster technological preeminence. The Corporation states in one of its flyers, "As long as government compensates only for its failing industries, it can at best merely slow the rate of economic stagnation. By encouraging its technologically successful companies, Massachusetts controls the transition from declining industries to its future—computers, robotics, numerically controlled machines, biotechnology and others. . ."²⁶

The Bay State Skills Corporation is project-specific and requires private sector corporate participation in each jointly funded effort. State and private funds, channeled through an educational institution, provide training for workers with special emphasis on training in new technologies. Projects have included programs like training displaced bank tellers as computerized money machine repairers in addition to more professionally advanced levels of training. The recent annual report states that the 4 years of the program have involved more than 600 companies and 200 educational institutions and that 91 percent of trainees get full-time employment in the private sector. In 1985, more than \$5.7 million was awarded to 85 educational institutions in the State. The program has fast start-up phases and flexible program duration periods from 12 weeks to 2 years of training. It emphasizes the cooperation between educational institutions, private employers, and the State; it not only requires a mix of State and corporate funding but active involvement of company personnel in planning, designing, operating, teaching, monitoring, and evaluating the training programs. This program has been inspirational for other States in the country and has attracted interest from other industrial nations.

Expanding State training efforts

The Center for Policy Research and Analysis of the National Governors' Association has been active in promoting new State initiatives and recently cosponsored a conference with the Bay State Skills Corporation to help in such dissemination. More than 20 States have established rapid response teams to assist dislocated workers and industries, and while Job Training Partnership Act Title III funds cannot be used until a layoff or closing has been announced, States have been providing funds for worker retraining before firms are threatened with closing.²⁷

The move towards more activity at the State level appears a partial response to the deemphasis on Federal programs

during the 1980's and the thrust toward cost-sharing of job retraining by employers and government. Interest in the Canadian Industrial Adjustment Service has been accelerating in this country and several recent reports have called upon that system as a model.²⁸

It seems clear that the short-run response to technological change and worker retraining in the United States will depart from that in other industrial countries.²⁹ Some people have

called for more participatory efforts and a huge increase in Federal Government involvement in worker retraining. Such legislation is currently pending in the Congress.³⁰ For the moment, the illustrations drawn from the voluntary efforts in collectively negotiated agreements and some State programs may inspire more effort to provide the needed training of the American work force in this era of rapid technological change at the workplace. □

—FOOTNOTES—

¹ Bureau of Labor Statistics reports include Jerome A. Mark, "Technological change and employment: some results from BLS research," *Monthly Labor Review*, April 1987, pp. 26–29; and Ronald E. Kutscher and Valerie A. Personick, "Deindustrialization and the shift to services," *Monthly Labor Review*, June 1986, pp. 3–13.

² See Paul O. Flaim and Ellen Sehgal, "Displaced workers of 1979–83: how have they fared?" *Monthly Labor Review*, June 1985, pp. 3–16; and *Technology and Structural Unemployment: Reemployment of Adults*, OTA-ITE 250 (U.S. Congress, Office of Technology Assessment, February 1986).

³ Richard W. Riche, Daniel E. Hecker, and John U. Burgan, "High technology today and tomorrow: a small piece of the employment pie," *Monthly Labor Review*, November 1983, pp. 50–58; and Barry Bluestone and Bennett Harrison, *The Great American Job Machine: The Proliferation of Low Wage Employment in the U.S. Economy* (U.S. Congress, Joint Economic Committee, December 1986).

⁴ Richard M. Cyert and David C. Mowery, eds., *Technology and Employment: Innovation and Growth in the U.S. Economy* (Washington, DC, National Academy Press, 1987).

⁵ *Computerized Manufacturing Automation: Employment, Education and the Workplace*, OTA-CIT 235 (U.S. Congress, Office of Technology Assessment, April 1984).

⁶ Steven Deutsch, "New technology, union strategies and worker participation," *Economic and Industrial Democracy*, November 1986, pp. 529–39.

⁷ International Association of Machinists and Aerospace Workers, *Let's Rebuild America* (Washington, DC, Kelly Press, 1984).

⁸ See Gary Hansen, "Ford and the UAW have a better idea: A joint labor-management approach to plant closings and worker retraining," *Annals of the American Academy of Political and Social Science*, September 1984; and Ronald E. Berenbeim, *Company Programs to Ease the Impact of Shutdowns* (New York, The Conference Board, 1986).

⁹ Office of Technology Assessment, *Computerized Manufacturing Automation*.

¹⁰ Hansen, *Ford and the UAW*.

¹¹ George Kohl, "Changing competitive and technology environments in telecommunications," in Donald Kennedy and others, eds., *Labor and Technology* (University Park, PA, Pennsylvania State University Department of Labor Studies, 1982).

¹² Kenneth Noble, "Unions push retraining plans," *New York Times*, Mar. 23, 1986.

¹³ Office of Technology Assessment, *Computerized Manufacturing Automation*.

¹⁴ Margaret Hilton and Ronnie Straw, "Joint training in the telecommunications industry," working paper, Communications Workers of America, presented at Atlantic Economic Conference, Boston, Aug. 29–31, 1986.

¹⁵ *Quality of Work Life: AT&T and CWA Examine Process After Three Years* (U.S. Department of Labor, Bureau of Labor-Management Relations and Cooperative Programs, 1985).

¹⁶ Margaret Hilton, "Lying down together II: joint union-management training enhances productivity and revenues at Pacific Northwest Bell," *Training and Development Journal*, Summer 1986.

¹⁷ United Steelworkers of America, *Responding to Economic Dislocation: Assistance Program for Unemployed Steelworkers and a Directory of District Programs*, 1986.

¹⁸ Office of Technology Assessment, *Technology and Structural Unemployment*, p. 207.

¹⁹ Andrew Pollack, "A somber Silicon Valley is 'changed forever'," *New York Times*, Oct. 5, 1986.

²⁰ Arthur Young, *Study of the California Employment Panel* (Los Angeles, CA, Arthur Young and Co., 1985).

²¹ *Plant Closing: Advance Notice and Rapid Response-Special Report*, OTA-ITE 250 (U.S. Congress, Office of Technology Assessment, 1986).

²² *Employment Training Panel Annual Report 1985* (Sacramento, CA, Employment Training Panel, 1986).

²³ Young, *Employment Panel*.

²⁴ *The Final Report of the Mature Industries Research Project on Partial Plant Closings* (Boston, Commonwealth of Massachusetts, Division of Employment Services, January 1986).

²⁵ *Bay State Skills Corporation Act of 1981*.

²⁶ Bay State Skills Corporation, *1986 Report* (Boston, Bay State Skills Corporation, 1986).

²⁷ Kris M. Balderston, *Plant Closings, Layoffs and Worker Readjustment: The States' Response to Economic Change* (Washington, DC, National Governors' Association, 1986). Also, National Governors' Association report, "Jobs, Growth and Competitiveness," *The New York Times*, July 26, 1987.

²⁸ See, for example, *Economic Adjustment and Worker Dislocation in a Competitive Society* (U.S. Department of Labor, December 1986); Office of Technology Assessment, *Technology and Structural Unemployment*; and Office of Technology Assessment, *Plant Closing*.

²⁹ Foreign approaches and contrasts with the United States are explored in Steven Deutsch, "International experiences with technological change," *Monthly Labor Review*, March 1986, pp. 35–40.

³⁰ This position is argued by Ray Marshall, *Unheard Voices: Labor and Economic Policy in a Competitive World* (New York, Basic Books, 1987) and is expressed in the Economic Dislocation and Workers Adjustment Act of 1987, the Education and Training for American Competitiveness Act of 1987, and the Trade and International Economic Policy Act of 1987.