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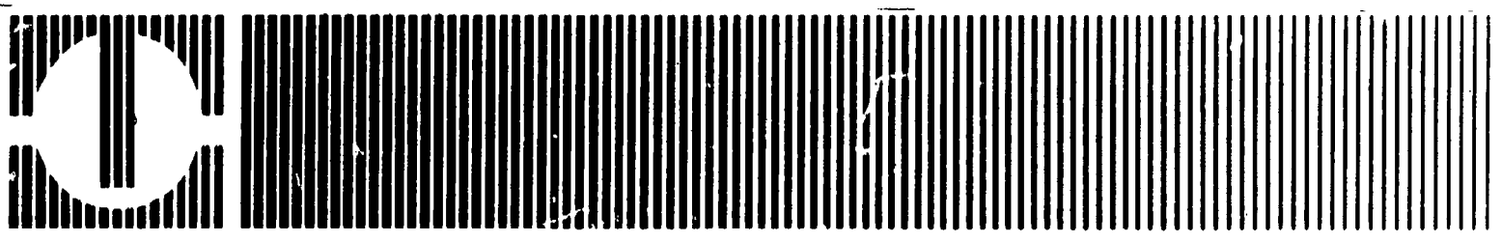
ABSTRACT

This paper addresses the extent to which retraining and training programs are available for employed and unemployed adults. First, demographic and economic shifts and projections into the next century are discussed as the context for needed training. Second, the promise and positive impacts of new technologies in office and business settings are explored, along with the problems that may accompany the introduction of automation in such settings. Approaches to avoiding or alleviating these problems are then presented, along with an examination of the general barriers to adult participation in (re)training programs. The third section discusses the types of training programs available to adults from a variety of providers in the corporate sector (in-house programs, contracts with a postsecondary education institution, tuition-assistance programs, union negotiated training programs), the education and training sector (noncollegiate postsecondary schools, four-year colleges and universities, two-year colleges, professional associations), and the public sector (educational brokering services, public school systems, local community programs, Federal employment and training programs, collaborative training programs). Examples of specific programs are detailed for each sector. Increased emphasis on programs and information that address the needs of adults for training in new office and business technologies is recommended. (Author/YLB)

(Re)Training Adults for New Office and Business Technologies

STATE-OF-THE-ART PAPERS



OFFICE FOR RESEARCH IN HIGH TECHNOLOGY EDUCATION
The University of Tennessee College of Education

(Re)Training Adults for New Office and Business Technologies

by

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FOREWORD

The Office for Research in High Technology Education at the University of Tennessee, Knoxville, is conducting a program of work on high technology and its implications for education. Funded by the U.S. Department of Education's Office of Vocational and Adult Education, the program addresses the skill requirements and social implications of a technology-oriented society. Issues concerning computer literacy and computer applications are a focus of the program. The balance between the liberal arts and technological skills and the complementary roles they play in enabling people to function in and derive satisfaction from today's high-technology era are also addressed. The program's efforts are targeted at secondary schools, two-year post-secondary institutions, community colleges, universities, industrial training personnel, and other education and training groups.

The program consists of three major components:

At Home In the Office Study - At Home In the Office is an experiment that has placed office workers and equipment in the workers' homes to determine (1) what types of office work can effectively be done at home and (2) the advantages and disadvantages of home work stations. The implications for educators, employers, and employees will be significant, as work at home offers a possible avenue of employment for people living in rural areas, parents of pre-school children, handicapped individuals, and others.

COMTASK Database - COMTASK is a model of a computerized task inventory for high-technology occupations. The outcomes of the COMTASK system include a sampling of task analyses, the demonstration of how these task analyses can be rapidly updated, a manual for conducting task analyses to provide data for the system, and a guide to using the system.

State-of-the-Art Papers - A series of nine papers is being developed to address high technology and economic issues that are of major concern to education. Nine working titles have been selected:

- The Changing Business Environment: Implications for Vocational Curricula
- Computer Literacy in Vocational Education: Perspectives and Directions
- Computer Software for Vocational Education: Development and Evaluation
- Educating for the Future: The Effects of Some Recent Legislation on Secondary Vocational Education
- The Electronic Cottage
- High Technology in Rural Settings
- (Re)Training Adults for New Office and Business Technologies
- Robots, Jobs, and Education
- Work in a World of High Technology: Problems and Prospects for Disadvantaged Workers

Abstract

This paper addresses the extent to which retraining and training programs are available for employed and unemployed adults. First, demographic and economic shifts and projections into the next century are discussed as the context for needed training. Second, the promise and positive impacts of new technologies in office and business settings are explored, along with the problems that may accompany the introduction of automation in such settings. Approaches to avoiding or alleviating these problems are then presented, together with an examination of the general barriers to adult participation in (re)training programs.

The third section discusses the different types of training programs available to adults from a variety of providers in the corporate sector, the education and training sector, and the public sector. Examples of specific programs are detailed for each of these sectors, followed by recommendations calling for increased emphasis on programs and information that address the needs of adults for training in new office and business technologies.

About the Author

Bryna Shore Fraser is currently a Senior Program Officer in the Center for Education and Work of the National Institute for Work and Learning (formerly the National Manpower Institute). She has been intensively involved in a number of integrative research and operational programs. She was coauthor with Paul Parton of a four-volume policy research study, Between Two Worlds: Youth Transition From School to Work, and has written about a wide array of education and work subjects, including The Structure of Adult Learning, Education, and Training Opportunities in the United States.

About the Editors

This paper has been prepared as part of a series of state-of-the-art papers edited by Lillian A. Clinard, an associate director of The University of Tennessee's Energy, Environment, and Resources Center (EERC), and Mary R. English, a research associate at EERC. The editors, who have been on assignment to the Office for Research in High Technology Education, were responsible for selecting the series' authors, reviewing and coordinating external reviews of the papers, and preparing the papers for release.

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TECHNOLOGY TRAINING: THE SOCIAL AND ECONOMIC CONTEXT

Introduction

Current projections indicate that the major impact of high technology will not be in the production of the technology itself but in the application of new technologies in many different occupations across a wide range of industries. Increasingly, the literature on employment in the age of high technology is focusing on the fear that automation in business and commercial environments will result in thousands of American workers being displaced from their jobs each year, with thousands more forced into de-skilled, dehumanized jobs. Past history serves to fuel these fears. With the introduction of advanced machinery such as the combine and the cotton gin into American agriculture, the majority of farm workers were forced off the land. More recently, as the automated assembly line and industrial robots were introduced on the factory floor, thousands of steelworkers, automakers, and other blue-collar workers were left without jobs and with little hope of returning to their previous occupations.

Whereas in the past such technological developments caused short-term dislocation while actually increasing employment in the long run through the creation of new jobs and new industries in high growth economies, today's concern is heightened by the reality of a slow-growing economy and by the knowledge that changing demographic and economic conditions may result in America's inability to absorb workers displaced by high technology into the workforce and into jobs for which they are skilled.

Technology is only as good as the person who uses it. The most sophisticated -- as well as the simplest -- equipment will not increase

productivity unless those using it have the knowledge and motivation to make it work. As new technology is introduced into more and more work environments, changes will be needed in work skills and patterns. Most companies already are aware of this relationship and recognize that they must retrain their employees to learn, use, and maintain new technologies. Training programs are now regularly implemented along with business modernization and expansion.

No surprise, then, that private employers are the major providers and sponsors of work skills training and other education for workers. The American Society for Training and Development estimates that $30 billion is spent annually on education and training by private and public employers in the United States. For example, Polaroid Corporation's announcement of Spring 1983 courses for employees included more than 100 courses ranging from mini- and microcomputer applications overview, to trigonometry, to spoken English II, to trades apprenticeship. And those were just the courses offered to employees for voluntary participation -- over and above on-line skills training, vendor training, tuition assistance programs, and management and executive development programs. In 1984 Motorola Inc. will spend approximately 1.5 percent of its payroll on employee training in literally hundreds of areas. That figure is scheduled to increase to 2 percent in 1985 and 3.4 percent in later years.

As far as specific training for new technology is concerned, the picture is more complex and somewhat contradictory. A survey of 5,000 middle managers conducted for Exxon Office Systems in 1983 found that 49 percent of those polled use a computer at work and that 78 percent of the users do so on a daily basis. The most frequently cited sources of training were self-study through manuals (31%), training programs at work (28%), college (24%), the computer

manufacturer (23%), co-workers (22%), the computer itself (12%), and a friend (5%). The study also found, however, that 64 percent of the 51 percent who don't use a computer at work had received some computer training previously. Thus, the study concluded, there is a significant number of people in offices who have been exposed to training but do not use these skills to work productively (Exxon Office Systems, 1984, p. 11). According to a recent survey of 453 companies by Arthur Young & Co., however, microcomputers have had a very limited impact on U.S. companies due, at least in part, to the absence of training programs. Only 25 percent of the 453 companies surveyed use formal training programs to teach employees how to operate microcomputer equipment and software, and only 24 percent of these companies have seen training materials of which they approve. At the same time, less than 15 percent of the respondents are experiencing widespread use of microcomputers within their organization, and nearly 60 percent report little or no use of the computers.

The Arthur Young & Co. survey results indicate that no one is taking responsibility for training microcomputer users -- neither the companies nor the computer industry. Too often the software manufacturers provide only a user's manual with no formal trainer or program available to instruct the user. Inexperienced users do not have the skills and knowledge needed to operate this technology effectively and may have trouble accepting it as a potentially helpful work tool.

In addition, as we approach the year 2000, a set of demographic and economic forces has come into play that will have an enormous impact on the jobs, careers, and lives of many adult workers. These forces affect both the needs of adults for training throughout their lives and the ability of our training system to respond to these needs. Before examining the specific problems and

promise of technology training at midlife, relevant demographic and economic developments and trends must be noted, as they set the context for reviewing technology training for workers in business and commercial settings.*

The Demographic Context

Changes in the composition of the U.S. population and in the composition of its workforce will have direct and indirect consequences for adult training policies and practices.

Aging of the population. The 1980's and 1990's will see the baby boom generation move into middle age. By the year 2000, the median age of the U.S. population will be almost 35. Approximately 187 million adults 21 years old or older will comprise the adult U.S. population, an increase of 50 million over 1976.

Growth in the number of middle-aged workers. By the year 2000, the number of middle-aged workers (30 to 49 years old) will increase by 79 percent. This will result in "generational crowding" or "mid-career compaction," meaning that there will be more mid-career workers than there are opportunities for job and career promotions. Greater competition for fewer slots will affect the labor market attitudes and behaviors of this group and will likely have an impact on the demand for training services.

*The sections on demographic and economic shifts are based on the preliminary draft of Ivan Charner and Bryna Shore Fraser, Different Strokes for Different Folks: Access and Barriers to Adult Education and Training, 1984.

Increased life expectancy. Advances in medicine and nutrition will continue to increase life expectancies, particularly for women. While many older workers will choose to retire early, others will remain in or re-enter the workforce for financial and/or psychological reasons. New work patterns are likely to emerge that will allow for part-time work (on a daily, weekly, monthly, or yearly basis) and for the pursuit of leisure activities. Services and resources for this group will be needed on a scale that will be surpassed only when the baby boom generation moves into its older years, starting in 2025.

More women in the paid labor force. The numbers and proportion of women in the paid labor force have been increasing steadily. For the past three decades, six out of every ten new workers have been women. By 1990, two-thirds of all women under the age of 55 will be working, and by the end of this century, women will comprise half of the total workforce in this country (The National Council on the Future of Women in the Workplace, 1984, p. 1). The growing number of women entering, re-entering, or wishing to re-enter the labor force has resulted in their increased participation in programs, including training, to help ease their transition.

Increased numbers of minorities. By the year 2000, Blacks and Hispanics will constitute almost one-quarter of the U.S. workforce, an increase of almost ten percent over the 1970's. Increased in-migration (legal and illegal) from Latin America is expected as a result of shortages of entry-level workers. The impact of the increased proportion of minorities will also be felt by the education/training system, government, and service organizations.

Decline in the number of young adults. As a result of the post-baby-boom decline in birthrates from 1958 to 1975, only 18 million new workers will be added to the workforce in the 1990's, compared with 27 million and 20 million new

workers in the 1970's and 1960's, respectively (Carnevale, 1984, p. 14). This will mean a smaller pool of traditional entry-level workers in the labor force.

Economic Shifts

Major economic shifts have occurred over the past two decades, and further shifts are expected through the first quarter of the next century. Some of these shifts have been or will be dramatic while others will be more gradual. Both the speed with which these shifts take place as well as the shifts themselves will affect future employment and training.

In addition to these economic changes, new technologies have had major impacts on every segment of the labor force and on society in general. To cite just a few examples:

- Advances in agricultural technology have allowed fewer and fewer farmers to produce more and more. Mechanized farm machinery has increased the yield of an acre of land to the point that a mere three percent of the workforce currently produces all the food we eat and more (Schwartz & Neikirk, 1983, p. 25).

- Automation has transformed the assembly lines and factory floors in several industries by using robots to perform the tasks previously performed by workers. Of the approximately 7,000 industrial robots in use today, 25 percent are used in the auto industry, with manufacturers of consumer appliances (such as dishwashers and refrigerators) constituting the second largest user group (Condon, 1984, pp. 15, 17).

- The microcomputer and word processor are transforming the office from an environment that has been largely labor intensive to one that relies heavily on electronic storage and transmission of information. Nearly 70 percent of U.S. companies now use word processing equipment, one element of several in the electronic office, including copiers, calculators, enhanced telephone systems, and electronic mail terminals (Moriarty & Yeager, 1982, p. 46).

- In the communications area, teleconferencing (audio and video), videotex, satellite systems, and cellular phones are transforming this industry and the nature of the jobs in it.

The high technology revolution is all around us -- in the factory, at the office, in our communication, transportation, and health care systems, and in our homes. And some predict that the greatest technological advances are yet to come in the biological and health sciences. It is certain that all these technologies will continue to grow. What is much less certain at this time are the implications of the following economic shifts for employment, training, and personal development.

Continued growth of the information sector. In the late 1950's, information work became the dominant sector of the U.S. labor force and the principal source of economic output. As Figure 1 shows, this sector has been growing since the late 1800's. About half of all workers are employed in the information sector, and, while the slope of the curve is expected to level off due to automation and other technological advances, it is expected that this sector will remain the principal employer into the twenty-first century.

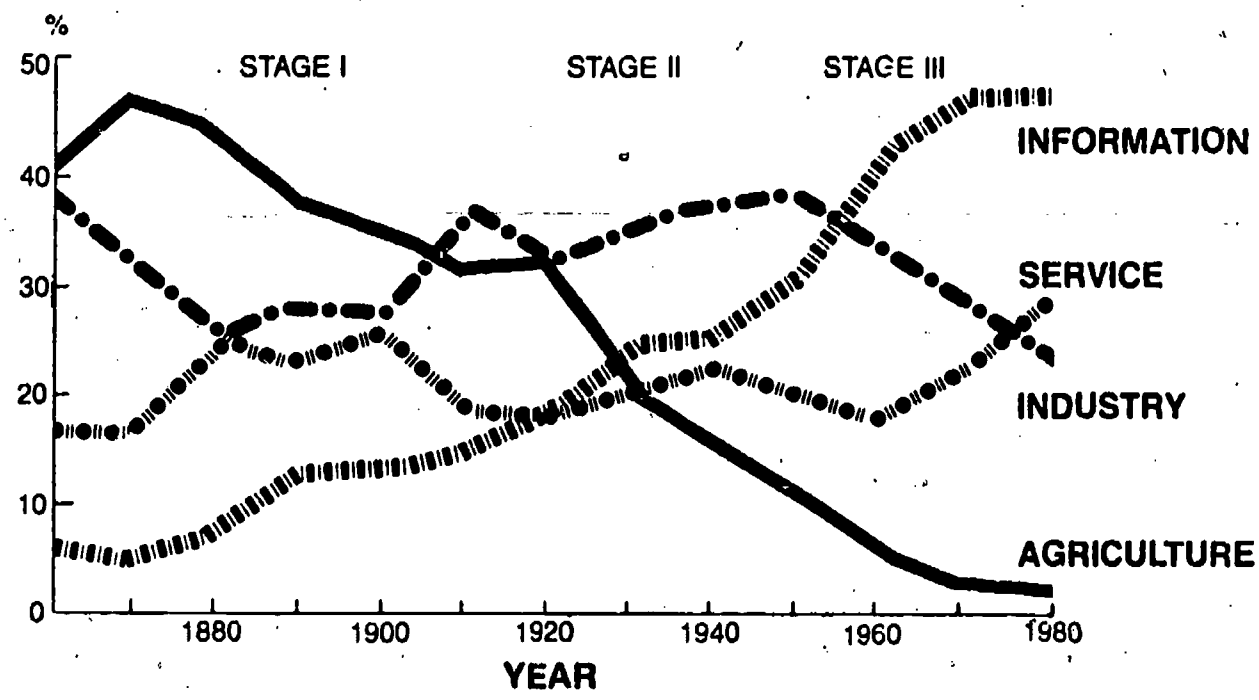

Figure 1. The four sectors of the U.S. labor force by percent 1860-1980 (using median estimates of information workers)

Source: From The Information Economy: Definition and Measurement by Marc Porat, May 1977, Office of Telecommunications Special Publication 77-12(1).

Growth of the service sector. As Figure 1 also shows, the service sector surpassed the industrial sector in the late 1970's, becoming the second largest employer in the U.S. economy. This sector will continue to grow for two main reasons. First, the growing number of women in the paid workforce is increasing the number of dual wage-earner households: 51 percent of all households today, 75 percent in 1995. These families will have more money but less time, and it is projected that they will "buy" more time by purchasing more services such as restaurant meals, dependent care, home maintenance, and similar time-saving services. Second, it is very likely that this sector will be affected by an influx of workers displaced by automation, technological advances, and foreign competition. As one study predicts:

> Since most service work involves relatively unsophisticated, commonplace skills and knowledge, the service sector has always been the natural marketplace employer of last resort. The ready supply of displaced workers with limited employable skills will foster low wages in the service sector, and thus promote the general growth of service-related business. Along the line, it should be noted that millions of people will use service employment as a temporary transitional phase in their careers, while they acquire some form of re-training to qualify for work in more rewarding sectors of the economy (Edwards & Snyder, 1984, p. 5).

Continued decline of the industrial sector. Figure 1 shows that the industrial sector has been shrinking since the early 1950's and will continue to do so during the next decade. Because of increased automation and robotization (estimates range from 50,000 to 100,000 regarding the number of robots that will be in use by 1990), improved operational procedures, and growing competition from Third World countries with cheaper labor costs, this sector is expected to employ no more than 12 percent of the workforce by the mid-1990's (Crohn, 1983, p. 21). The automobile, steel, clothing, and supportive industries have been

hardest hit by the growing trend of importing goods that used to be produced here in the United States.

Continuing expansion of self-employment. Since reaching a low of seven percent in 1970, self-employment has been on the rise and is expected to continue its growth. The expanding information and service sectors will reinforce this trend, giving rise to information and service entrepreneurs. Self-employment is expected to double by the year 2000 from its low in 1970. Changes in other sectors of the economy will also help foster its growth. For example, as mid-level workers at mid-career are laid off or not promoted, they may choose to enter self-employment in new venture enterprises. The computer software and support industries are a good example of this burgeoning phenomenon.

Growth of international trade and Third World development. Developed nations are rapidly depleting their reserves of natural resources while continuing to upgrade the quality of human resources. This will result in increased dependence on developing countries for raw materials and "cheap" labor for mass-produced goods. By the year 2000, one-third of the world's goods and services will be consumed or used outside of the country of origin.

The implementation of new technologies. Robotization, CAD/CAM systems, and other new manufacturing/industrial technologies are projected to eliminate five to seven million jobs (mostly blue-collar) before the turn of the century. Information/communication technologies are expected to eliminate seven to twelve million white-collar positions. By the year 2000, the total loss of jobs is projected to be between 15 and 20 million. On the other hand, the production of these new technologies will create two to three million new jobs, while the maintenance and repair of these new technologies will generate an additional

four to five million high-technology service positions. In addition, these new technologies will affect the production of finished information products in the "publishing" industry such as books, magazines, disks, cassettes, and video media. Between one and a half and two and a half million jobs will be generated in this area. The net result is a loss of five to thirteen million jobs due to these new technologies.

At the same time that these new technologies will lessen job opportunities in the manufacturing industries, the computer may create a similar loss of jobs in the services sector. In offices, supermarkets, department stores, and warehouses, workers will be losing their positions to computerized operations. Repair and services jobs as well as programmer and design jobs created by this new technology will not suffice to meet the job needs of dislocated workers and would-be workers in the services sector (Schwartz & Neikirk, 1983, pp. 34-35). The introduction of all these new technologies into the workplace will generate greatly increased needs and demands for training and development in two ways: (1) displaced workers will have to be retrained for re-employability and (2) employees who are provided with new technologies on the job will have to be trained in their use. In addition, it is likely that unskilled workers will experience the greatest job loss. In the area of robotics, for example, the Upjohn Institute estimates that 32,000 to 64,000 new jobs will be created but warns that over half of these jobs will require two or more years of college level training (Education Daily, August 16, 1983, p. 6).

Each of these factors alone and all of them collectively will have great impact on the jobs and careers of adults in the next 15 to 25 years. The figures indicate that many workers will need to be retrained just to remain in their jobs. Others will not have that option and will be displaced from their

existing jobs. Some workers will be forced to change jobs for mobility or financial reasons, while others will choose to make job or career changes to improve themselves and their lives. A 1975-76 survey by the College Board found that 36 percent of adults between the ages of 30 and 49 were "in transition," either undergoing or anticipating job or career changes (Arbeiter et al., 1977). Occupational mobility data, analyzed by the Bureau of Labor Statistics, showed that in 1977 four of every fifteen workers between the ages of 35 and 54 changed occupations (Griffin, 1981, pp. 2-4). Another study found that within a single month, 3.3 million employed people were looking for new jobs (Special Labor Force Report 175, 1975). Many, if not most, of these adults need additional education and training to secure the skills and knowledge necessary for making these transitions. Without opportunities for continued (re)training and education, many adults will be unable to respond successfully to the job and career changes that they will face in the coming years.

Having outlined the general demographic and economic conditions that will affect working adults in the next 25 years, we now turn our attention to the promise, problems, and programs of technology training at midlife for workers in the business and commercial sectors.

THE PROMISE AND PROBLEMS OF TECHNOLOGY TRAINING

The Promise

The prospect of working with new technology is welcomed by most people when it is first suggested. The reasons for this are quite understandable. Its introduction into an office or a commercial setting is often accompanied by a general modernization or redesign of the workplace -- an improved and up-to-date working environment. Technology also seems to offer a chance to learn new skills and eliminate some of the more boring and repetitive aspects of many jobs. In some cases, managements offer a financial incentive for accepting new technology -- in the form of extra payment for working on the new machines or a raise on completion of a training course in their use. Some workers also see the new equipment primarily as toys at first and look forward to the chance to play with them.

The introduction of automation into office and commerical settings is a qualitatively new experience. Supplementing the output of workers with machines (mechanization) has occurred steadily over the years through the use of manual typewriters, electric typewriters, and other business machines. Office and commercial automation, however, in which machines take over entire worker functions and drastically alter the contents of jobs for remaining workers is a recent phenomenon. For example, automation in sales and distribution work has replaced individual selecting, demonstrating, cutting, and packing of goods with mass production and pre-packaging of branded goods.

The electronic cash register or, as it is formally called, Electronic Point of Sale Data Capture Equipment, collects and transmits information to the warehouse, accounts department, personnel department, and even the customer's

bank through EFT (Electronic Funds Transfer). All these forms of communication have replaced traditional paper-based forms which employed large numbers of workers including stock-keepers, order clerks, invoice clerks, and bookkeepers.

What has been the response of workers to these new technologies? Has the introduction of automation improved the quality of work and removed the drudgery from it or has it made jobs more boring and repetitive? Has it led to new opportunities for women, who hold the majority of the jobs affected by automation in business and commercial settings, or has it in fact reduced the number and variety of jobs open to them? And, most importantly in this paper, how have workers been introduced to and trained for the use of this new technology? The answers to these questions are complex and frequently contradictory.

One recent survey of over 500 secretaries and administrative assistants found that "office automation has been accepted with open arms" (Gallant, March 5, 1984, p. 24). This national survey ("People in the Electronic Office") was designed to gauge the sentiments of corporate secretaries toward recently introduced office automation tools, primarily word processing equipment. On a scale of emotional responses ranging from love to hate, 83 percent of the respondents said they loved the word processing equipment, while none expressed any hatred of the equipment. Eighty-seven percent said they felt that their word processing skills would lead to new career opportunities, while 88 percent expressed the belief that these skills would result in salary increases.

But the same survey revealed some troubling disparities between respondents' beliefs and the reality of their situations. Only 30 percent had actually received pay raises as a result of acquiring word processing skills,

and while 75 percent said that the equipment freed them from typing chores and allowed them more time for work involving decision-making, when asked what new responsibilities the electronic equipment had allowed them to undertake, almost all cited traditional secretarial tasks such as drafting letters and researching reports.

Yet another significant finding of the survey was the importance of age as a factor. Forty-eight percent of the respondents under age 25 reported pay raises resulting from word processing skills, compared with much lower figures among older secretaries. The younger secretaries said their knowledge of word processing was more important then such customary skills as shorthand, while the older secretaries placed more value on traditional abilities. In addition, almost a third of the respondents under age 25 had already had training in either COBOL or BASIC programming, compared with a very small percentage of the older respondents.

In another survey, "Office Automation and the Workplace," over 1,200 secretaries and 900 managers in 443 information-intensive businesses were questioned. Once again, younger secretaries were found to view automated equipment more favorably than their older counterparts. Another significant finding of this survey was that secretaries in particular cited training as the single most important change needed when introducing automation into the workplace. The most frequent suggestion made for improving productivity in businesses where automation already existed was more and better training (Keefe, March 26; 1984, p. 22).

The Problems

Both studies cited above point out the need to develop programs for bringing an understanding of automation, specifically computers, to the group that fears them the most — workers over the age of 30. According to James Renier, president of Honeywell Information Systems, if nothing is done to allay cyberphobia among those born before 1954, "the computer will obsolete many of those over 30 in the workforce" ("Academia, business called to combat 'cyberphobia,'" 1984, p. 26). Renier believes that the arrival of computers in the workplace may be alienating workers who find computers "enigmatic and threatening," and in order for older workers to gain a true understanding of computers, he suggests that employers give workers a hands-on orientation to new computers in the workplace and that they continually reassure employees that their jobs are not in jeopardy.

Job loss is one of the major fears accompanying the introduction of new technology into the workplace. The main reason that a company chooses automated equipment is to increase productivity, i.e., to get more work done by fewer people. Unfortunately for employees, some employers believe the whole point of automating is to save money by eliminating jobs. A recent study conducted for the Air Force Systems Command, the purchasing arm of the Air Force, found that fully automating its offices would have the same effect as increasing its clerical staff by 25 percent. Although office automation would cost twenty-five million dollars over a five-year period, such an outlay would still be cheaper than hiring more people to do the same job (Butler, 1984, p. 196). It is a foregone conclusion that when new technology is implemented to reduce staff, employee anxiety will be great.

Closely linked to the concept of using automation to eliminate jobs is the notion of "de-skilling" or reducing the skills needed to perform in a job. Henry Levin and Russell Rumberger (1983), researchers at Stanford University, state that, "the expansion of the lowest skilled jobs in the American economy will vastly outstrip the growth of high technology ones; and the proliferation of high technology industries and their products is far more likely to reduce the skill requirements of jobs in the U.S. economy than to upgrade them." The first wave of word processors, for example, replaced typewriters in secretarial pools; operators could then spend the whole day doing nothing but typing. Some critics charge that by automating the office, companies "are not so much increasing clerical productivity and reducing labor costs as they are reducing skills in the secretarial jobs and creating an even more low paid, highly expendable, and interchangeable labor force" (Machung, 1983, p. 123).

Others express concern that management can hire cheaper workers with less education who can be trained to become reasonably fast keyboard operators while the machine does most of the work (e.g., laying out documents, correcting spelling, etc.). For workers, this can mean loss of job satisfaction, loss of control over the work, and increased boredom. It may also result in jobs becoming concentrated at two extremes: high-level skilled jobs and entry-level positions with little chance for skill-upgrading or promotion (National Council on the Future of Women..., 1984, p. 13).

Loss of promotion prospects is another fear that accompanies the implementation of new technology. With automation, the work process may become more and more fragmented, with different people performing different parts of a particular task. The individual worker doesn't learn the entire process and, without such knowledge, the chances of learning enough to be promoted become

very slim. In addition, there may be fewer positions into which to be promoted. Many of the new machines have built-in monitoring devices that track each worker's pace, resulting in less need for supervisors -- traditionally one of the ways up the career ladder for clerical workers (Huws, 1982, p. 27). Increasingly, the better office jobs tend to be technical ones, in such areas as computer maintenance, programming, or systems design, jobs for which few clerical workers are qualified or retrained. A study of five large employers found that when computerization was introduced, clericals were rarely upgraded to fill new skilled jobs. The main movement for these workers was either horizontal or downward (Cassedy & Nussbaum, 1983, p. 96).

All of the factors noted above may contribute to increased stress on the job when new technology is introduced. In addition to the stress placed on workers as a result of increased speed and monotony, stress may also be caused by physical conditions (such as working all day in front of a VDT screen) or by the pressure of being constantly monitored by a machine. Employers credit computer monitoring of workers with improving productivity because supervisors can automatically determine a worker's speed and accuracy and take steps quickly to improve them -- either by helping the employee correct the problem or, failing that, by disciplining or even firing the worker. Such use of monitoring, however, has been assailed (by unions in particular) as a sometimes counterproductive intrusion that can dramatically increase the stress in jobs and reduce worker motivation (Perl, 1984, p. A28).

Training Without Trauma

Given the range of problems that can accompany the introduction of new technology into the workplace, particularly for older workers, the investment

in and quality of training become critical factors in any decision to retrain employees. Optimal use of computer technology necessitates a high-level match between people and machines. Changed tasks, roles, and machine pacing must be learned. For example, a secretary who moves from a typewriter to a word processor has to learn to increase concentration on work (due to the machine's sensitivity); hand-eye coordination (due to the speed of the information flow); and ability to respond to signs rather than complete symbols (due to the shorthand language of the computer). All of this learning depends, in turn, on mental flexibility.

Even under the best working conditions, it is difficult for workers to learn so many new skills well and all at once. No wonder, then, that employees often lack the ability to make a rapid, performance-oriented adjustment to new technology. A major outcome of all this can be "technostress" — a condition resulting from the inability of an individual or organization to adapt to the introduction and implementation of new technology. Factors that affect the probability of technostress occurring include: the age of the user; past experience with technology; perceived control over new tasks; job security; and the attitude of management toward implementation (Broad, 1984, p. 30).

Fortunately, there are methods that can be used to minimize the likelihood of technostress occurring when new technology is introduced. On this, there is a consensus in the literature regarding effective approaches to lessening anxiety by increasing employee participation throughout the planning and implementation phases of workplace automation. This consensus is best expressed by Rosabeth Moss Kanter in her report, "Office Automation and People: A New Dimension." The report notes that "bringing in major technical change is not simply a technical matter. Participation and collaboration [with workers]

are essential to the success of innovation, particularly complex innovations like office automation" (Keefe, 1984, p. 23). Kanter goes on to outline the steps that should be taken by any company wishing to introduce new technology into the office environment with minimal stress and maximum use of new equipment to "enrich human minds and communication."

1. Long before any system is implemented, plans and ideas should be reviewed by all affected workers in the organization to ensure that all key stakeholder groups will develop a sense of ownership in the effort. Allowing future users to participate as early in the process as possible eliminates the feeling of powerlessness.

2. A steering committee should be formed to manage the entire automation changeover effort.

3. To ensure the involvement of potential users and affected workers, suggestions should be solicited and management briefings should be held long before the equipment arrives. This input should also be used to help make specific equipment purchasing decisions.

4. When the equipment is installed, dialogues between the users and the equipment vendors should be encouraged, and the vendors should be willing to modify their plans to accommodate the needs of a particular office.

5. The employer should offer open-ended, people-oriented training that is self-paced, problem-centered, and based on real-life problems.

6. Regular user meetings should be established on a permanent basis to provide encouragement and support, including personal and professional growth ("Winners in office of future will use OA as 'head tool': professor," 1984, p. 23).

By taking the steps outlined above, employers may be able to alleviate or avoid many of the fears and problems that have been associated with the introduction of new technologies in the past. There remains, however, another more universal set of problems relating to adult participation in (re)training and education programs that must also be successfully dealt with to assure a smooth transition for adult workers from the old work environment to the new.

Overcoming Barriers to Adult Participation in Training

Before we can address the specific programs for technology (re)training available to mid-career workers, we must initially examine the barriers facing adults voluntarily seeking access to such training, some of which relate to the problems (discussed previously) that arise when new technology is introduced into the workplace. These barriers can be categorized as situational, social/psychological, and structural and are frequently cited by adults as reasons for not participating in (re)training or education.*

Category	Specific Reasons
Situational Barriers	• Costs (too expensive) • Lack of time • Age (too old) • Prior educational attainment (too low) • Home responsibilities (too many) • Job responsibilities (too many) • Number of dependents (child care) • Occupational status • Level of income

*The following discussion is based on Ivan Charner, Patterns of Adult Participation in Learning Activities.

Social/Psychological Barriers	• Lack of confidence in ability • Feeling too old • Low self-concept • Tired of school • Lack of interest • Family or friends don't like the idea • Hesitate to seem too ambitious • Fear of trying something new (e.g., new technology)
Structural Barriers	• Course scheduling • Work schedule • Lack of transportation • Inconvenient location of courses • Lack of relevant courses • Financial support restrictions • Too long to complete program • Don't want to go full-time • Too much red tape • Lack of information on courses • Lack of information on support assistance • Inadequate counseling

Situational barriers are those factors that arise out of an individual's position in a family, workplace, or social group at a given time. Within this category, costs, lack of time, age, and level of education head the list of barriers. Costs are a particular problem for women and those with less education. Lack of time, on the other hand, is more of a problem for men, middle-aged adults, and adults with higher levels of educational attainment.

Social/psychological barriers are those factors related to an individual's attitudes and self-perceptions or to the influence of significant others (family, friends, etc.) on the actions of an individual. Only small proportions of adults report such factors as barriers to their participation in education or training activities. Included in this category are lack of confidence in ability, feeling of being too old, lack of interest, and lack of support from family or friends. Women more frequently than men report that they feel they are too old to begin. Men, on the other hand, cite lack of confidence

in ability more than women. Variation by age is found for lack of confidence in ability and feeling too old to begin, with younger adults more often reporting a lack of confidence and, not surprisingly, older adults more often feeling too old to begin. Differences related to educational level show those with less education citing lack of confidence in ability more often than those with more education.

Structural barriers are policies and practices of organizations that overtly or subtly exclude or discourage adults from participating in (re)training and education activities. These factors fall between situational and social/psychological barriers in the proportion of adults reporting such factors as deterring their participation. The array of structural factors includes: scheduling problems (course and work); location and transportation problems; lack of courses or relevancy of courses; procedural problems (red tape, credit, admission, full-time); and information/counseling problems. Of these factors, location, scheduling, and lack of courses are most often mentioned as barriers, with few differences among subgroups of adults. Information is also cited as a problem but is probably more critical than reported because many of the other structural problems may ultimately be due to lack of information about the options that do exist. Information does seem to be a bigger problem for adults with lower levels of education and those who are in lower status occupations.

Any training program aimed at adults, therefore, must effectively address and help participants surmount the barriers noted above. Mandatory employer-provided training at the workplace during regular working hours eliminates a significant number of situational and structural barriers but must pay particular attention to the social/psychological barriers that are especially

likely to be significant factors accompanying the introduction of new technology. As John Naisbitt (1982) states in his book Megatrends, "We must learn to balance the material wonders of technology with the spiritual demands of our human nature" (p. 40).

TECHNOLOGY TRAINING PROGRAMS

Given the fears and general barriers confronting adults participating in any (re)training/education program, how does a mid-career worker go about getting trained in up-to-date technological skills for office and commerical settings? Before detailing the options available to both employed and unemployed adults, it seems appropriate to note a number of constraints encountered in compiling the materials that serve as the basis for this section.

First, despite the growing attention being paid to the introduction and impacts of new technology in business settings, by far the majority of the literature to date has dealt with the impact of automation in the manufacturing sector and on the blue-collar workers displaced by its implementation. While increasing focus is being placed on the "Office of the Future," there is currently little printed information available on the plight of the older office worker forced to either undergo retraining or face being let go. There is even less published material on the specific technology training programs aimed at mid-career adults in transition. Careful review of the latest journals, newsletters, and publications dealing with the retail trades, office automation, computer technology, management, and training and development yielded little in the way of specific examples of training in new office and business technology for this population.

Second, most companies are reluctant to provide detailed descriptions of company-specific training courses, and while almost all organizations with 500 employees or more have at least one full-time person responsible for training activities, many office and commercial enterprises employ less than 100 employees and have no one in-house with even part-time training responsibilities.

Therefore, much of the program-specific information contained in this section has been based on the limited published material available or on anecdotal information provided by program sponsors.

Corporate Training

Corporate training includes a wide variety of programs that are either provided or sponsored by an employer. Although business and industry provides the lion's share of training in the United States -- more than three times as much as the amount spent by federal, state, and local governments combined -- most of these programs are concentrated in only two to three hundred of the largest companies. Furthermore, businesses are spending more and more money on remedial math and reading instruction rather than on focused skill training (Business-Higher Education Forum, 1984, p. 30).

A substantial portion of corporate training is generally developed to respond to changes in a company's technology, organization, or products. In the case of technological innovation, for example, for months prior to the introduction into the workplace of computers, a company will be preparing a whole curriculum of training materials for its computer operators, service personnel, supervisors, and others who will have to be familiar with the new equipment. A growing proportion of this material is being produced in the form of video cassettes, computerized instruction, satellite-transmitted teleconferences, and other ways of allowing the necessary training to take place in many locations and at flexible times. At the same time there continues to be much use of traditional printed manuals. Only rarely, however, is this material geared to the needs of a particular age group.

Employer provided/sponsored training generally falls into one of four categories: (1) in-house programs; (2) contracts with a postsecondary educational institution; (3) tuition-assistance programs; and (4) union-negotiated (re)training programs.

In-house programs. In-house training programs are usually delivered by company staff, frequently by a part- or full-time trainer. Employers either develop their own training curricula or buy/lease prepackaged training programs. A third option is to bring in outside consultants to design and/or deliver training courses at the worksite. Examples of technology training programs incorporating each of these three options are presented below.

Employer-designed and -delivered program. To encourage computer literacy among all its employees, the Penn Mutual Life Insurance Company in Philadelphia has set up a Personal Computer Staff, composed of five employees and a manager, which is responsible for devising and administering programs aimed at helping workers become knowledgeable about computers and computing. The company also sponsors a personal computer purchasing program for all employees at all levels of the company and offers formal classes in such areas as introduction to personal computers and word processing ("Technical Transition Training," 1984, p. 7).

Lloyds Bank California is the 8th largest statewide bank in California and has approximately 3,000 employees. The bank sponsors an extensive Career Development Program and offers 60-75 in-bank classes and workshops to over 1,500 employees to develop all levels of employees and management. Among the Human Resources Development staff of 27 are five classroom instructors and four electronic data processing instructors. In-bank training classes and outside educational opportunities are offered to all non-officers who work full-time or

part-time (a minimum of 20 scheduled hours per week).

- Skill Training Classes (New Accounts, General Ledger, Collection and Insurance, Safe Deposit, Data Clerk, etc.) are designed to enhance current performance or help an employee meet immediate goals within a branch bank. (These classes can also be taken through one of the 88 community colleges within the state and can help the employee earn an Associate of Arts degree.)

- In-bank Classes to enhance knowledge and attitudes are offered to all non-officer employees (Secretarial Training, Numbers Skills, Adventures in Attitudes, Careers in Management, Bank Orientation, etc.). Most of these classes cannot be obtained through a community college.

- TIPS (Training in Products and Services) is mandatory for all line employees and voluntary for administrative employees. This program consists of instruction in bank products, sales techniques, memory training, customer relations, and grooming.

- Teller Training Schools (four) are located geographically within the Lloyds Bank California system. Potential tellers are tested and hired by instructors, undergo two weeks formal training and two weeks in a training branch, and are then sent to the branches for assignment.

Electronic Data Processing (EDP) systems are increasingly important and problematic at the bank. An ongoing, comprehensive data processing training program helps the bank to maximize use of EDP systems and minimize problems.

Four members of the EDP Systems Training Group are under a separate accounting system, report to HRD Administration, and are housed in Management Information Systems. Their objectives are:

- Provide continuous, thorough, and uniform data processing instruction for all levels of Lloyd's employees.

- Improve the use of EDP input and output in branch, region, and administrative offices.

- Improve communication between Management Information Services and branch, region, and administrative offices.

- Increase the technician's understanding of branch operations and provide management with insight into program changes and Management Information Services.

Activities are conducted to enable realization of objectives. Positioning two members in each Data Center allows one member to be in the field training while the other is available to solve specific EDP problems, maintain logs, and issue bulletins. Time is spent in identifying training needs, developing classes and instructional materials, conducting classes, and following the effectiveness of training. Administrators and technicians from Management Information Services supply the detailed EDP information necessary to complete and correct instruction.

The EDP group develops in-branch users' manuals for commercial loan and installment loan programs. The manuals provide explicit, step-by-step instructions in processing loans, quick references, illustrations, and problem-solving advice. The users' manuals and class workbooks supplement each other.

Employer delivery of a purchased program. United Virginia Bank purchased a computer-based training program designed to increase the effectiveness of its teller training efforts. The bank determined that a generic computer training program could be purchased from a local vendor at much less cost than developing an interactive videotape system in-house. The purchased program consisted of 22 lessons, supporting texts, and other materials.

Each year, more than 100 tellers in the Richmond region attend the bank's four-week teller course. In a recent study of the program, officials asked the following questions: (1) Can the program reduce training time without sacrificing quality? (2) Can experienced teller trainers take an abbreviated course? (3) Can the program increase the remedial training available to employees during the program? (4) How can trainees learn more quickly, more thoroughly, and more enjoyably? (5) How can the program better train part-time

tellers who usually can't attend classes?

The teller trainees in each class spend the first four days of their training on the terminals. The program presents lessons and asks the students relevant questions. It also tells them whether they have answered correctly. (Before beginning classes, students take a written test that measures their current level of banking knowledge. If a student's score is high, he or she is exempted from certain lessons.)

The training program is based on modules that enable the bank to accomplish several goals. First, the program allows students to move at their own pace. They can repeat any section they are having trouble with. Second, computerized instruction frees the instructor to help students who require one-on-one assistance; meanwhile, the rest of the class members stay busy at their terminals. Third, teller trainees are able to move into the branches more quickly because the program shaves one day from classroom work. Fourth, trainees say they enjoy learning from a computer. Moreover, they now score higher on final tests -- 90% or more -- and are being taught 15% more than with traditional methods.

Recognizing that students can't sit at terminals for long stretches, the bank supplements the computer curriculum with other individual segments. For example, trainees practice using calculators and other business machines in the training center. They also study the bank's operations manual and review workbooks on the history of banking, customer service, and cross-selling. Instructors set aside some time to discuss the workbooks and other subjects with the class.

At the completion of the program, a written test is given. If a student fails to display a complete understanding of the material, the student and

instructor work out a plan to correct this by repeating portions of the program, by additional computer work, or by other arrangements. After successfully completing the generic computer program, the student moves on to a study of the bank's policies.

Before the teller trainees graduate, they are judged in five categories: the final generic test; participation in role-playing and other class activities; a final test on bank policy; professional attitude; and performance during on-the-job training.

Overall, United Virginia Bank's experience with computer-based training has been very positive, and the bank intends to continue to experiment with the concept and expand the program, bearing in mind the fact that, in the words of the bank's human resources planning and project specialist, "technology has never been -- and never will be -- a substitute for thoughtful, creative, and dedicated employees" (Coleman, 1983, p. 58).

Employer use of outside consultant for developing training program.

Metropolitan Life Insurance Company is training 20,000 employees at 1,250 sites to use the company's recently acquired minicomputer-based network. Metropolitan is spending over $90 million for the network hardware and approximately $3 million for the training program. Applications of the system include data entry and editing, a client data base specific to each sales office, word processing, electronic mail, and policy and contract illustrations. Almost all Metropolitan employees will be users of the system.

Metropolitan's training plan was developed with the help of an outside consulting firm. Called a top-down training program, it resembles an inverted pyramid in structure. Senior executives in the personal insurance field were trained first, senior sales staff were trained second, and key people in eight

regional head offices were trained next. Each regional office became home to a nucleus of six to eight trainers. Next in line were the "critical users" — sales managers and office managers in 1,100 U.S. sales outlets. These users traveled to the company's eight regional head offices for training. When the sales and office managers were trained, they became responsible for training sales office staff. The training emphasized hands-on experience, with 20% of the time spent in lectures and the rest of the time in actively using the system.

The network's most popular uses so far have been illustrating policy values, showing policy status, and electronic mail. Demand was so strong for word processing training that it was added to the training program. "We've had our pockets of resistance," says Richard Anderson, Metropolitan's assistant vice president of personal information systems, "but by and large, the reaction has been more positive than we anticipated" (Desmond, 1984, p. 8).

Employer use of outside consultant for developing and delivering training program. ITT Educational Services, Inc.-Business Division offers employers complete training programs (including provision of facilities) in such areas as automation, bank teller, computer programming, data processing, electronic office machine technology, keypunch operator, retail technical sales, secretarial, telecommunications, and word processing. In addition to generic or custom-designed training programs, ITT offers to take care of any/all arrangements, including: site selection; employee recruitment; student enrollment; assessment; basic/remedial education; English as a second language; skill training; career counseling; and support service coordination.

For example, ITT offers businesses a 2-1/2 day initial operator training program in word processing that outlines exactly what skills the trainee will learn. The program has the following characteristics: class size -- no more

than 16 participants with two instructors; method of training -- "hands-on" instruction with one work station per person, a course manual, and other course materials; and a "100% training effectiveness guarantee" that states that if upon completion the trainee cannot perform the skills contained in the course overview, ITT will retrain the individual free of charge, train a substitute selected by the company at no cost, or refund the program fee. ITT also offers more advanced training beyond the initial level for supervisory personnel, as well as courses that provide part of the training at the trainee's work station on the job. Upon successful completion of the program, each trainee receives a "certificate of participation." The costs of participation are paid by the employer, although the individual's travel costs to and from ITT's local facility may or may not be assumed by the employer.

Control Data offers large and small employers a variety of approaches to employee training at the workplace, at regional seminars, and at its Control Data Learning Centers. The use of these learning centers, located in most major cities, enables employers and employees to choose from a wide range of individualized multi-media courses available through the PLATO computer-based educational delivery system. The seminars, held periodically in cities around the country, offer two- to four-day training sessions in such areas as data communications, data base management, EDP operations, microcomputers, word processing/office automation, and videoteleconferencing. Costs of attending these seminars are paid by the employer.

Contracts with postsecondary educational institutions. Many employers, particularly those smaller businesses that do not have an in-house training capability of their own, are contracting with postsecondary educational institutions for both custom-designed and generic training programs. A

growing number of colleges -- mainly two-year community colleges -- have established offices or centers whose function is to offer the colleges' educational services, resources, and facilities to local business and industry, although, overall, institutions of higher education provide only a small amount of employer-sponsored education and training. The majority of contracted programs involve a small number of employees and are of short duration, ranging from a one-hour seminar to a full-semester course.

Custom-designed or "special" programs are those that are offered to a particular firm or organization. These programs may be standard courses identified in the college catalogue that are presented at times and locations convenient to the firm and in time blocks appropriate to circumstances; they may be customized versions of standard college offerings; or they may be totally new programs, structured to meet the specific demands of the company. They may be taught by college faculty or by instructors hired specifically for the course.

Generic programs share the design variabilities of special programs, but they are presented to a number of firms and/or groups that share interests and needs for the instruction. In most cases, generic programs are offered to companies and/or groups that do not have sufficient numbers of employees or personnel to warrant a special individual program (Mahoney, 1982, p. 14).

There are numerous examples of postsecondary educational institutions' linkages with employers.

1. The Moraine Employment Training Center at Moraine Valley Community College in Palos Hills, Illinois, was established in 1982. One of its first efforts was the Employee Skills Institute, which offers as many as twelve training programs, ranging from two to eight weeks long, and condensed to allow students to enter the workforce as soon as possible. The courses are offered on

campus or in the workplace (depending on the location of equipment necessary for instruction), and for credit or not. Instructors for these courses may be college personnel or individuals with related industry training experience.

The center offers both special and generic programs. Since 1978, the college has provided 63 special programs and 163 generic programs. Approximately 1,500 students have participated in special programs and 3,500 in generic programs.

Some of the special courses offered for employees of specific companies include: Union Carbide Company, "Office of the Future"; Johnson & Johnson Corporation, "Business Letter Writing"; Hickory Hills Bank, "Word Processing Training"; and Chris Community Hospital, "Secretarial Training" (Mahoney, 1982, pp. 24-27).

2. John C. Calhoun State Community College, Decatur, Alabama, and the Tennessee Valley Authority have designed a telecommunications/microelectronic training center network. The telecommunications training network is designed to be a model for industry and education in the development of high technology training systems.

The microelectronic/computer/telecommunication network provides training in four areas: (1) short courses for industrial development and industry; (2) a two-year associate degree in microelectronics, computer-related technologies; (3) retraining of displaced workers; and (4) short courses for technical faculty at both the secondary and postsecondary levels. The training is a comprehensive, integrated approach to high-technology telecommunications skills required by industry and provides technical training to industrial operators and maintenance personnel; a learning environment with computer coordination of equipment; actual training in state-of-the-art

telecommunications, microelectronic computer-related skills; and a network system among three postsecondary institution sites under the administration of Calhoun State Community College.

Under the training for displaced workers, 1,013 individuals have been retrained. Thirty working people have recently been trained in short courses for industrial upgrading.

Tuition assistance programs. A very high proportion of companies, particularly the larger ones, have some form of tuition aid or tuition assistance programs under which employees receive partial or full reimbursement of the costs incurred for courses taken on their own. Generally, these programs have a very low participation rate, particularly among lower-level, non-management employees. Because tuition assistance programs are not specifically designed to enhance the occupational or technological skills of mid-career adults, examples of such programs are not included here.

Union-negotiated (re)training programs. Unions are very active in the support of training and retraining for their members. A number of union-negotiated agreements call for advance notification of expected technological changes and the retraining of those workers who would be displaced. Two recent examples of such provisions are the United Auto Workers (UAW)-General Motors (GM) agreement and the Communications Workers of America National Training Fund, under the retraining provisions negotiated with the seven regional Bell System holding companies.

Two different programs are available to UAW workers under its agreement with GM. The first is the UAW-GM Tuition Assistance Plan, paid for by the "5 cents per hour fund" established by GM, which provides tuition assistance to eligible employees on layoff with recall/rehire rights. The second program is

the UAW-GM Training & Placement Centers, operated regionally, designed to provide placement and training opportunities for laid-off UAW-GM workers at no cost to the participants. The chief purpose of the center is to place and, when necessary, train or retrain workers for re-employment in the job market.

The first priority is job placement -- training is recommended only when no jobs exist for the employee or if training is necessary to make employee better qualified for future job opportunities. Training courses are provided through area technical or vocational schools, two-year or four-year colleges, adult education classes, or General Educational Development (GED) classes. Active workers at risk of losing their jobs are eligible to participate in skill upgrading programs at the workplace. It is too early to assess the effectiveness of these programs which, despite the fact that they are aimed at workers in the manufacturing sector, may prove to be effective models for the service sector as well.

Of more relevance to this paper is the negotiated agreement between the Communications Workers of America (CWA) and the seven regional Bell System holding companies. A provision in the agreement stipulates that retraining will be provided for any worker who needs or desires it. Local committees have been established in each of the seven regions and are responsible for the development of appropriate programs in response to local membership needs. At the new CWA training center in Indianapolis, courses offered displaced operators and clerical workers include digital electronics, computer literacy, office automation, and career planning.

In point of fact, however, only a very small number of workers in offices and businesses belong to a union. The majority of employees in these work settings are dependent on employer-provided (re)training or must look to other

sources of education and training for programs.

In summary, then, corporate training that is mandated, provided, and/or paid for by the worker's employer eliminates a significant number of barriers facing employed adults in need of up-to-date technological training. Some of these barriers and the means used for overcoming them include:

- Financial constraints -- employer finances the total costs of the training.
- Time and location constraints -- programs are offered at the workplace or a nearby training facility during regular working hours.
- Problems due to prior educational attainment -- remedial courses are offered; programs are held in familiar or non-threatening settings (e.g., the workplace); active, hands-on participation by the learner is encouraged.
- Scheduling problems -- programs are generally short-term, at or near the workplace, with flexible curricula.

In addition, training is provided on state-of-the-art equipment and frequently gives the trainee important, transferable skills useful for job/career transitions.

Unfortunately, not all middle-aged workers have the opportunity to receive technology training from their employers. And, of course, there are thousands more unemployed adults who desire such training. For them, the choices are narrowed to either the education and training sector or the offerings available in the public sector.

The Education and Training Sector

Noncollegiate postsecondary schools. Given the increased attention being paid to the need for training in new technological skills, it is no surprise that more and more people are turning to noncollegiate postsecondary schools (often called proprietary or trade and technical schools) for courses in electronics,

communications, computers, health care, and secretarial fields. In the past two years, enrollments in these schools have increased by 25 percent. More than one and a half million people are enrolled annually in these public and private training institutions. Women, once a minority in these schools, currently constitute 52 percent of their enrollments.

Many proprietary schools are small and independently owned and specialize in training students for a single vocation. But many others are part of chains of three, four, or more schools. Large national corporations are active in the field, too. ITT Educational Services, Inc. is the leading example, operating a nationwide network of 28 proprietary schools, offering technical and business programs, and 19 career training centers. ITT trains more than 15,000 people annually in 39 business and technical skill areas. Among the courses offered by ITT schools are: automation, bank teller, computer programming, data processing, electronic office machine technology, keypunch operator, retail technical sales, secretarial, telecommunications, and word processing. ITT schools also provide counseling and placement services to their students.

Noncollegiate postsecondary schools draw from two major groups: recent high school graduates interested in obtaining specialized vocational skills and adults seeking to update or improve existing skills or learn new ones. These schools do not grant degrees, offering primarily vocational and technical courses on a part-time and full-time basis. There are more than 100 fields offered, including two of the most popular areas today — computer programming and electronics. Programs last from two weeks to two years, and classes usually are held five days a week, five hours a day. Tuition for a typical ten-month course averages $2,000, clearly putting the average low-skilled, low-paid worker or unemployed would-be worker at a financial disadvantage. There is no

guarantee of a job upon completion of a course, although the schools frequently emphasize the high starting salaries offered in sought-after fields and their close links to community employers.

Noncollegiate postsecondary schools do maintain a high degree of flexibility in admissions requirements and in courses offered and are generally responsive to local employment needs. In regard to the effectiveness of these schools in training students for actual jobs, however, evidence to date is mixed at best. Several studies have found that relatively few graduates of professional or technical-level training courses actually find jobs in that area. This is particularly true for graduates of computer courses.

Occupational schools vary considerably in quality and, while many have excellent reputations, others engage in questionable practices. All potential students should heed the old "Buyer Beware" warning and investigate thoroughly before enrolling. Clearly, the need for obtaining information on quality of program, completion rates, entry requirements, costs, financial aid, job placement rates and assistance, and refund policies is crucial for any individual seeking (re)training in hopes of obtaining a new or better job (Kaercher, 1983, pp. 57-62).

Four-year colleges and universities. Colleges and universities have long been involved in the further education of adults through their continuing education and extension departments. Approximately 1,230 four-year institutions of higher education operate such programs or variations thereof. In general, the range of courses is broad and varied, although usually not for degree credit. The participants in these programs are usually well-educated and fairly well-off, while the programs are generally supported almost entirely from student fees.

Colleges and universities are providing more learning opportunities for adults through two separate approaches: adapting the delivery of traditional programs to accommodate a nontraditional student population and offering nontraditional programs to both traditional and nontraditional students. Some of the modifications being made to the traditional course offerings include:

1. Scheduling classes at times other than during the morning or afternoon, when the majority of adults are at work. More classes are now being held at night or even on weekends. For example: Wayne State University's Weekend College, a prototype for other four-year universities through the To-Educate the People Consortium.

2. Offering classes at locations other than just the main campus. Courses are being given at regional campus centers as well as libraries, employment sites, union halls, and even on commuter trains. For example: the College of New Rochelle; the University of Pennsylvania/CIGNA B.A. program.

3. Using the media to transmit courses, lectures, and reading materials. A number of courses are being given through local newspapers; others are televised and are shown, through the use of cable TV, several times during the week. Another use of television involves taping lectures so that students may come in and view the tapes at times convenient to their schedules. For example: New York University's Sunrise Semester; PBS's Adult Learning Programming Service; California State University at Chico's Instructional Television for Students aimed at rural, part-time off-campus students.

4. Easing admission requirements and formal entry qualifications for certain courses of study, including the granting of credit for life experience. For example: the College Level Examination Program; the Council for Advancement of Experiential Learning; and the New York State Regents External Degree.

5. Encouraging greater use of independent study, which may be more challenging and appropriate to the needs of adult learners. For example: Empire State College; University of Mid-America.

Over the last decade there has been marked growth in the development of nontraditional programs in colleges and universities. These programs have been founded on two basic principles: "that opportunity should be equal for all who wish to learn and that learning is a lifelong process unconfined to one's youth or to campus classrooms" (Cross et al., 1974).

One example of a nontraditional program in technical training is the Grass Roots Computer Literacy for Rural Adults Project operated by the University of Idaho Cooperative Extension (with funding from the U.S. Department of Education's Fund for the Improvement of Postsecondary Education). This project, started in the fall of 1983, has two goals. The first is to design, test, and evaluate a curriculum to teach computer literacy to rural adults. By computer literacy, the project means the ability to understand simple computers and to be able to use mini- and microcomputers in work or home settings. Through advisory groups consisting of community people, small business people, farmers, and homemakers, the project concluded that there is a dramatic increase in the number of jobs requiring computers and a dearth of training opportunities available to rural adults for computer literacy.

The second goal is to develop a delivery system that is appropriate for teaching in rural communities. In developing the curriculum, the project recognized the necessity of incorporating rural values and experiences.

This project focuses on eliminating a number of the barriers to adult participation in the project. Costs -- there are no costs to the participants in the program. These are covered through a grant to the University from the Fund for the Improvement of Postsecondary Education. Time -- courses are offered in the evening at high schools in the rural communities. Home responsibilities -- courses are offered at times when participants can attend. Also courses last for four weeks (two evenings per week) which makes attendance easier. Lack of confidence -- courses are designed to build self-esteem. Outreach efforts focus on local needs and face-to-face interactions. Course scheduling -- classes are offered in four-week blocks two evenings per week to coincide with work and home schedules. Location -- all classes are offered in

local school district high schools. Lack of relevant courses -- all courses are related to introduction to computers and computer applications. Length of program -- the program is of short duration focusing solely on computer literacy. Lack of information -- local persons are informed about the program through cooperative extension and other information sources that are relevant to rural adults.

The program is aimed at adults in rural communities who have not had the opportunity for computer training through existing extension or adult basic education programs. The majority of the participants served by the program are rural women, less than half of whom are displaced homeworkers.

The course covers introduction to computers and computer literacy. A math readiness component is included which covers math concepts, problem solving, and manipulation skills. A language readiness curriculum is available that focuses on logical thinking and the communication skills involved in information processing.

Referral services also are available to participants. These services include information on specialists in particular job or service areas (farming, lumber, banking, etc.). Information on job training (more advanced) also is made available to participants.

A cooperative community-based system of delivery has been developed for the program. The system involves participation by community people, small business persons, farmers, and homemakers in the delivery of the program to rural adults. The courses are designed with two principles in mind. First, adults learn better by doing than by seeing or listening, and instruction allows for practice and hands-on experience. Second, interaction among peers is an effective context for learning. Participants are encouraged to share feelings

and successes by teaching each other and by encouraging and facilitating ideas to be exchanged. The courses are delivered by a network of supervised peer teachers. These peer teachers are selected by local advisory committees and trained by project staff to recruit students and teach the course. Classes are kept small (12 per class) to allow for group interaction and discussion.

The project has access to the computers in the school districts and the University's extension computer system. Participants are learning on Apples, Commodores, and Radio Shack microcomputers.

All of the program participants have become computer literate. The program is not yet completed so placement rates (in jobs) are not available. While still in its early stages, the project has not only helped adult women to become computer literate, but has also helped them improve their basic math and literacy skills. In addition, the project has helped these women understand the role that the computer can play in their lives and in their communities. The delivery system with its peer teaching also has been well received by participants in the project.

Project costs have run approximately $120,000 per year including course development, peer teacher training, outreach, and delivery. While rural adults in Idaho are able to gain clerical skills through other extension courses, there have been no programs in computer literacy available to this population. This computer literacy project is a first step for rural adults who may seek additional vocational training on jobs that require computer skills.

In summary, then, both colleges and universities seem to be moving towards greater flexibility in accommodating diverse new populations of would-be learners. Practices vary significantly, however, as does the level of institutional responsiveness to the special needs of adult workers in search of

training and learning opportunities within the postsecondary structure. Thus far, it appears that innovative approaches like that cited above represent, in most instances, isolated departures from traditional delivery systems geared towards traditional student populations. With the decline in enrollment of traditional students, more postsecondary education institutions will find themselves in the challenging position of having to attract an older clientele and adapt to the differing needs and expectations of this nontraditional population.

Two-year colleges. The nation's 1,296 two-year community and junior colleges offer a variety of courses in career retraining and updating, for those currently employed as well as those seeking to enter or re-enter the labor market. Because the majority of the two-year schools are publicly supported, tuition and fees are generally low and affordable. Average tuition costs in 1980-81 were $385 for public two-year colleges, compared with $593 for public noncollegiate postsecondary schools and $915 for public four-year universities (Charner & Fraser, 1984, p. 17). Also, because of their liberal admissions policies, two-year colleges may be particularly attractive to those would-be adult learners who have not fared well within the traditional formal education system.

Recent data reveal that the community and junior college population is a working population (in 1978, more than half the adult participants were employees full-time), with particular interest in the occupational pay-off of the programs they are enrolled in. The data also show that the two-year colleges are serving an extremely varied clientele consisting of adults (the average age of community college students is twenty-seven), women, minorities, and the "disadvantaged," as well as substantial numbers of conventional

postsecondary students (Charner & Fraser, 1984).

These schools have been particularly responsive to the learning and training needs of adult workers in their communities, particularly blue-collar workers. A recent study indicated that 41 percent of community colleges had developed programs in response to union requests. Twenty-five percent were offering classes off-site in workplaces, union halls, and community centers. Programs included skill-upgrading in such areas as electronics, welding, and secretarial work. The main unions involved were the electrical workers, machinists, carpenters, plumbers, and sheet-metal workers (Goldstein, 1984). This responsiveness on the part of community colleges likely accounts for the finding that a higher percentage of blue-collar and service workers enrolled in adult education were in two-year colleges than in any other type of institution (National Center for Education Statistics, 1979).

Community and junior colleges also work effectively with local business and industry as noted earlier in this paper. These partnerships take a variety of forms, including, most often: plant-specific training provided by the college under contract with a local employer; equipment use or donation; industry assistance in developing programs; faculty assignments in industry; industry personnel as part of the instructional staff; sharing of facilities; and on-the-job training. An example of one such cooperative technology training program is the Intensive In-Plant Technician Training Model operated by the Rio Salado (AZ) Community College. This program has two primary goals. The first is to train technicians to respond to the needs of local industry. The second is to provide a means of upward mobility for women and minorities who did not have the opportunity for advancement or postsecondary education and training.

In the fall of 1981 this one-year Associate of Science degree program, delivered at the workplace, was developed to provide upward mobility opportunities to women and minority assembly line workers in the electronics industry. Traditionally technicians in this industry have been men while women have tended to fill the ranks of the assembly line. The objective was to move more women into technician positions. One-hundred thirty individuals have participated in the program over two years.

The program addresses a number of situational, social/psychological, and structural barriers. Costs -- costs for the program are covered by the company which pays tuition, books, and salaries of participating employees. Time -- participants are full-time students while collecting their full salaries. Job responsibilities -- participants are not responsible for performing any job duties while they are students. Lack of confidence -- tutorial assistance is available to participants, as is group and individual counseling. Course scheduling -- all courses are offered during regular work hours. Location -- all courses are offered at the worksite. Lack of relevant courses -- all courses are part of a degree program in technician training. Length of program -- the program is one-year long. Lack of information -- all eligible employees receive information on the program. Lack of counseling -- both individual and group counseling is offered.

The training and services provided are those necessary to meet the requirements for an Associate of Science degree for either an electrical technician or semi-conductor technician. Normally a two-year degree program, the 64-credit program has been compressed into one year. The curriculum which was developed jointly by the college and the industry is competency-based with highly concentrated courses. Courses are concentrated in a short time period

of 5 weeks with classes meeting for 3-1/2 to 4 hours five days per week.

The following courses comprise the program with all students required to take all courses:

- One-week orientation covering career awareness and career development
- Economics
- D.C. Theory-Introduction to Electronics I
- Speech
- Stress Management
- Drafting
- Active Circuits I
- Integrated Circuits
- Instrumentation
- Digital and Logic Circuits
- Introduction to Algebra
- Math for Technicians
- Freshman English
- General Psychology
- A.C Theory - Introduction to Electronics II
- Circuit Analyses
- Conceptual Physics
- Active Circuits II
- Pulse Circuits
- Microwave UHV/RF
- Solid State Devices

In addition, seminars are given in the following: microprocessing; soldering; experimental design; psychology of management; and resume writing. Finally, all participants take part in on-the-job training cooperative work experience when they actually work at technician jobs in the plant.

A number of services are also provided to participants. A counselor from the college is available at the worksite one day per week for individual counseling. A group counseling session also is required once per week.

The industry provides the students for the program from the ranks of its assembly line employees. The company pays the employee's salary for the entire year of the program in addition to all applicable tuition and book costs. The company also has provided a Technical Training Center at the worksite consisting of two classrooms (for instruction) and 18 lab stations (for instruction and practice). A full-time director, lab technician, and secretary are also provided by the company. The cost for the program runs at about $18,000 per student. This includes student salaries but not facility and staff costs.

All students go through the program together. Each class consists of about 26 students who remain together for all classes throughout the year. The group forms a support system for each participant. The courses are all very concentrated with instruction combining lecture and hands-on experience. Computer-assisted instruction is used only for tutorial assistance in electronics areas.

Ninety-eight percent of participants completed the program and 95 percent of the participants were promoted to either electronic technician or process technician positions in the company. All placements are done through a job-posting process, and placement in technician positions was not guaranteed. Each program completer applied for an available position(s) and competed with others (non-participants) for the position(s). The average salary increase after program completion was approximately $2.00 per hour from $8.25 per hour as an assembly line worker to $10.00 per hour as a starting technician.

This model project has been successful at overcoming a wide array of barriers. Because all participant costs are covered by the company and salaries are maintained, employees do not suffer any financial burden. By offering the program on a full-time basis at the worksite to employees who are on payroll, the time factor is overcome as a barrier. Job responsibilities are eliminated (but not salary) while the participants are part of the program so this does not act as a barrier. The tutorials, support group, and counseling help participants overcome any lack of confidence they may have. Because all courses are offered during regular work hours there are no scheduling problems. All courses are relevant to the jobs being prepared for, and the length of the program allows participants to complete it in one year. The one-year duration, however, may be too intense for some participants. Information on the program

and counseling are provided to all participants so these are no longer problems.

The Intensive In-Plant Technician Training Model offers an example of a training program that has adapted to the needs of an industry and a specific group of employees who could not otherwise participate in such a program. This program offers training to a population group which does not seem to be adequately served by more traditional adult education and training offerings.

Overall, the figures indicate that two-year colleges will continue to attract large numbers of adult participants, and that programs between colleges and businesses and between colleges and unions will increase, due to the following reasons:

- Two-year colleges offer low-cost, quality training.
- They provide adaptable and flexible programs, in terms of both location as well as willingness to adapt and alter programs to meet specific user needs.
- They are capable of presenting a range of programs, from developmental learning activities to technician programs and from entry-level to retraining.
- They adjust scheduling to meet learner demands (Jackman & Mahoney, 1982).

Professional associations. Professional associations are composed of member practitioners within a particular occupational group and are aimed at advancing the interests of the occupation as a whole as well as enhancing the occupational competence of its individual members. These associations are organized on a national, regional, state, or local basis and consist of such diverse memberships as engineers, real estate brokers, doctors, secretaries, and sociologists. They serve their members through meetings and conferences, professional publications, workshops, courses, and other educational activities. These activities are almost always part-time and are usually paid

for by the participants or their employers.

The American Management Association (AMA) is a major provider of education, with its 7,500 lecturers and discussion leaders and the provision of almost 100,000 courses for business personnel in a recent year (Anderson, Kasl, & Associates, 1982).

Most of the courses are of one to four days' duration and include subjects such as Production Planning and Control, Utilizing Computer-Aided Engineering for Better Design, Pre-retirement Planning, Career Workshop for Executive Secretaries, and Improving Interviewing Skills. Recently the AMA began offering courses on integrated office systems, which have proved to be both popular and useful; these courses are intended to help in making the changeover to the automated office. For those unable to leave their place of business, the AMA provides in-house courses for groups or supplies multimedia packages and a trainer for the companies to use.

The American Institute of Banking (AIB) is the educational division of the America Bankers Association. With more than 600 units in 50 states and 250,000 members, AIB claims to be the best industry-sponsored adult education program in the world ("Fact Sheet: American Institute of Banking," n.d.). AIB is open to all men and women who belong to a financial institution eligible for membership in the American Bankers Association, as well as to others employed in various banking-related organizations. Nearly half a million educational certificates and diplomas have been granted since AIB was founded. The approximate annual course enrollment is 170,000, while more than 80,000 bankers participate in at least one of the 1,800 educational seminars offered annually by AIB units.

Recently, AIB, together with the National Alliance of Business and the Worcester (MA) Area Chamber of Commerce established the American Institute of

Banking On-the-Job Training Program, a six-month, high-support classroom and on-the-job training program designed to assist economically disadvantaged individuals in securing jobs as tellers, keypunch operators, and clerks.

On-the-job training for teller trainees actually begins with two months of vestibule training at the bank site. A simulated bank area is provided for trainees to learn fundamental banking policies and procedures using "role-playing" techniques. Successful completion of the vestibule training period entitles the trainee to receive on-the-job training at a teller window. The trainee is supervised by an instructor (a bank employee) and required to perform teller duties and responsibilities, such as deposit and withdrawal transactions, loans and mortgage payments, and preparation of cashier checks.

A two-month observation training period is provided for clerical trainees to receive instruction in fundamental procedures of banking clerks. Trainees are expected, at the conclusion of the two-month observation period, to perform clerical duties such as processing new checks and mortgage accounts, under supervision.

This AIB program offers unemployed, disadvantaged adults the opportunity to get trained for actual jobs on the equipment that is already in use in the bank without cost to the trainee, a particularly important consideration to the population at which the program is aimed.

The Public Sector

Public sector training programs include a wide range of sponsors and providers offering technology training at low or no cost to the participant. Here again, however, we find very few programs aimed at the adult worker who has been laid off or faces possible job loss due to the introduction of technology

into the office or business. As noted earlier, most public (and private) training programs are not aimed at the middle-aged veteran worker suddenly thrown out of a retail or commercial job by a wave of new technology. Another troubling factor is that studies show that public retraining programs are of greatest benefit to younger, better educated workers who have achieved at least some financial security. Even among such workers, however, only about 15 percent have participated in retraining programs, citing lack of financial assistance during the training period as the major reason for not participating (Schwartz & Neikirk, 1983, p. 129).

Given this rather unpromising background, what options are available in the community to the adult worker in search of technology (re)training?

Educational brokering services. There are over 450 educational brokering-type services in the United States, offering information and counseling to adults who are considering changes in their careers through offices in community agencies, colleges and universities, and local governments and school districts. These services help adults assess their needs, make occupational and educational plans, choose the most appropriate training/education resources, use financial-aid programs, develop job-seeking skills, and gain entry to the programs or occupations of their choice. The information base of each service is comprehensive, containing data on educational offerings at all the educational institutions in the community as well as proprietary schools and community agencies. The service is open to the public and under no pressure to refer clients to a particular institution. Each service is concerned not primarily with job placement, but mainly with helping clients discover their own preferences, competencies, opportunities, and aims for action at the workplace and in the rest of their lives.

A number of brokering agencies have made a concentrated effort to market their services with employers in the public and private sectors. Some have been successful in developing a series of educational and occupational planning workshops sponsored usually by management and conducted on site. The agencies have also recruited counseling staff members from the ranks of the workforce. Still, the percentage of clientele in low-paid occupations is not commensurate with their roles in the labor force and the country. The number of clients served by these educational brokers annually is about 900,000 (Barton, 1982, pp. 61-62).

Public school systems. Local school systems, though mainly focused on educating youth, have long offered adult education courses in the public schools. With projected stabilization and, in some cases, decline in enrollments, it is likely that the trend of offering programs for adults will increase, particularly at the secondary level. Many schools, especially vocational schools, are upgrading their equipment through donations from and partnerships with employers, and schools throughout the country are benefiting from contributions from computer companies in particular. It is very likely, therefore, that computer training courses in a variety of fields will be increasingly available to community members through adult education programs.

One example of such a program is the "Computers for the Medical Assistant" course being offered this fall by the Fairfax County (VA) Public Schools Office of Adult and Community Education. The class, which meets weekly at a local high school for five weeks, explores the use of automation in the doctor's office. Another course covers the coding system being implemented in hospitals, insurance companies, and doctors' offices. Classes are held at night, and costs are very low.

Local community programs. On the local level, increasing numbers of community agencies and organizations are offering courses in technology use, particularly the operation of microcomputers and computer literacy. One example is a free computer education program started in 1983 by the Tacoma (WA) Public Library. Local library officials developed the pilot program, named Compulit, after learning that while computer education courses were available in area schools, no such programs were available for adults.

Compulit consists of three computer literacy classes, a microcomputer laboratory, and a computer checkout service in which class enrollees are allowed to take home a Timex Computer Corp. Sinclair/1000 microcomputer.

The classes offered are "Computer Literacy," Programming in BASIC," and "Selected Microcomputer Applications." Designed by the library staff and consultants, the courses are restricted to persons 18 years old and older. Classes are held once a week for four to eight weeks.

The computer laboratory is equipped with a variety of microcomputers -- an Apple II, an IBM Personal Computer, a Kaypro II, a Micro Decision, a Radio Shack TRS-80 Color Computer and TRS-80 Model III, and a VIC-20. Many popular home and business software programs are available for the various systems. Six Sinclair/1000s are available for at-home use.

The Compulit courses have proven popular with all age groups. Slightly more than half of those enrolled have been between 36 and 64 years old. The students have been about equally divided between men and women, according to library statistics.

First-year funding for the program came from a $40,000 Library and Construction Act grant from the Washington State Library Commission and $20,000 from the library budget ("Library's computer course swamped with registrants,"

1984, p. 34).

Federal employment and training programs. The federal government, through an array of employment and training programs, provides significant education and (re)training opportunities, focusing on entry-level training for the disadvantaged would-be worker, with some attention paid to the retraining of the dislocated worker. Most recently, federal programs for unemployed and disadvantaged workers have included: the Comprehensive Employment and Training Act of 1973 (CETA) and its successor, the Job Training Partnership Act (JTPA); the Work Incentive (WIN) program; and the Trade Act of 1974.

The types of training provided through these programs include machine tool, welding, secretarial, electronics, clerical, and LPN. Unfortunately, most observers of these programs have found them inadequate, characterized by duplication, omissions, and a lack of focus. Often, the entry-level training programs have little relationship to actual employer needs, preparing people for jobs that don't exist at the same time that shortages in skilled people are apparent in other areas (Business-Higher Education Forum, 1984, p. 30).

The current Job Training Partnership Act (JTPA) expects to produce 800,000 to 1,000,000 trainees in fiscal year 1984 at a cost of $3.5 billion. The bulk of this money is to support the training of disadvantaged youth in marketable skills. In FY 1983, about $215 million was allocated for the retraining of adult workers who lost their jobs in heavy industry because of automation or the 1981-82 recession. The program emphasized training in fields where job openings were increasing — i.e., the service industry: health care, food services, clerical work, and computer sciences. Some critics, however, believe that trainees, particularly women, are being short-changed because the program emphasizes short-term training for low-level jobs that could be

obtained without the training (Johnson, 1984, p. 9).

As the training programs themselves are conducted not by the federal government (which provides funding) but by local, community-based oganizations or through partnerships on the local level, examples of these programs in the area of technology training are included in the following discussion.

Collaborative training programs. Since 1980, local partnership programs have enjoyed increasing currency as the preferred locus of responsibility and service deliverer for government training programs. These partnerships take a variety of forms but, in almost every case, always include the involvement of one or more major employer(s) in the community. The presence of the employer is designed to assure that training programs are up-to-date and provide training in skills needed for current or projected jobs in local industry and businesses. The programs described below are typical of the collaborative efforts focusing on the provision of technology training at the state and local levels.

- Word Processing Training Centers are currently operating in 32 cities across the country. These centers are run by local community-based organizations in partnership with the IBM Corporation, with additional funding from the Job Training Partnership Act. Training in word processing, computer operation, and computer programming is provided to approximately 3,000 individuals annually, most of whom are women in their late 20's and 30's, although ages range from 18 to 55. The training is done on up-to-date equipment provided and updated periodically by IBM, which also provides loaned staff to the centers for the first three years of operation, at which time centers are expected to be self-sufficient, although IBM continues to donate and upgrade equipment.

• The Washington, D.C. Word Processing Center, by way of specific example, is operated by the Washington Urban League and serves three main categories of workers: women returning to the workforce; workers whose jobs have been terminated; and public assistance recipients. Ninety-eight percent of the program participants are female. The training course, which is promoted heavily through local advertising, lasts for 26 weeks and consists of six hours a day, five days a week. While no stipend is offered to trainess, they do receive $35 a week to cover transportation, and other support services, including counseling, are provided. The center trained 153 word processors in 1983, over 85 percent of whom were placed in jobs with an average starting salary of $13,400. In a follow-up of trainees placed during the center's first three years of operation, 75 percent had been retained by their employers, and many of the trainees had moved up to become administrative assistants or managers. Training program operators are convinced that the program offers participants not just entry-level skills but also the skills needed to gain upward mobility within the employing organization. Twenty-three new centers are being added to the national program by June 1, 1985.

• The Bay State Skills Corporation (BSSC) was created and funded by the Massachusetts state legislature in 1981 to act as a catalyst in forming partnerships with business and education to train workers in skills needed by growing industries in the state. BSSC provides grants to public or non-profit education and training institutions which link up with one or more growing companies to train workers for specific jobs. Participating companies are required to match the grant with contributions of equipment, materials, staff time, or cash.

The training can take place at community colleges, vocational schools, four-year colleges, universities, and community-based employment and training organizations throughout the state. The training is not restricted to unemployed or poor individuals. Because employers' major criteria are the need for skilled workers, BSSC's primary focus is on training people for jobs, regardless of their economic status. The programs cover a variety of training levels, including entry-level training, employee upgrading, retraining, and advanced (college- and university-level) programs, and run from 20 weeks to 20 months. Training is provided in a wide variety of new and emerging occupations, such as nuclear medicine technology, computer-aided design/computer-aided manufacturing, plastics technology, and advanced automation and robotics, in addition to the more traditional occupations of the machine trades, licensed practical nursing, and junior accounting.

Thus far, the BSSC has awarded over $6 million in grants-in-aid for 76 programs of skills training and education which will train over 5,000 individuals and has worked with over 75 education and training institutions and 300 businesses. BSSC has also established a Career and Learning Line to provide information on where people can find specific education and training programs.

An example of one of the BSSC-sponsored programs is the Regis College/Honeywell Corporation computer programming retraining program. The program included paid internships, a job fair where interested companies could meet with trainees and develop employment prospects, and the development of an industry-sponsored scholarship pool for future trainees. The 35 trainees had no previous computer training and accumulated 150 hours in the classroom and 60 hours of on-site training at Honeywell in a two-phase program. The program operated evenings and weekends and was targeted toward laid-off teachers and

other government employees, including those displaced by Proposition 2-1/2. Honeywell contributed $77,177 worth of supplies, computer time, curriculum advice, and salaries for instructors from Honeywell. The donation extended throughout the two 15-week training phases. The BSSC grant award of $32,879 paid for technical and career workshop instructors, training materials and supplies, and a small amount of administrative costs.

The strengths of the program were the strong commitment from the Honeywell Corporation; an expansion of the private linkages to include other companies in need of computer programmers; and the targeting of the program to laid-off teachers and other displaced government workers. Regis College plans to institutionalize this computer programming course at the school and offer it on a regular basis through tuition and private corporation contributions, as needed.

- The private, non-profit Corporation for Technological Training (CTT) was established in affiliation with the Maryland State Job Service and the Montgomery County Government to create programs that train or retrain workers or upgrade their skills. Funding is provided by federal, state, and local governments and the private sector. CTT programs are directed specifically toward high-tech skills rather than general technological education. CTT serves as a broker, helping high-tech firms develop skills programs and design curricula, then contracting with private firms or public institutions for the actual training. CTT also helps firms develop skill-upgrading programs and customized training programs, as well as arranging and overseeing training.

The Technical Occupations Employment Group (TOEG) is a division of CTT which was established as a broker between workers and local high-tech employers. TOEG is basically a system that matches an individual's skills for high-tech

work with the skills local companies need. The individual may be employed or not; TOEG provides free, confidential service to anyone who seeks a career in a high-tech industry.

TOEG testing and skill specialists determine each applicant's qualifications and aptitude for technical employment. An hour-long computerized test called APTICOM reveals general technical capabilities. A comprehensive personal interview follows. Good prospects for technical employment may then go through a comprehensive assessment process called MESA. MESA testing, a thorough employment screening system, may take up to four hours.

Once a worker's technical employment qualifications are in the TOEG computer along with a company's skills requirements, the computer makes appropriate matches. Employers receive from TOEG the names and skill inventories of prospective employees. The employer then decides which prospects to contact for interviews and whether to hire any of them.

From December 1983 to July 1984, TOEG tested 650 people, 300 of whom were found technically eligible and 100 of whom were placed in jobs (between March and July). TOEG clients have ranged from individuals eligible under the Job Training Partnership Act to executives. Half the clients have been unemployed, 43 percent are minority, and 33 percent are JTPA-eligible. Currently, CTT is working with 60 employers and is in the process of setting up its first training program (in electronics).

IN CONCLUSION

Collaborative programs in technology training offer some hope that attention is beginning to be paid to the needs of workers of all ages for training or retraining in new technologies. Unfortunately, what the preceding review of programs reveals is that hardly any focus is being placed on addressing the particular needs of mid-life adult workers in business and office occupations, whether employed, unemployed, or seeking to make a job or career transition. It is possible, perhaps, that the existing literature in this area does not reflect the bulk of what is currently happening in individual programs, but it is unlikely that a large number of programs for mid-life adults are operating in relative obscurity.

What all this discussion points out, in addition to the apparent dearth of programs, is the lack of timely and accurate information on the entire system of adult training in the United States. More information is needed on: the demands for adult (re)training by individuals (whether employed or unemployed) and employers; the need for (re)training in terms of changing occupational requirements and technologies; and the structure of adult (re)training opportunity in terms of the providers of (re)training products and services.

Specifically, an inventory of adult technology (re)training programs needs to be developed, particularly in service and information occupations. This inventory should provide a detailed history of programs (goals, objectives, populations served, outcomes) as well as descriptions of training and services offered and instructional approaches. The inventory could be computerized so that information would be readily accessible to those interested in developing their own programs or in learning about offerings available to them.

After a detailed inventory has been developed, case studies of a large number of these different adult technology (re)training programs should be undertaken. These case studies could help to identify and document those components that respond to the needs or eliminate barriers of different groups of adults. These case studies would uncover a number of critical factors which are related to ease of access, elimination of barriers, and effectiveness of these programs. Decision-makers in educational institutions, business, or government could use the information from these case studies to develop new programs or to modify existing programs to enable them to better meet the needs of adults for technology training.

Currently available information on training often is extremely dated or focuses on a very narrow band of workers (e.g., most of the data on "dislocated workers" deal with workers in the manufacturing sector of the economy, not with workers in the service sector). We know that employers are providing some forms of training when new technology is introduced into the workplace, but there appears to be little differentiation in the types of training offered to differing age groups of employees. We also know that in 1982 companies invested an average of $3,600 per worker in new facilities and equipment (much of which, no doubt, was linked to the introduction of new technologies), yet these same companies invested an average of just $300 per worker for training.

As stated at the outset of this paper, technology is only as good as the person who uses it. Surely, the time has come to focus more attention and resources on technology training for all who want and need such training, not just in manufacturing but in the increasingly important information and service sectors of the economy.

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At Home in the Office:

- At Home in the Office: A Guide for the Home Worker

COMTASK:

- Procedures for Conducting a Job Analysis: A Manual for the COMTASK Database
- COMTASK User's Guide

State-of-the-Art Papers:

- The Changing Business Environment: Implications for Vocational Curricula
- Computer Literacy in Vocational Education: Perspectives and Directions
- Computer Software for Vocational Education: Development and Evaluation
- Educating for the Future: The Effects of Some Recent Legislation on Secondary Vocational Education
- The Electronic Cottage
- High Technology in Rural Settings
- (Re)Training Adults for New Office and Business Technologies
- Robots, Jobs, and Education
- Work in a World of High Technology: Problems and Prospects for Disadvantaged Workers