Chapter 3

Training and Education for Office Automation

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Chapter 3

Training and Education for Office Automation

Automated office technologies are promoting change in skills, jobs, and organizational structures. These changes are creating a continual need for new kinds of training and education for office workers. The demands on the resources of companies, governments, and individuals to keep up with these relatively rapid changes will be enormous. Those who are getting the largest share of work-related training are those already employed, in higher level jobs, white, young to middle age, with discretionary income and time.

The training costs associated with introducing new technologies were not fully anticipated by early users and are just beginning to be fully recognized as a necessary element in achieving increased productivity. Frequently, organizations have designed and implemented new systems without recognizing the evolution that might occur and the need for continuing training that would accompany this evolution. The result was often decreased productivity. More attention paid to training can provide significant benefits, including greater job satisfaction, reduced turnover of employees, improved efficiency, and more effective service to customers. Experience with office automation has led to greater recognition of the importance of training. Training is itself now a fast growing industry.

This chapter looks at ways in which workers obtain training and the implications of this to individuals and employers.

There are good data on educational levels attained by citizens before leaving school. It is more difficult to determine how much adult training and education occurs and how much of it is job related. In 1981, nearly 24 million adults participated in adult education and vocational education provided by universities, community colleges, governments, secondary schools, private schools, commercial schools, and employers. hluch of this training is recreational, such as crafts, photography, and travel classes. However, much of it is also job related: for example, computer courses.

There are signs that a large part of the population does not, have access to training, which creates inequities in opportunities for available jobs, The lack of coordination on a national level of information on training and education for work and on job opportunities hampers t he ability of individuals to plan careers and to adju st to changing job markets. The benefirs for the individual changing new skills are notonly higher income and greater imcome security, but also an increase in self- esteem and confidence. which promotes the ability to learn additional new ski11s.

Training and continuous education and opportunities for acquiring office automation skills are critical for at least three reasons:

1. At least 75 percent of the adult workers for the year 2000 are already in the labor market. The majority of those that must be trained and educated to use office technologies are adults past the stage of secondary education.
2. Office automation (OA) technologies have the potential to affect the lives of more people than any other type of computerized technology, since office workers now outnumber manufacturing workers.
3. Employment trends show a continual change in skill requirements. This means that adults must be frequently retrained to use the new technologies and adapt to changes in occupations and the work environment. Changes in the work environment and work performed may necessitate adaptation to unforeseen work situations.

TECHNOLOGY AND TRAINING

New technologies and the accompanying training needs seem to operate in cycles. The training cycle for a technology has been described as follows:[1]

- new technology introduced—employers provide extensive training and upgrading of employees because of lack of available expertise in the work force;
- technology becomes widely adopted and equipment is standardized-specific skills become general skills; employers lose employees to other firms;
- employers cease to provide general training; training is shifted out of the workplace and into the schools, and firms focus on firm-specific skills;
- increased demand makes it feasible for public and private schools to standardize and formalize training; and
- the industry using the technology, or the technology itself, declines; demand for skills contracts—training focused on replacement needs of the firm and on retraining of displaced workers.

Office technologies are in the early stages of this cycle. Some employers are continuing and even increasing their expenditures on training, but with the largest proportion spent on management skills training. Some are beginning to require skills in using automated equipment as a condition for employment, as they find a more plentiful supply of already trained workers.

Public and private educational systems are now offering training in office automation as well as providing the genelal education needed by office workers. U.S. companies spend $40 billion per year on further education and training of workers. [2] Over 21 million people participated in adult education (part-time, nondegree studies) in 1981.[3] Fifty-seven percent of these courses were in formal educational institutions such as universities, vocational and trade schools, community colleges, or elementary and high schools. Twenty-seven percent of the courses were provided by business, labor, and professional organizations or government agencies. Sixty-one percent of the courses taken were job related, that is, were taken to improve skills for a current job or to get a new job.[4]

The Stakeholders

According to the Bureau of Labor Statistics (BLS) the work force is expected to grow by 23 percent by 1995. BLS projected growth of 1.6 percent per year between 1982 and 1990. This would slow to 1.0 percent per year between 1990 and 1995.[5] This is based on a projected population increase of 12.5 percent by 1995.[6]

About 75 percent of the U.S. labor force for 2000 is already in the labor market, creating a great need for adult learning opportunities. As the "baby boom" generation ages, the need for teaching new skills to an adult work force has been termed an "adult learning crisis.'" The term "crisis" refers to the wide gap in future skill requirements for work in automated offices and the current capacity to train adults, and was identified for example in the Leontief-Duchin employment forecast described in chapter 2. Changes in elementary and secondary education will have little immediate impact on these adult learning needs in the next two decades, since the formal educational system may reach only 25 percent of that work force that are new entrants.

'Patricia Flynn, *The Impact of Technological Change on Jobs and Workers* (Waltham, MA: Bentley College, March 1985).

-*Manpower Comments* (Washington, DC: Scientific Manpower Commission, July-August 1985), p. 7.

'Digest *of Education Statistics, 1983-84* (Washington, DC: U.S. Department of Education, National Center for Education Statistics, December 1983), p. 157.

'*Training*, October 1983, pp. 54-68.

Randolph Brown, "Demographics of the Current and Future American Work Force, " *Profit Sharing*, vol. 32, November 1985, pp. 5-17.

"The BLS projected population for 1985 was 237.5 million, The population, according to the Bureau of the Census, actually reached 238 million in May of 1985 that indicates that the total for 1985 will be somewhat higher than was projected.

"Lewis J. Perelman, *The Learning Enterprise: Adult Learning, Human Capital and Economic Development*, The Council of State Planning Agencies, 1984, p. xv.

Because of continuing technological change, office workers will have to train and retrain over a lifetime. This will have a heavy impact on the resources of both providers of training and of those who are trained. In 1981, when the average annual earnings in private industry were just over $13,000, 42 percent of the participants in adult education had incomes of over $25,000, 42 percent had incomes of $10,000 to $25,000, and 12 percent had incomes of under $10,000 (the remainder were unreported)."

Average costs for training in some office-related occupations are illustrated in table 3-1. Additional costs to the trainees are reduced leisure, family, and personal time. These costs can be a substantial barrier, especially for those with child care and other family responsibilities.

Women, who are heavily employed in clerical work and increasingly striving to move up in organizational hierarchies, have a large stake in the changes in jobs and training. Women have constituted a large proportion of the increase in the labor force in the past 15 years.

Blacks have also been moving into office jobs in the past three decades, increasing their participation rate in clerical jobs from 2.7 percent in 1950 to 10.2 percent in 1984. They, too, have a strong interest in the changes occurring. Black and other groups will enter the work force at a faster rate than whites, and will account for about one-fourth of the projected increase in the labor force to the year 1995.[9] Hispanics will also make up a larger part of the office work force because of a higher birthrate than whites and because of high immigration rates.

The group most effected in the past by discrepancies between skills required for available jobs and their own education and skills, are young workers, and especially those from inner-city minorities. More than 40 percent of the unemployed in January 1983 were under 25 years old.[10] The rate was 50 percent for black teenagers. This situation may be somewhat alleviated by the decrease in number of young workers, but the problem of lack of needed skills will continue to limit the opportunities in office work for many young minority workers.

The 35 to 50 year olds who will constitute the largest group in the work force until after 2000 have completed their basic formal education. Their additional training and education will be achieved through on-the-job training or through their own efforts outside the workplace.

Older workers also have a stake in changing skill requirements. There is no evidence to prove that age is directly and linearly related to performance," or to learning, but there is less incentive for organizations to offer continuing education and training to older workers as they approach early retirement age. Attitudes on the part of managers that reflect their own perceptions of a worker's capabilities play a large part in determining what training is offered. While there is no evidence that intelligence, learning ability, memory, or motivation decline with age until very late in life,[12] this perception can seriously affect the kind and amount of training and retraining that is offered to older workers.

[9] *Digest of Education Statistics, 1983-84,* op. cit., p. 157.
[10] *Monthly Labor Review* (Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, November 1983), p. 3.

Table 3-1 .—Average Costs for Training Among Selected Office-Related Occupations

	Costs (dollars)		Hours	
Occupation	Public	Private	Public	Private
Accounting	$488	$2,893	1,238	1,019
Business administration	395	3,913	1,148	1,198
Secretary, ...	541	2,903	998	1,043
Computer programmer	551	3,473	1,276	704
Clerk	507	1,870	924	785

SOURCE U S Department of Education National Center for Education Statistics *Digest of Education Statistics, 79831984,* Washington, DC table 139

[10] *The Employment Situation: December 1982* (Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, Jan. 7, 1983).
"U.S. Senate, Special Committee on Aging, *The Costs of Employing Older Workers (* Washington, DC: U.S. Government Printing Office, September 1984), p. 4.
-Ibid., p. 59.

Basic Skills Required for Office Automation

Whether skills required to work in automated offices are at a' 'higher' or 'lower' level than those they are replacing, and whether more or less training and education will be needed by future employees, has been the subject of much debate.

The basic skill requirements for all office work can be obtained through the traditional educational system. These include reading, writing, spelling, and some math proficiency. Problem solving, abstract thinking, communications, and interpersonal skills are increasingly important. But studies have concluded that one-fifth of the Nation's adults do not have adequate reading and writing skills to function competently in the labor force. "

Some office automation equipment will foster jobs that require less skill than do manual operations, but many jobs found in an automated office require a higher degree of discretion, initiative, understanding, and creativity. A few specific skills become redundant, but many workers must cover a wider span of work activity than before, often in a shorter time span.

The degree of automation achieved may determine the skill levels required. In the factory, levels of automation vary from a power tool that is hand controlled to a robot that identifies and selects appropriate actions and corrects its own performance while operating. The skills required can increase as tasks are automated but only to a certain level. [14] When the automation reaches higher levels the required skill levels can decrease, as the worker is required only to monitor the machine and respond when the machine warns that something is wrong.

Most offices are now at the lower to middle levels of automation; it is likely that the skills required are more complex at this time because of the many sets of rules that need to be learned to operate the new equipment, and because of the changes in the work process and in relationships between work groups.

Among clerical workers surveyed by Kelly Services, Inc., 88 percent of the 613 respondents believed that their skills were increased by automation and that this would help them obtain salary increases, even though only 30 percent of them had achieved such increases since acquiring new skills.

Some experts [15] challenge the popular belief that computer training should be basic in schools in order to prepare students for the workplace, on the grounds that the "higher" the technology, the lower the skill level required. A BLS analysis indicates that only a small percentage of new jobs in the future will require computer literacy beyond what can be learned on the job in a few hours or days. " Others challenge the assumption that jobs requiring use of a computer are automatically transformed into "knowledge work. "

Researchers seem to be in agreement that the number of jobs available in the future requiring in-depth knowledge of computers are not a large proportion of projected new jobs. However there is also general agreement that skills will change for many jobs (particularly office jobs) and that training and retraining, probably throughout the lifetime, will be required for many workers. As lower level clerical jobs are automated and eliminated, the remaining jobs will require higher level skills. To what extent employers are willing to provide this training on the job will depend on the availability of workers who have obtained the required skills elsewhere. From the workers' point of view, achieving these skills will be critically important in obtaining employ-

[14] See Norvell Northcutt, *Adult Functional Competency*. Adult Performance Levels Project, Industrial and Business Training Bureau, University of Texas, Austin, 1975.

"James Bright, "The Relationship of Increasing Automation and Skill Requirements, *Employment Impact of Technological Change, Appendix Volume II: Technology and the American Economy*. National Commission on Technology, Automation, and Economic Progress (cd.), Washington, DC, 1966, pp. 11-209.

[15] For example, Douglas Noble, "Computer Literacy and ideology, " *Teachers College Record*, vol. 85, No. 4, summer 1984, pp. 602-614.

"Henry Levin, "Jobs: A Changing Workforce, A Changing Education'?" *Change*, vol. 16, October 1984, pp. 32-37.

ment and in making job changes throughout their lives; 81 percent of adult Americans feel that additional training will be required of them because of changes in the workplace.[5]

Determining Training Requirements

The major factors to consider in determining training requirements are the needs of the users (their current skill level and learning needs level), the nature of the technological applications and products in a specific office, and the characteristics of the job.

Users of automated office technologies include: 1) those currently unfamiliar with computers; 2) those who currently use computers as tools to perform specific tasks but are unaware of "how the computer works"; and 3) those who program, perform systems analyses, and do other work that requires understanding of how computer systems work. OTA case studies indicate that an increasing number of computer users fall between divisions 2 and 3; they are not computer professionals and they usually employ software packages developed by others; but they may occasionally write small programs to improve the computer's effectiveness as a tool.

The tasks to which office automation can be applied include: 1) tasks that require only a well-defined, step-by-step procedure; 2) tasks that require a limited amount of problem solving; and 3) tasks that involve analyzing and manipulating data to achieve some goal. [6]

For some tasks in the first category, training may be brief—as little as a few hours. Even for tasks in the third category, learning to use a computer as an effective tool may take relatively little time when the worker already has other expertise. For example, an economist learning to use a statistical package may require only a few days' training and practice, to be reasonably competent. However, there are man-y jobs in insurance, banking, and elsewhere, in which the automated system is an integral part of the work process. Weeks or even months of training and practice may be needed before an employee is fully competent.

The organizational structure and environment also has a bearing on training requirements and success. Skill needs change as an employee moves up in the hierarchy of the organization. Training managers to supervise workers in an automated office environment is a different process from training workers to use the equipment. The immediate working environment depends largely on the philosophy of the organization's management. Management may or may not, for example, consult employees about the implementation of office automation, the redesign of the workflow, and training methods.

Methods for Delivery of Training

Research has demonstrated the importance of hands-on experience in learning office automation skills; how well people learn a new skill depends heavily on how much "engaged time"[7] they spend on the learning,[8] although experts differ as to whether this applies to less motivated trainees to the same degree as it does to the highly motivated. Hands-on and on-the-job training assure that the trainee is "engaged" during the learning session.

Self-teaching (and mutual learning) appears to be the most common mode of training, followed by home study. But there are some problems with self-teaching. The lack of formal, guided instruction for all employees creates an unequal knowledge base, leaving some employees at a disadvantage. For example, many workers are not allowed training time on the job, and have responsibilities that take up their time off the job, and so are prevented from learning even when they want to do so,

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[5] "America at Work: The Evolving Role of Proprietary Vocational I+; duration, ITT Educational Services, Inc., Indianapolis, I h', 1982. Summary of a survey of a representative national cross-section of more than 1,000 adults.

[6] Paul Harmon, "Training: Psychology Meets Technology," *Computer World,* May 2, 1983, p. 9.

[7] Ibid., p. 12.

[8] Raymond Nickerson, "Information Technology and Psychology," *Third Annual Houston Symposium (New* York: Praeger Publishers, 1982), p. 203.

Generally, when office automation equipment is purchased, the vendor provides a limited amount of orientation training, often in a classroom setting or through computer-based training. The users must then experiment independently to determine what applications are best for their own specific tasks. Coworkers supply additional knowledge.

Key workers are often used to train others in an office and assist them in acquiring office automation skills. These "internal trainers" may receive formal training from the vendor or may develop expertise on their own. Then they must "interpret" the skills and tutor other staff members. Other office workers benefit by learning from someone who knows both the business operations and the system.

Beneficial as this short cut to formal training may seem, it may not be as productive as it first appears. The internal trainers are often volunteers whose formal job descriptions do not take this role into account and no allowance is made for it in their official work schedules.[21] They must balance the importance of their training activities against the possible loss of productivity in their own assigned duties. While the key workers often enjoy their teaching role, they may or may not be good teachers and may or may not treat coworkers fairly in sharing their time and attention among them.

User groups are formed by users of a technology to share information and to assist each other. Such groups are usually formed by employees and are most often managed and maintained by the users themselves. User groups are also encouraged by equipment vendors. Outside help or intervention is rare. During meetings, users take on the role of teacher, translator, trainer, problem solver, and student.

Centers for learning, testing, and exchanging information (often called user or technical information centers) have been established in many organizations, as a place that employees may go to learn about automated technologies. These "user information centers" may offer a variety of services including—instructional classes, computer-based training, hardware and software testing, rating guidelines for applications and prepurchases, and educational and informational publications. The training is most often self-initiated by the worker seeking basic skills or further applications knowledge. These forms of in-house, group learning are beneficial because people feel rewarded when they meet new challenges on their own.

Computer-based training (CBT) for learning office automation skills is increasingly available. There are multiple choices of off-the-shelf equipment and systems, standard sets of equipment and software programs that can quickly and easily be adjusted to a variety of requirements. Some include optical disk and video text. As more manufacturers and vendors have entered the field, the cost of CBT hardware has decreased; it is no longer a prohibitive factor in most cases. In its 1984 industry survey, Training magazine reports that 46.4 percent of all responding organizations use computers for training.[22]

Computer-based training is popular because it reduces the two most commonly cited problems of training-cost and time. One expert reports that the use of CBT reduced course length and that students trained on such techniques achieved the same or a better level of performance than was achieved by those trained in the longer conventional instruction courses. A review of the literature found no evidence that the use of computer-managed instruction (CMI) or computer-assisted instruction (CAI) caused students to do less well than control groups receiving other forms of instruction within the classroom.[23] Two matters cause concern when CBT is used—the fidelity of the training system in simulating the work envi-

[21] Tora Bikson, Don Mankin, and Cathleen Stasz, "Individual and Organizational Impact of Computer-Mediated Work: A Case Study, " The Rand Corp., OTA contract report, March 1985, p. 42.

"*Training,* October 1984, p. 56.

[23] See Mildred D. Jarvis, "Computer Based Training: Lessons Learned, ' *Proceedings of the Human Factors Society—28th Annual Meeting, 1984,* pp. 515-519, also her reference to Orlansky and String's report on the cost-effectiveness of CBT in military training, 1979.

Photo credit Digital Equipment Corp

Computer-based training

ronment, and the quality of the written documentation used in the training. The closer the learning situation follows the work setting, as opposed to merely presenting drill and practice exercises, the greater the applied learning that is acquired. Poorly written documentation prevents trainees from advancing through the stages of learning or achieving the highest level of learning possible.

Home study is a growing alternative to formal classroom-based training. CAI and CM I packages are offered, for example, by the National Radio Institute (NRI), which provides technical correspondence courses. Cost is the restricting factor for home study because it is expensive to convert courses to technology-oriented modes of delivery and because the students must often purchase their own hardware and software to study at home. However, for basic education, TV-presented courses are very cost effective. While sending employees to a training seminar or conference can cost approximately $40 per hour, and a university course can cost $7.50 per hour, a TV course costs only pennies per hour.

How Is Training Obtained?

A survey of Fortune 1500 firms" indicated that companies, when automating offices, are

24"America at Work: The Management Perspective on Training for Business, " ITT Educational Services, Indianapolis, IN, *1983, p. 44.*

most likely to hire new employees with the required skills (44 percent), switch employees into positions requiring no additional skills (40 percent), or reduce the number of employees (40 percent). Thirty-six percent switched employees into positions that required additional training.

In addition to formal education institutions, many public and private sector organizations, including unions, are involved in providing training and/or education, but demand so far outstrips supply. Some experts have questioned whether the capacity exists to respond to all training and retraining needs. Many business organizations are increasing their budgets for training. A 1983 survey of 1,821 private and government employers" showed that 1984 training budget increases were predicted by 47.4 percent of the companies surveyed, but 53.5 percent actually did increase those expenditures in 1984.

Although it varies considerably by industry, the dollars spent on nontechnical training such as sales and supervisory skills, outweigh the dollars spent on technical training such as word processing, programming, and electronic testing. Also, according to this survey[26] managers were much more likely to receive training than lower level employees. Midlevel managers and first line supervisors received an average of 32.5 hours of training, executives received 28.3 hours, and professionals, 27.2 hours, while administrative and secretarial employees received approximately 11 hours. Most of the companies surveyed offered both in-house and outside training with executives most likely to receive outside training and lower level employees most likely to receive in-house training. Only 31 percent of these companies engage in retraining of employees, usually lower level employees.

In a survey of selected clients in Chicago, Price Waterhouse[27] found that 42 percent of these firms provide on-the-job training, most often with vendor prepared documentation. The figure went up to 64 percent for the smaller firms surveyed. This agrees with the BLS survey showing that 50 to 60 percent of workers gained qualifying skills on the job.

Temporary agencies anxious to increase their supply of trained workers are offering word processing training to potential employees, often by means of computer-aided instruction and simulation. A standard for basic, intermediate, and advanced skills has been developed by one agency .28 This standard requires that an operator with basic skills be able to—set up the system, keyboard, create documents, make minor corrections and proof, store and file text, recall/retrieve text, and print text. Advanced operators should also be able to execute special software packages, develop graphics, write special programs, and supervise other operators.

The Kelly surveys[29] found in 1982 that 52 percent of the companies surveyed developed their own training programs and 51 percent

"Training Budgets '84: In the Pink—and the Green, " *Training,* October 1984, pp. 16-31.

"'''Training Magazine's Industry Report, " *Training,* October 1984.

"Price Waterhouse Office Automation Survey, " Chicago, IL, *1984,*

-"'Manpower-The Temp Agency--Launches New Approach to WP Training & Placement, " *Inside Word Processing,* vol. *4, No. 6,* June 1983.

[29] *The Kelly Report on People in the Electronic Office* (Troy, MI: Kelly Services, Inc., 1982); *The Kelly Report on People in the Electronic Office 11: How Office Workers View Automation* (Troy, MI: Kelly Services, Inc., 1983); and *The Kelly Report on People in the Electronic Office III* (Troy, M 1: Kelly Services, Inc., 1984).

Photo credit Manpower Inc

trained their own personnel. Fifty-one percent used a manufacturer-developed training program and 32 percent used the manufacturer's trainers. A 1983 survey showed that 34 percent of the nonmanagerial employees surveyed received their training from a vendor representative, 28 percent from a supervisor, 26 percent from a manual (self-trained), and 11 percent from an outside consultant or a class off the premises.

Professionals and managers in offices are not neglected in the market for office automation training. Courses focusing on the upper level employees' need for training are becoming common. Many professionals and managers learn such skills on the job, through their own efforts, by means of a manual or by "just fooling around" with the machine. The availability of simplified software in specific professional fields is making it easier for the professional to be self-taught, and new ways to get work done are finding their way into management training curricula,

Data on the sources of training for current jobs were developed by Carey and Eck at the Bureau of Labor Statistics.'" Table 3-2 shows that in 1983, 70 percent of computer systems analysts and scientists received training for their current jobs in a school, mostly 4-year colleges. Fifty-seven percent of secretaries, stenographers, and typists and 22 percent of records clerks received school training. Seventeen percent of all workers received qualifying training in 4-year (or more) college programs. Professionals working in offices, such as economists, statisticians, engineers, etc., usually obtain their qualifying training in a 4-year college. Business administrators and managers are also increasingly qualifying for their jobs through college education. Employers seem to be requiring higher qualifications for many jobs as a more highly educated work force becomes available. This reduces opportunities for less educated employees to be promoted to higher level positions.

Max Carey and Alan Eck, "How Workers Get Their Training," *occupational Outlook Quarter*?'. vol.28, winter 1984, pp. 3-21.

Formal company training programs reached 27 percent of computer systems analysts and scientists, 30 percent of operations and systems researchers and analysts, 17 percent of general office supervisors, 25 percent of insurance adjusters, examiners, and investigators, but only 4 percent of secretaries. Informal on-the-job training was received by considerably larger proportions of the occupations shown in table 3-1.

About 55 percent of a sample of all workers employed in January 1983 indicated that, according to their own perceptions, they needed specific training to qualify for their current jobs. One-third of all workers had undertaken skill improvement (see table 3-3 for some typical office-related occupations) since obtaining their current jobs.

Although only about 5 percent of all workers obtain training from high school vocational programs, a large proportion of these are office workers. Thirty-five percent of secretaries have received vocational training as have a large proportion of computer systems programmers and computer systems operators. Thirty-five percent of the 5.9 million enrolled in public vocational education in 1981 -82[31] studied office trades, and 23 percent of adult education participants studied business-related courses." Business/office school enrollment increased 38.1 percent between 1975 and 1981, while vocational and technical schools and institutes suffered decreasing enrollments during that time.

The Adequacy of Office Automation Training

A recent study" found that in the last 20 years, the post-secondary education field was able to accommodate quite well to changes in demand for its services. However, secondary

'*Occupational Projections and Training Data* (Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, 1984), table C-1 .

Digest of Education Statistics, 198.3-84, op. cit.

Sue Berryman, *The Adjustment of Youth and Educational Institutions to Technologically Generated Changes in Skill Requirements* (Washington, DC: National ('omission for Employment Policy, May 19851, p. 66.

Table 3-2.—Sources of Training Needed for Obtaining Current Job Among Representative Office-Related Occupations

Occupation	Number in occupation (thousands)	Sources of training (percent of occupational employment)										
		Any school	High school vocational	Post high school private vocational	Post high school public vocational	Junior college or technical institute	College, 4 years +	Formal company	Informal on-the-job	Armed forces	Correspondence	Friends
Computer systems analysts and scientists	243		4	2	1	9	52	27	5	5	1	2
Operations and systems researchers and analysts	117		3	5	1	9	44	30	4	7	1	—
Public relations specialist	82		5	2	1	1	41	6	8	4	—	6
Legal assistants	85		8	—	2	8	30	3	9	—	—	2
Supervisor, general office	228		5	2	—	7	12	17	1	3	1	2
Supervisor, financial records processor	61		2	1	3	3	29	8	3	3	1	2
Computer equipment operators	410		11	4	2	14	7	15	3	2	—	1
Secretary, stenographer, typists	3,426		35	6	4	13	7	4	1	—	1	1
Records clerks	105		8	2	1	4	10	11	9	—	1	—
Financial records processor	488		16	4	2	8	6	5	5	—	1	2
Insurance adjusters, examiners and investigators	132		7	—	2	4	14	25	5	—	1	—
Eligibility clerks, social welfare	40		10	—	3	16	9	6	5	—	—	1
Statistical clerks	54		9	5	3	6	10	11	6	3	—	3

SOURCE: Max Carey and Alan Eck, "How Workers Get Their Training," *Outlook Quarterly*, winter 1984

Table 3-3.—Sources of Training for Skills Improvement Among Representative Office-Related Occupations

Occupation	Number in occupation (thousands)	Sources of trainlng (percent of occupatlonal employment) School	Formal company	Informal on-the-job	Other
Computer systems analysts and scientists	165	16	37	25	8
Operations and systems researchers and analysts	94	31	38	22	7
Public relations specialist	52	15	16	16	8
Legal assistants	38	19	9	12	2
Supervisor, general office	180	14	26	16	7
Supervisor, financial records processor	47	24	26	11	1
Computer equipment operators	247	13	16	25	2
Secretary, stenographer, typists	1,309	11	7	11	3
Records clerks	80	7	13	19	3
Financial records processor	692	11	6	12	2
Insurance adjusters, examiners and investigators	112	10	25	23	6
Eligibility clerks, social welfare	29	11	13	23	5
Statistical clerks	36	8	15	26	4

SOURCE: Max Carey and Alan Eck, "How Workers Get Their Training," *Occupational Outlook Quarterly*, winter 1984

vocational education in comprehensive schools was relatively unresponsive to changes in skill requirements. This problem may be exacerbated by declining enrollments and the need to delegate scarce resources to the academic studies, for that there is greater demand in these comprehensive schools. By contrast, private and public schools that focused on vocational education are more adaptable to changes in skill requirements in the labor market.

Although the adequacy of any training or retraining depends on the office, the job, and the individual's needs, commitment, and capability, it is possible to discuss in general terms other factors influencing the quality of training. The quality is dependent on the quality of the instructional materials and design, the quality and availability of instructors, and the range of courses that are offered.

There is currently no legislation to regulate, assess, or accredit the content or the quality of the courses offered in the private and commercial sectors. Those who invest in such training are at the mercy of the market. This lack of quality control can be expensive and can drain the resources of individuals and organizations.

EDUCATION FOR OFFICE AUTOMATION TECHNOLOGIES

Computers have assumed such an important function in the contemporary practice of business, industry, science, and scholarship that almost no student can expect to remain isolated from these tools. This imposes on education the additional task of preparing students for jobs in which they will use the computer as a partner.[34] Schools and colleges find themselves pressed for expanding the curriculum:

- by students–many of whom expect schools to provide them with access to computing and instruction in computer-related subjects, and
- by the job market-because employers expect applicants to have some basic computer literacy before they arrive on the job.

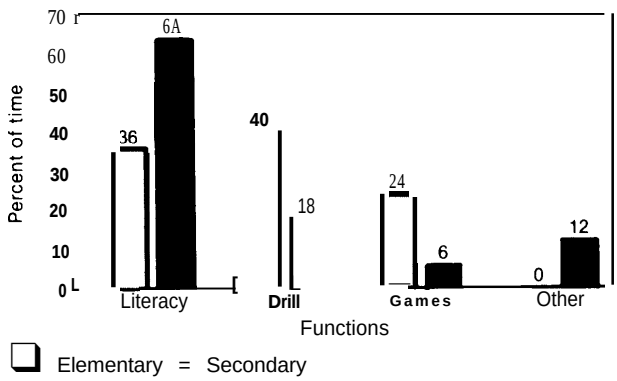
[34] Charles Mossman, Associate Vice President, Academic Resource Planning, California State University, Fullerton, in joint hearings before the U.S. Congress, House, Information Technology in Education, Apr. 2-3, 1980, p. 145.

According to a recent national study, computers in high schools are used two-thirds of the time to teach children how to use a computer ("computer literacy"), and 18 percent of the time for drills and practice in various subject matter. Results of a survey of 1,082 elementary and secondary schools, conducted by the Center for the Social Organization of Schools, the Johns Hopkins University, are shown in figure 3-1. It appears that relatively little is being done to exploit the computer's potential for teaching traditional subject matter in a more efficient, interesting, or effective manner. Also, time is not spent on the computer to teach and develop office automation skills for future jobs.

Computer-assisted instruction (CAI)–the computer as teacher—has been introduced to improve the delivery and productivity of general education. CAI has been found to reduce by 10 to 30 percent the amount of time students need to master a subject.[35] CAI supplements the teachers' efforts in the traditional classroom setting and provides specialized individual instruction.

"'Education Turnkey Systems, Inc., "Uses of Computers in Education, " prepared for the National Commission for Employment Policy, April 1985, p. 42

Figure 3-1.—The Use of Computers in Elementary and Secondary School Education



SOURCE Figure derived from School Uses of Microcomputers Reports From a National Survey (working paper) Center for Social Organization of Schools The Johns Hopkins University No 2, June 1983

The effectiveness of CA I is hindered by the lack of high-quality software. The Educational Products Information Exchange Institute, in cooperation with the Consumer Union, evaluated 600 pieces of educational software in 1984 and rated only 5 percent of what was examined, or 30 programs, as "first-rate."[36]

It takes about 200 person-hours to create 1 hour of conventional CAI. Work is being done at the Advanced Computer Tutoring Project, Carnegie-Mellon University, Pittsburgh, Pennsylvania, to reduce the time required to develop CAI.[37] Attempts are also being made to develop intelligent CAI, or ICAI, which allows for conceptual modeling and interactive instruction.

Computer-managed instruction (CMI) is an automated technology used for the management of the school system and for managing the instructional flow in the classroom. It aids both the teacher and student by providing pre- and post-tests to evaluate advances in learning levels, offering diagnostics, helping students with assignments, and keeping student records. The teacher need not be present for all testing, assigning, and recordkeeping. Cognitive diagnostics for learners can also be provided by computer programs.

The hardware available for educational uses and teaching office automation skills has focused on using microcomputers. Video disks in the future may play an important role because they allow for greater interaction in instruction by simulating actual situations. Although information on educational software, evaluations, and availability is published, the price of these analyses limits access to this information for many educators. Most school districts lack the means to identify better software, and in most schools only a handful of teachers have the training to make effective use of computers.[38]

[36]Edward B. Fiske, "Computers, In Most Schools, Have Brought No Revolution, " *New York Times*, Dec. 9, 1984, p. 80.
[37]John R. Anderson, C. Franklin Boyle, and Brian J. Reiser, "Intelligent Tutoring Systems, " Science, Apr. 26, 1985, p. 228.
[38]Fiske, op. cit., p. 1.

Teachers and Computers

The proportion of college freshmen choosing education as a major has declined from 22 percent in 1966 to 4.7 percent in 1982,[39] because of the job disincentives common to the teaching profession (low status, low pay, low-advancement opportunity, and diminished psychic income). Teachers are being pursued by industry to fill training positions and they are finding these jobs more rewarding than teaching.

The difficulties of competing for manpower and other resources in a rapidly growing high-technology market are acutely felt by educators at the university level. Over the decade from 1970-71 to 1981-82, B.A. degrees in the computer sciences increased from 2,388 to 20,267, nearly 750 percent. Yet a large portion of faculty positions are unfilled and the number of Ph. D.s graduating each year has dropped substantially. The shortage of faculty in the field of engineering and computer science has been attributed to the fact that industry, by offering higher salaries and other incentives, has been able to draw academics and students away from universities.[40] The percentage of computer science faculty leaving for industry is twice that of any other field of engineering.

Curriculum Development

Efforts have begun to update curricula and include more courses in the use of computers, but office automation and other technology-related subjects are caught in the lag between need, development, and implementation of new curricula. This is especially obvious at the secondary and post-secondary levels of education, where these skills are most often learned.

The rapid pace of technological change has complicated the delivery of appropriate courses. In a report on office automation productivity,[41] Russell Aldrich of Apple Computer, who teaches at Golden Gate University in San Francisco, says that:

> Many times, a particular course was a good course, and a required course 5 to 10 years ago. But because technology is progressing rapidly, we are seeing so large a revolution in certain areas of office productivity, communications process, and management roles, that what was on the frontier 2 years ago is no longer relevant today. *What is lacking is a mechanism for higher education institutions to quickly and accurately evaluate the information industry pulse so* that it can design and plan curriculum that anticipates educatiomd needs and fills to them.42 (Emphasis added.)

The Office Systems Research Association (OSRA), in a cooperative effort between educators and business sector representatives, is working to develop a model curriculum in office systems for universities and colleges. "Office systems' is defined as the business function related to the coordination and management of the information resources of an organization. Generally, this includes responsibilities for automated and manual office equipment, human factors, and office procedures. According to OSRA, managers in the office systems area are responsible for a business unit too complex to rely strictly on a computer background or management techniques applicable to the traditional office environment. The Office Systems Model Curriculum Project was begun in 1984 and is aimed at providing a framework, and possible standardization, of office systems curricula for all schools. OSRA plans to have a draft of their model ready in mid-1 985.[43]

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[39] Center for Strategic and international Studies, *Technical Excellence in America: Incentives for Investment in Human Capital,* Debra van Opstal (cd.) (Washington, DC: Georgetown University, October 1984), p. 1.

[40] U.S. Department of Education, National Center for Educational Statistics, *Condition of Education,* 1984, table 2-12.

[41] Frank Freudberg, *Office Automation Productivity: Lost En Route to the Promised Land* (Willow Grove, PA: Association of Information Systems Professionals, 1984), p. 14.

[42] Freudberg, op. cit., p. 15.

[43] This information is based on correspondence and conversations with Bridget O'Connor, OSRA Vice President, Professional Studies, Business Education Program, New York University, March 1985.

Access to Education

To the extent that computer literacy and computer expertise are needed for success in getting and keeping jobs, inequities in receiving computer experiences in school are especially serious for low-income, female, and rural students. They translate into social and economic inequities by giving some people more effective tools for working and living in an age of information technologies than others.

Each year the National Assessment of Educational Progress (NAEP) surveys[44] a stratified random sample of students aged 9, 13, and 17 in approximately 700 schools in the United States. Data from the 1982 survey show inequities in access to computer literacy associated with wealth of the school, community size, region, gender, and race.

[44]Education Commission of the States, National Assessment of Educational Progress, Denver, CO, July 1983.

Photo credit: Manpower, Inc.

Student enrollment in computer programming is much lower in schools that qualify for Title I assistance (by having a large percentage of the parents with income below the poverty line) than in schools that do not qualify. After a survey of schools in 1983, Quality Education Data, Inc., reports that the 12,000 wealthiest schools are four times as likely to have microcomputers as are the 12,000 poorest schools. Rural and disadvantaged urban communities provide computer learning opportunities at a much lower rate than other communities.[45] Among students at age 13, less than 17 percent of the rural/ghetto students, but 32 percent of those living in "urban/rich" areas, reported use of computers in schools. Eighteen percent of junior high school students in small towns report school computer use, compared with 26 percent in large cities.

Students living in the South are much less likely to have used computers in schools than students living in other parts of the country. Those in the Western States are twice as likely as southern students to receive such experience.

Young women in secondary schools are less likely than young men to spend time with computers and to enroll in computer classes.[46] Females are less likely to take computer programming classes than males; one study in 1983 showed that 8 percent of the females and 14 percent of the males have enrolled in programming courses for at least one semester. The Women's Action Alliance of New York City has devised several school-based strategies to overcome this problem, working with parents and teachers to increase girls' use of computers. The results after a year of trial at a

[45]These and the following figures are based on the work of Ronald E. Anderson, Wayne W. Welch, and Linda J. Harris, *Computer Inequities in Opportunities for Computer Literacy*. University of Minnesota, based on work supported by the National Science Foundation under grant SED 8022125A01, 1983, p. 4.

[46]As shown in studies by Anderson, Welch, and Harris, op. cit., 1983.

middle school in Wisconsin, showed a 42-percent increase in computer usage by girls.[47]

While the NAEP data showed some racial inequity in computer exposure in 1978, more recent results reveal no significant difference between black and white students when income differences are equated. Apparent inequity between black and white students in use of computers in schools and for enrollment in computer programming courses is derivative of income and rural/urban differences.

Inequities in computer access identified here point to the need for attention at all levels of the educational system: National, State, community, district, school, and the classroom.

[47] Margie Snider, "Education Equity Projects That Work," *Women's Political Times*, January/February 1985, p. 2.

POLICY CONSIDERATIONS

Policies in Foreign Countries

In some countries, training and retraining programs are used as a basic instrument to deal with specific labor market problems. The successes and failures of foreign experiences are rich in lessons for shaping U.S. policy.

The European and Japanese emphasis is on strong vocational education as a basis for work life and on periodic training to keep skills up to date. Their philosophy is that these programs serve not only low-wage workers, but a broad segment of the primary labor force.[48] However, the degree of government involvement differs among these countries.

In France, the Law for Continuous Training, implemented in 1971, committed the government to provide training opportunities to adults and youth. In Sweden, where workers are considered to have a right to training, the government plays a strong role in adult training and retraining. A close coordination among government, employers, and unions helps ensure that government programs mesh well with national needs. The flexibility of the system in identifying new jobs and in retraining workers has reportedly added to the success in Sweden.

Union involvement and training vouchers encourage wide participation in West Germany; the government and private industry both play major roles. In Japan almost all efforts are by private companies. Japan continually retrains selected workers in the "lifetime employment system. Increasing "labor-market transparency" or skill transferability, providing job referral, counseling, testing, *training*, and relocation assistance to workers, are regarded as a matter of high public interest and the public employment service plays a major role in labor-market adjustment policy in Europe and Japan,"

[48] Michael Podgursky, *Labor Market Policy and Structural Adjustment*, paper prepared for the conference on U.S. Industrial Policy and International Development, Overseas Development Council, Washington, DC, March 4, 1983, p. 17.

Existing Legislation

This section will present a summary of legislation and regulations related to education and training for automated office work and some options for congressional consideration.

The potential for successful delivery of education for office automation skills and knowledge already exists in the traditional education system, most often addressed at the secondary and post-secondary level, where much of the Federal legislation is focused. Educational policies and legislation set the framework for addressing new and changing education needs. The higher education delivery system in the United States is a complex matrix of private and public institutions that function with varying degrees of independence and dependence on State agencies. The Federal Government direct role in institutional control has been limited to setting criteria for an institution to participate in Federal programs or receive

[49] Ibid. p. 26.

Federal contracts. Various congressional actions have been taken to draw attention to selected national problems, to provide the fiscal resources needed to address these problems, to support research activities that have national and international implications, and to complement and supplement the role of parents and State and local governments in supporting individuals and institutions.

Although there is no existing Federal legislation specifically addressing office automation education, there are related laws that could provide a vehicle for delivery of office automation education.

Direct Federal involvement in training and employment programs is considered to have begun with the Area Redevelopment Act (ARA) of 1961, although indirect Federal involvement in training through vocational education programs began with the Smith-Hughes Act of 1917. The Manpower Development and Training Act (MDTA), enacted in 1962, focused training efforts on workers displaced due to automation. The Johnson Administration's war on poverty brought about a wide range of work experience and training programs targeted on the poor, minorities, and youth. The Comprehensive Employment and Training Act (CETA), passed in 1973, absorbed many existing work and training programs and was designed to operate primarily at the local level.[50] CETA underwent amendments during its history that expanded its purpose and reach. The Trade Adjustment Assistance (TAA) program reauthorized in 1981, also authorized funds for training. The Job Training Partnership Act (JTPA) replaced all portions of CETA on September 30, 1982. This new program shifted the focus away from direct Federal involvement in training programs and established a business-government partnership in the provision of training for job skills. Training programs are operated by the States in combination with local-area governments and Private Industry Councils (PICS) and provide for the training of unemployed displaced workers in skills relevant to real employment opportunities in the area. These programs were not primarily aimed at office workers or at office automation training.

Target groups for legislated training programs have traditionally included about 8 percent of the population. These groups include—low-skilled adults (especially women and minorities), disadvantaged youth, and residents of economically depressed areas. The gaps in public policy left by JTPA and similar programs relate to: 1) the retraining needs of the large-middle tier of employed but at-risk workers; and 2) the basic skill needs of the 20 million or so functionally illiterate adults in the work force who will not be touched by reforms in elementary/secondary education, and whose learning handicaps prevent them from benefiting from job-specific training."

The Vocational Education Act (Perkins Act), as revised in 1984, provides focus on educational needs at the secondary and post-secondary school level. The Perkins Act grants funds to States to make vocational education programs accessible to all persons, but follows the current trend of placing greater control and responsibility at the State and local levels. Targeted groups include:

- handicapped and disadvantaged persons,
- single parents and homemakers,
- adults in need of training and retraining, persons in programs designed to eliminate sex bias and stereotyping in vocational education, and
- persons incarcerated.

The act is designed to improve the quality of vocational education programs in order to give the Nation's work force the marketable skills needed to improve productivity and promote economic growth. Under this act, the acquisition of office automation skills may be included in State programs for general vocational opportunities. Part E of Title III, "Industry-Education Partnership for Training in High-Technology Occupations, " allows for

"'U.S. Congress, Library of Congress, Congressional Research Service, *Job Training Programs: Reauthorization and Funding Issues,* by Karen Spar, Issue Brief No. IB82005, Feb. 8, 1982.

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"'Perelman, op cit., p. 27.

grants to States to provide incentives for business and industry and the vocational education community to develop training programs for high-technology equipment, systems, and processes. These programs are intended to be closely tied to the local labor market and skill needs.

The act states that to the maximum extent practicable, funds will be utilized in coordination with JTPA to avoid duplication of effort and to ensure maximum effective utilization of funds under both acts. While the goals of the two acts are similar, the manner of achievement is different. The focus of the Perkins Act is public vocational training and education, while the focus of JTPA is on industry-sponsored training. The two acts overlap where there is the greatest need for assistance.

Funding for these programs is the key to their success. However, the level of Federal funding for employment and training decreased by 49.7 percent between 1981 and 1984. Funding for elementary, secondary, and vocational education decreased by 8.9 percent during that period. There were some increases for fiscal year 1985— 17.5 percent for elementary, secondary, and vocational education; and 14 percent for training and employment; but decreases are again projected for fiscal years 1986 through 1990 in training and employment functions.[52]

Federal aid to State and local governments for vocational and adult education decreased by less than one-half percent between 1981 and 1984, but is projected to increase by 23.7 percent in 1986. Federal aid to State and local governments for employment and training services was decreased by nearly 57 percent between 1981 and 1984, and is projected to increase by only about 13 percent by 1990, with some fluctuations. If this trend continues, State implementation of this act will not be effective. [53]

The Employee Education Act amends the Internal Revenue Code to extend for 2 years the income tax exclusion for amounts received by an employee under a qualified employer provided assistance program. Unless extended by Congress, this act will expire at the end of 1985. The act limits the exclusion to $5,000 of educational assistance furnished to an individual during a calendar year.

State and Local Practices

Typically, State funding and support of education has been related to economic development. Several private sector industries and research and development firms have recently moved toward more direct involvement with higher education institutions by starting joint education ventures. While joint ventures are encouraged by some Federal laws, many businesses have traditionally contracted locally for training and education programs for their employees.

States have assumed a greater role during the past few years, as they enact student assistance programs to supplement declining Federal support and shoulder the responsibility of Federal programs. As State policy makers have been confronted simultaneously with revenue declines and requests for additional funds for higher education as well as for other human resource investments, some have taken the unpopular course of raising taxes to provide additional support. Others have reduced real levels of support for higher education in general and for research universities in particular. The funding pattern has been unique to each State.

Some States are making strong efforts to keep up with the new teacher and curriculum needs. For example, the State of Minnesota has made new office automation skills and computer knowledge a high priority for vocational education programs. Efforts are being made first to increase the competency of teachers through conferences and workshops on high-technology equipment, office systems, telecommunications, and curricula design. An integrated office system has been installed for teachers' hands-on experience. The system provides administrative assistance for teachers.

Executive office of the President, Office of Management and Budget, *Historical Tables. Budget of the U.S. Government. Fiscal Year 1986*, table 3-3 (19) and (20), 1985.

I bid., table 12-3 (43) and (52).

The State's vocational program will also include more opportunities for the adult and part-time student communities.

Another example of State activity is in Texas, where "House Bill 246" will be implemented in all school districts in the 1985-86 school year. This law mandates computer literacy courses for middle school (seventh and eighth grade) students and computer science classes for all high school students, as requirements for graduation. The computer literacy course includes history, terminology, basic programming skills, and issues of computer use in the society. Computer-related course credits are not required at the elementary school level, but many school districts are providing some type of computer awareness at that level.

Policy Options

Federal actions that could encourage education and training opportunities related to office automation might include:

- designate funds specifically for office automation education programs through new legislation or existing vocational education legislation that provides aid to schools;
- increase funds for programs through existing legislation (e.g., the Perkins Act);
- promote access for students in low-income families and in rural areas, and for women, through direct funding and establishment of service programs;
- increase Federal attention to maintaining the capacity and quality of research in the Nation's universities and the flow of new talent into academia;
- provide career counseling, job guidance programs, job search assistance and training programs that do not penalize those receiving unemployment insurance;
- encourage ties with the private sector through cooperative educational efforts, curriculum development, and industry-based activities for office automation skills;
- establish support programs or tax credits for small businesses to ensure that the education of employees is adequate to maintain current levels of employment and productivity;
- provide training grants and tax credits to businesses that incur expenses for office automation training. Also provide incentives to establish training programs in office automation skills, including employment tax credits for employers who train and educate workers. Employers could be given the same kind of tax write-offs for training that they get for plant modernization;
- establish a program of Individual Training Accounts (ITAs), similar to the Individual Retirement Accounts. The ITA may require employers and employees to make equal contributions to a bank account; this money would not be taxed until withdrawn. The account could be drawn by employees to pay for retraining when needed. This would direct resources toward retraining needs of mainstream workers now being neglected. A key objection to this proposal is that workers may not be able to choose and direct their own retraining in the best way, or appropriate programs may not be available;
- expand the tax deductibility of training for current and new occupations related to office automation;
- change unemployment regulations to permit receiving unemployment benefits during training. Encourage States to consider those in training programs as still available for work, and to reserve parts of their State funds to establish permanent funds for retraining; and
- encourage union involvement in negotiations for skill training opportunities. Include requirements that firms give notice of plant closings in advance and aid in the retraining of displaced workers.

Congress may determine to take none of the above actions, making the conscious choice to preserve the status quo. Since there is no existing regulation of office automation training, the training available commercially is likely to grow, but with existing inequities in access and quality unchecked.