DOCUMENT RESUME

ED 254 618 CE 040 121

AUTHOR Smith, E. Ray; Stallard, John J.
TITLE The Changing Business Environment: Implications for Vocational Curricula. State-of-the-Art Paper.
INSTITUTION Tennessee Univ., Knoxville. Office for Research in High Technology Education.
SPONS AGENCY Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE Dec 84
CONTRACT 300-83-0176
NOTE 33p.; For related documents, see CE 040 115-126. Product of the "High Technology Education: A Program of Work" Project.
PUB TYPE Information Analyses (070)

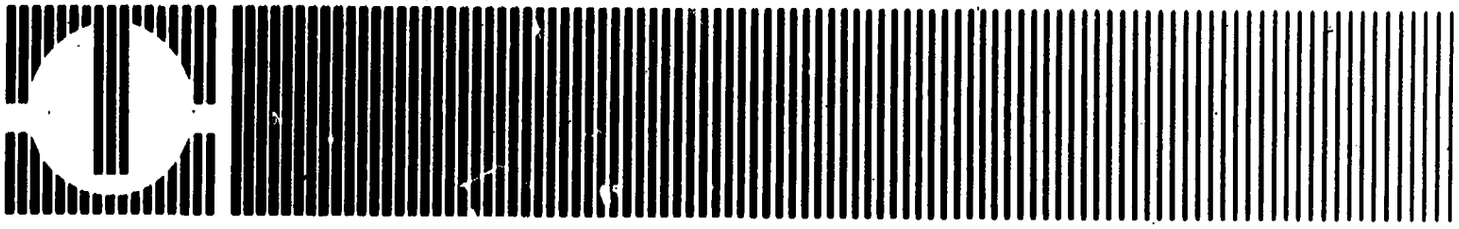
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Automation; *Business; Communications; Computer Oriented Programs; Computer Software; Data Processing; Electronics; Futures (of Society); Human Factors Engineering; Information Centers; *Information Processing; Man Machine Systems; *Microcomputers; *Office Occupations; Office Occupations Education; State of the Art Reviews; *Technological Advancement; Telecommunications; Word Processing; Work Environment
IDENTIFIERS *Information Management; *Office Automation

ABSTRACT

The widespread use of the micro/personal computer and related technological advancements are having important impacts on information management in the modern electronic office. Some of the most common software applications include word processing, spread sheet analysis, data management, graphics, and communications. Ancillary hardware/software systems being used in offices to improve information management are optical character recognition, facsimile, laser copier/printer, fiber optics, microform/computer systems, networking, and dictating systems. Two other basic concepts emerging from the implementation of the micro/personal computer in business are ergonomics and the information center. Excerpts from leading business journals and independent consultants provide evidence of the importance and acceptance of electronic technologies, savings in office costs through the use of electronic technologies, the growth of computer technologies in the workplace, and the importance of the human factor in this new electronic age. Educational implications from this changing office environment include: (1) computer literacy is essential; (2) everyone should be taught the sight method of keyboarding skill; (3) students should be trained for a grouping of career-related positions; and (4) major revisions are needed at all levels of business education, teacher education, and office administration. (YLB)

The Changing Business Environment: Implications for Vocational Curricula

STATE-OF-THE-ART PAPERS



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

The Changing Business Environment: Implications for Vocational Curricula

by

E. Ray Smith, Professor, ~~and~~
John J. Stallard, Professor,
Office Systems Management,
College of Business Administration,
The University of Tennessee

Office for Research in High Technology Education
428 Claxton Addition, College of Education
The University of Tennessee, Knoxville, TN 37996-3400

December, 1984

Sponsoring Agency:
U.S. Department of Education

STATE-OF-THE-ART PAPER

THE CHANGING BUSINESS ENVIRONMENT: IMPLICATIONS FOR VOCATIONAL CURRICULA

R01-1565-44-009-85

FUNDING INFORMATION

Project Title:	High Technology Education: A Program of Work
Contract Number:	300830176
Source of Contract:	U.S. Department of Education Office of Vocational and Adult Education
Project Monitor:	Richard DiCola
Contractor:	The University of Tennessee
Project Directors:	Janet Treichel Sheila McCullough
Principal Investigators:	At Home in the Office Study - Sheila McCullough COMTASK Database - John C. Peterson State-of-the-Art Papers - Lillian Clinard
Disclaimer:	The activity which is the subject of this report was supported in whole or in part by the U.S. Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the Department of Education, and no official endorsement by the Department of Education should be inferred.
Discrimination Prohibited:	No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance, or be so treated on the basis of sex under most education programs or activities receiving Federal assistance.

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

The purpose of this paper is to identify the changing aspects of office work and the electronic technologies that are bringing about dramatic changes in the office environment. The widespread use of the micro/personal computer and related technological advancements are having important impacts on information management in the modern electronic office. New terms such as "ergonomics" and "information center" are increasingly used to discuss and describe the new environments in which "knowledge workers" perform. Evidence from a variety of sources about the acceptance of these electronic technologies is presented. The paper's final portion presents educational implications resulting from this changing office environment.

About the Authors

E. Ray Smith has consulted on office automation and organization as well as business writing for such major organizations as Union Carbide and the Tennessee Valley Authority. Dr. Smith coauthored The Electronic Office with Dr. Stallard.

John J. Stallard has done extensive research in the field of office management and has written articles for such publications as Delta Pi Epsilon Research Journal and Management World. He is coauthor of Office Management and Control and The Electronic Office: A Guide for Managers.

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.

Acknowledgments

The editors extend thanks to Marly Bergerud, who provided background information for this paper; to Betty Brown, who reviewed a draft of the paper; and to the U.S. Department of Education, which also provided a review.

CONTENTS

INTRODUCTION

Scenario 1. Nancy Jenkins, secretary to George Butler, vice-president, has been with Stanleytown Industries since 1964. The company is widely recognized as a leader in the manufacturing of sporting goods equipment. During Nancy's tenure with this company, she has held various positions, including billing machine operator, accounting clerk, and records specialist. She has watched Stanleytown Industries grow from its main headquarters office in Bristol, Virginia, to its five subsidiaries located in Mobile, Alabama; Jacksonville, Florida; Columbus, Ohio; Tulsa, Oklahoma; and Indianapolis, Indiana.

When Nancy first arrived at Stanleytown Industries, she wondered if she had made the right decision, but she began to realize after a few weeks that indeed there was a good future with the company. Benefits were excellent, pay was comparable to industry averages for the area, morale was high, and the employees were a good group of "hard-working" people. Nancy knew that if she was to get ahead in the company, she must continue her education. So she took courses in office administration at the nearby community college. She became very proficient in the use of numerous secretarial skills, including typing, shorthand, filing, and general office procedures. Even though Nancy had worked in several types of positions at Stanleytown Industries, her main goal for years had been to be a private secretary to a chief executive officer.

Her goal became reality. In June of 1980 Nancy was named as secretary and administrative assistant to George Butler. Her years of service in the

company had paid off for her. She believed she was reaching a stage of self-actualization.

George Butler had long been known for his conservative ways of doing things and his seeming reluctance to change. Word was out that he was considered an effective manager, but that he could be very demanding of his subordinates. Naturally, Nancy had some apprehension during her first days on the job in her new assignment.

At 10:30 a.m. on the first day of her new position, Nancy was called into George's office. He indicated that he reserved this specific time daily to take care of correspondence. He then began to dictate the first of seven pieces of correspondence. The material ranged from short memos to be sent internally to a two-page letter to be sent to four international firms that were considering possible distribution of Stanleytown Industries equipment.

George requested that the vice-presidents for marketing at the home office and the various subsidiaries get copies of the letter to the international firms. Since he had three telephone interruptions and needed time to organize his thoughts for dictation, Nancy completed this phase of her work at 11:45 a.m. She went back to her office, looked over her notes and made editorial comments, and then decided to take her lunch hour before transcribing her notes.

At 1 p.m. she began typing the memos and letters. Nancy completed the short memos first and then began working on the two-page letter. She made sure that the necessary carbon copies were made of all the correspondence. At 2:15 p.m. Nancy had almost finished typing all the correspondence. She

was doing the last letter when George called her on the intercom to make a change in the two-page letter. He had inadvertently quoted some incorrect pricing information. The changes involved roughly an entire paragraph, so the work had to be retyped. Can you imagine the frustration Nancy must have felt when you consider all the carbon packs she had to do?

* * *

Now, let us look at the process involved in getting this work done. You have an executive dictating correspondence to a secretary (executive/secretary relationship). So the documents have been created (input); then Nancy must transcribe on her electric typewriter all the necessary copies (production/reproduction). The typing of the two-page letter alone involved four originals and seven carbon copies. George wanted each manager to have an individual copy of each original letter.

Now, imagine the distribution process. Nancy was responsible for mailing all copies to the subsidiary managers, and their secretaries were responsible for filing their respective correspondence. Nancy was also responsible for filing at the main office (storage). She made an individual file folder for each of the international firms. She decided to try to minimize a little bit of the paper work. She indicated on each of the original letters that carbon copies were being sent to the five managers located throughout the country as well as the vicepresident of the home office

The process just described in this scenario truly reflects the way office work was done for a number of years. The one-to-one executive/secretary relationship typified the traditional office setting where manual

systems dominated. The executive either dictated letters and reports to a secretary or wrote them in longhand; the secretary either transcribed the dictation notes or typed from the executive's copy. Then, if changes were to be made, most documents usually had to be retyped because of equipment limitations.

Just think of the thousands and thousands of times this same procedure has occurred in business offices. The masses of paperwork generated by this process are awesome. In the past, American businesses solved the problem by simply adding additional clerical staff to handle the workloads. The bottom line was exorbitant costs and questionable productivity. Surely there must be a more efficient, less expensive way to improve office output.

NOW . . . ENTER THE AGE OF THE COMPUTER. The electronic age is with us, and innovative technological advancements are revolutionizing the way in which office work is performed. Businesses are making the shift from pencils and paper to silicon chips and computer bits. As this occurs, executives are realizing the effects of increased productivity, from the top of the corporate ladder to the bottom. Before the end of the 1980s, those who work at desks will be sharing their desk space with personal computers. Nearly everything done at a desk can be done more efficiently using a computer. One writer has said that "putting computers in the hands of an office staff can streamline the flow of work and increase its volume as dramatically as Henry Ford's assembly line once galvanized factory work." Those businesses that do not put in computers will lose a competitive edge which will result in decreased profits (Stallard & Terry, 1984, p. 65).

The revolutionary impact of computers on business operations has continued because of technological developments in computers and their ever-increasing applications to a myriad of business problems. Perhaps the most important aspect accompanying the computer's emergence is its ability to serve and make life more productive. Today's electronic devices offer unlimited promise. They challenge our minds because they are tools capable of doing just about anything we can think of. Because of the computer, exciting changes are happening in the office, plant, store, school, and home. We are leaving the industrial age and entering a new one, and we must be willing to accept the challenges -- and opportunities -- of what lies ahead (Stallard & Terry, pp. 65-66).

According to John Naisbett in his 1982 bestseller, Megatrends, one of the ten new directions transforming our lives is that of moving from an industrial society to that of an information society (pp. 1-33). If there is any entity within business enterprises that shows proof of that statement, then certainly it would have to be the office workplace. Let us examine some of the latest technologies that are already affecting the context in which Naisbitt's "transformation" is now happening.

ELECTRONIC OFFICE TECHNOLOGIES AND THEIR SETTINGS

The availability of the micro/personal computer in the 1980s is continuing to alter the way office work is performed. Prior to this time, the computer meant a large mainframe housed behind closed doors in a specially designed, climate-controlled room. Specialists called "programmers" and "systems analysts" controlled the work that was performed on the computer. Today, this situation has changed! With the widespread use of the micro/personal computer and the availability of "user-friendly" software, office workers of every type are finding that the computer can enhance their work. The significant impact of the micro/personal computer was exemplified by Time Magazine's giving its Man of the Year Award to the computer in 1982 (Friedrich, 1983, p. 16). Friedrich also stresses that "the 'information revolution' that futurists have long predicted has arrived, bringing with it the promise of the dramatic changes in the way people live and work, perhaps even in the way they think. America will never be the same" (p. 14).

Hardware and Software

In performing office work, the employee or worker can view the computer as consisting of two distinct parts -- hardware and software. Micro/personal computer hardware refers to the equipment or machine components, which include the following: a display monitor for viewing the information; a keyboard for inputting words or data; a microprocessor that controls all activities, performs arithmetic/logic, and contains the

memory; a disk drive which reads programs into the memory and outputs completed information; discs (either floppy or hard) for storing information; and a printer.

Software refers to the instructions, or programs, that activate the computer to complete selected applications. Some of the most common software applications include word processing, spreadsheet analysis, data management, graphics, and communications. It is with these "user-friendly" software programs that office workers are now able to use computer technologies to enhance their productivity. Each of these concepts/applications is briefly described below.

Word processing. Word processing is a computer application that allows text (as opposed to numbers in data processing) to be entered irto the computer memory, changes to be made in the text, final copy to be stored, and final printout to be made at once or later. In offices, the word-processing application can be performed on a multifunction computer (such as the micro/personal computer), a multiterminal system (several display-keyboard units attached to one host computer), or a dedicated word processor. The word-processing application provides a more productive and economical way to produce the many memos, letters, forms, and reports needed in business.

Spreadsheet analysis. Spreadsheet analysis is a computer application that allows words and numbers to be displayed in a columns-and-rows format (a worksheet). Here, the calculation of data (integers, dollars and cents, scientific notations, etc.) in solving everyday financial business problems is emphasized. Once the customized form, such as an income statement, has

been designed and data entered, a change in one data entry is automatically recalculated in other affected numbers. This application provides an excellent way for business people to ask "What if . . ." questions and to obtain data that are useful in making decisions. The spreadsheet application also provides the convenience of storing the completed worksheet for future reference, editing, or printing.

Data management. Data management involves the use of a computer software package to structure large amounts of data into data files. (Data files that are related are referred to as a data base.) According to George Fakok, Area Management of Honeywell's Information Systems Division, a data base "is a representation or model of the things, descriptions, and relationships that define the business and the environment in which the business operates" (Synders, 1984, p. 36). A database management system (DBMS) offers the advantages of storing large amounts of data, allowing selection of a specific set of data needed in a decisionmaking situation, and ensuring the timeliness of that data.

Graphics. Graphics is a computer application that allows stored data to be converted into visual representations such as bar charts, line charts, circles, etc. These visuals also can be integrated into written messages prepared with the word-processing application. The visuals produced by the graphics application provide a faster means of communicating information, such as trends, to the reader or listener.

Communications. "Communications" refers to the capability of a computer to "talk" with another computer or device. In the electronic office, the term "telecommunications" is used to indicate the electronic transmission of data or other information from one computer terminal to

another. When information is transferred to an off-site location, a modem and telephone are used to make the connection between the two communicating units. On-site communications are achieved through a local area network or by a direct connection between two units. Having the communications capability allows the computer to send or receive messages electronically (electronic mail) and to interface with other computers or computer devices.

Ancillary Hardware/Software Systems

Ancillary hardware/software systems are also being used in offices to improve information management. Some of the more important ones include the following: optical character recognition (OCR), facsimile, laser copier/printer, fiber optics, microform/computer systems, networking, and dictating systems.

Optical character recognition (OCR). An optical character recognition machine can "read" a completed document and convert its contents into electronic signals understood by the computer by means of a photoelectronic conversion mechanism. A letter or other written document received in an office could be put into the computerized system without having to re-key the document. Thus, time and money would be saved.

Facsimile. "Facsimile" is one of several ways in which communications can occur. A facsimile piece of hardware allows the sending of text or graphic data to a remote location instantaneously by telephone lines, private transmission lines, or satellite. At the receiving end, the document is reproduced as a copy of the original. Although text can be transmitted by this communication capability, it is especially useful in transmitting images such as graphics.

Laser copier/printer. The laser copier/printer is a device that provides a hard-copy output. Since it may utilize a microchip, it is considered "intelligent" and can receive digital signals from a micro/personal computer, a dedicated word processor, an OCR device, or some other computer-related device. The laser copier/printer can serve a variety of uses -- as a word processor and printer, an electronic mail or facsimile unit, a phototypesetter, a duplicator, a copier, or an addressing/labeling device. In addition to its versatility, the laser copier/printer offers extremely high speed for document output.

Fiber optics. Fiber optics refer to the use of small, glasslike strands to replace copper wires. Telephone wires are being changed rapidly from copper to fiber optics. The fiber optics approach offers the advantage of faster data transmission since it uses light impulses instead of sound waves. When transmitting data to a remote location via copper telephone wires, various noises can interfere with the message received. Fiber optics will ensure the data's integrity during transmission, and transmission will take place at a faster speed. The fiber optics technology is also being used within various computer devices to improve their performance.

Microform/computer system. The microform/computer system refers to the integration of the computer and microform technologies for efficient document storage and retrieval. This system allows the interfacing of regular hard copy, the computer, and microform -- microfilm, microfiche, etc. Using the technologies available, one can (a) input hard copy into the computer via the OCR and output via the micro/personal computer; (b)

input hard copy into the microform media via a camera and output via the micro/personal computer or microform reader/printer; or (c) use the microform as input to the computer (CIM) and output from the computer to microform (COM). This microform/computer system offers the advantages of rapid retrieval of needed information via the computerized multiindexing system and economical storage of the miniature microforms.

Networking. In computer terms, networking is the linking of computer-related devices for improving the processing, communicating, and disseminating of information. In a specific office location, cables are normally laid and the various devices are connected to the network. This type of networking is called a local area network (LAN). In a networking system, all user groups can have access to the needed information and can exchange information between different systems, areas, and terminals. Networking allows various devices (micro/personal computers, word processors, mainframe computers, electronic copiers, OCR equipment, facsimile devices, etc.) to communicate with each other. Wider area communicating is possible by using telephone lines or satellites for connection to other geographically dispersed systems. The advantages of the networking concept include better utilization of peripheral equipment (e.g., printers) through sharing, better communciations, and timely access to needed information.

Dictating systems. A dictating system is a machine that lets originators record their thoughts for transcription by another person. Dictation systems can be either portable, desktop, or centralized units. Some units also answer the telephone and allow messages to be stored when

an individual is away from the office. A dictation system provides the advantages of a lower cost for originating documents and conveniences associated with the various features available on a specific dictation system.

The New Office Setting

Two other basic concepts emerging from the implementation of the micro/personal computer in business are ergonomics and the information center.

Ergonomics. Ergonomics is a term that refers to the study of the total environmental conditions within an office setting and the person/machine interfaces needed to bring about a productive worker environment. According to Wagoner and Ruprecht (1984), ergonomics includes these factors:

> systems and job analysis, time and work study, the selection of tools and hardware for housing and equipping the worker, the physiology of the worker, the behavioral responses of workers to their work environments, and the external factors that physically and psychologically affect workers (such as light, temperature, sound, color, texture, shape, and appearance). (p. 392)

In essence, ergonomics encompasses all factors that affect a worker's attitude and job performance. Management thus needs to be aware of and optimize those factors that will enhance worker productivity. For example, a traditional office desk was not designed for a computer terminal. Placing a terminal on a traditional desk may cause discomfort or even injury, thus impeding worker productivity. The electronic office creates a need for modification of various office elements.

Information center. The "information center" is a new concept evolving from the needs of office workers in the electronic environments of today's offices. In these companies, information is considered a critical resource that can no longer be left in several different, and many times uncoordinated, departments. Unlike data processing and management information systems, the information center is being designed to support end-user computing. According to Nofel (1984), the information center "is a place within a business where end-users can go to learn how to use computer resources to get data they need. . . . The information center . . . coordinates and controls user services, devices, and programs" (p. 75).

> Information Centers are proliferating rapidly. Of 160 large North American corporations queried in a mid-1984 survey by Diebold Group, Inc., a New York consulting firm, 80 percent reported that they had set up information centers this year, up from only 67 percent in 1983 ("Office Automation Restructures Business," 1984, p. 124)

MOVEMENT FROM TRADITIONAL TO AUTOMATED OFFICE

For a moment now, reflect on how Nancy Jenkins processed her secretarial work in the traditional office setting in Scenario 1. Remember, she took dictation of all of George Butler's correspondence directly from him. She then transcribed her notes on an electric typewriter, made numerous carbon copies of the correspondence, and mailed copies of the two-page letter to the vice presidents of the company's subsidiaries. Nancy manually filed all the necessary copies at the home office. In addition, secretaries at the subsidiary offices were responsible for filing copies of the correspondence mailed to them.

With the various electronic technology applications described in the previous section of this paper, how could Nancy Jenkins's and George Butler's office work be improved?

Scenario 2. First, George Butler could have dictated all his correspondence and reports using some form of dictation system. This could have been done at the office with a desktop system, or he could have used a portable unit at home or while traveling. If Stanleytown Industries had a centralized system for dictation tied in with phone systems, George could have communicated his correspondence and reports in this manner. While he was doing so, Nancy would have been free to perform other secretarial and administrative support activities. The result would have been increased productivity on both their parts.

Second, Nancy could have transcribed the taped dictation using her personal desktop computer. Since one of the major capabilities of Nancy's newest equipment is that of word processing, she could have reduced greatly

the time for completing this phase of her work. Why? Her personal desktop computer with the word-processing software and a good-quality printer would provide the following functions:

a. All the correspondence could be stored on floppy disks which would allow for complete elimination of paper copies for file purposes.

b. The text material could be manipulated by eliminating words, paragraphs, sentences, etc. Material could be moved from place to place in the document being prepared. Thus, text revisions would not necessitate total retyping.

c. At the press of a specific command key, any number of original copies could be printed out. This would avoid the time and expense of making multiple carbons or xeroxed copies.

Third, if Stanleytown Industries had technology which allowed for communications capabilities, Nancy could have sent correspondence via electronic mail. Such transmission is possible through the use of communicating microprocessors which utilize telecommunications technology. Electronic mail definitely improves productivity in that this concept is one of the most effective means for realizing the "paperless office." Greater cost effectiveness of clerical and support staffing can be achieved through this means.

Fourth, if instant transmission of the two-page letter to the international firms was necessary, Nancy could have utilized satellite technology. Again, the time factor is the big advantage for the use of such an application. Satellite transmission reduces the time involved with using manual postal systems; rather than the international firms' receiving the communication a week later, they could get it within a few hours.

There is another important aspect of the entire process of making the secretary and executive more productive. (And, even though the following idea sounds utopian, it is being realized today in some industries.) That is, if George Butler had his own microprocessor with the capability of using integrated software systems, he could enhance his work by composing his correspondence at the microprocessor and sending and receiving correspondence electronically. He could also use microprocessor software packages to aid his communications and decisionmaking. Spreadsheet analysis, graphics, word-processing, and records management systems through integrated software packages have been developed for businesses. George, if he chooses to use the automated office as a system, could definitely improve his productivity at Stanleytown Industries.

* * *

If you had a position similar to that of Nancy Jenkins or George Butler as described in Scenario 1, would you prefer to stay with that type of office and perform office functions manually? Or would you want to make the transition to Scenario 2? These two options are available today. Which would you choose?

HOW CREDIBLE IS THE ELECTRONIC OFFICE?

This section presents excerpts from leading business journals and independent consultants about the importance and acceptance of electronic technologies, the office cost factors, the growth of computer technologies, and the importance of the human factor.

Importance and Acceptance of Electronic Technologies

The widespread use of computer technologies is shown below:

> [The computer] . . . is revolutionizing the office. Routine tasks like managing payrolls and checking inventories have long since been turned over to computers, but now the typewriter is giving way to the word processor, and every office thus becomes part of a network. (Friedrich, 1983, p. 18)

> But no longer is office automation just word processing. Instead, it is a web of new technologies -- personal computers, electronic messages, voice mail, and video-conferencing systems -- that are gradually becoming a critical part of the way corporations manage information. ("Office Automation Restructures Business," 1984, p. 118)

> Small business computers (SBC's) are standard fixtures in North American offices. At this point 92 percent of all surveyed organizations use or are planning to use SBC's.
>
> These trends are reflected in the results of a recent survey conducted by the Administrative Management Society (AMS). A similar survey reported in November 1983 showed 79 percent of businesses surveyed were using or planning to use SBC's compared with 71 percent in July 1982 survey. (McKendrick, 1984, pp. 14-15)

> A recent survey on office technology for Honeywell, Inc. polled 701 managers, analysts, accountants, engineers, planners and administrators in corporate production, development, marketing, legal and financial departments.
>
> More than 90% say desk-top computers and related technologies let them make better informed decisions and give them more time for creative work. (Anderson, 1984, p. 1)

> According to Harold Todd, executive vice president at First Atlanta Bank, "managers who do not have the ability to use a terminal within three to five years may become organizationally dysfunctional. (Friedrich, 1983, p. 18)

Cost Factors

The following citations point out the excessive office costs in the traditional office and contrast the savings through the use of electronic technologies.

> [O]ffice costs (comprised mostly of salaries) have become the single largest expense in most organizations: 40-50% of operating costs on the average . . . office costs constitute as much as 70% of the total operating costs in service-oriented organizations. (Office Automation Handbook, 1982, pp. 2-4)

The Dartnell Institute of Business Research reported that in 1984 the cost of the average business letter (one dictated by a middle-management executive to a secretary) was $8.10; the full cost of the average letter drops to $6.08 (a savings of 24.9 percent) when a dictating machine is used. Dartnell also reports that 46 percent of today's executives use machine dictation at least part of the time; 54 percent do not use machine dictation ("Letter Cost Up Again," 1984, p. 4).

> All told, office professionals could save about 15% of their time if they used the technology now available, says a study by Booz, Allen and Hamilton, and that technology is constantly improving. In one survey of corporations, 55% said they were planning to acquire the latest equipment. This technology involves not just word processors but computerized electronic message systems that could eventually make paper obsolete, and wall-size, two-way TV teleconference screens that will obviate traveling to meetings. (Friedrich, 1983, p. 18)

Computer Technology Growth

The following statements provide data which show the growth of computer technologies in the workplace:

In 1980 some two dozen firms sold 724,00 personal computers for $1.8 billion. In 1981 IBM entered the picture; sales doubled to 1.4 million units for $3 billion sales. When the figures are in for 1982, according to Dataquest, a California research firm, more than 100 companies will probably have sold 2.8 million units for $4.9 billion. (Friedrich, 1983, p. 14)

In order for technology to truly meet users' needs, it will have to move from the stand-alone approach toward more integrated methods of managing information. According to a recent study conducted by Arthur D. Little, Inc., a research and management consulting firm, "U.S. sales of integrated office information systems are expected to rise from an estimated $1 billion in 1983 to $23 billion in 1988." (Lacy, 1984, p. 16)

PC's are everywhere. Companies are buying microprocessors as if there were no tomorrow. The PC has now become accepted as a useful tool; it has now proved that it can handle many of the tasks that need to be addressed by management. (Seybold, 1984, p. 231)

The Human Factor

Even though the micro/personal computer is causing a great transformation in the way in which office work is conducted, the following quotation accentuates the importance of the human factor in this new electronic age:

> . . . now, at the dawn of the twenty-first century, high tech/high touch has truly come of age. Technology and our human potential are the two great challenges and adventures facing humankind today. The great lesson we must learn from the principle of high tech/high touch is a modern version of the ancient Greek ideal -- balance.
>
> The more high technology around us, the more need for human touch . . . high tech/high touch . . . the principle symbolizes the need for balance between our physical and spiritual reality. (Naisbitt, 1982, pp. 35-52).

EMPLOYMENT AND TRAINING CONSIDERATIONS

This section emphasizes the changing role of the knowledge worker, selected office-related job titles, available training, and employment projections.

According to the authors of The Electronic Office (Stallard, Smith, & Reese, 1983), "the major impact of a word processing installation has been on the clerical/secretarial employees. Whereas these office workers have been performing a variety of activities, office workers in a word processing installation are normally grouped into two categories — corresponding secretaries and administrative secretaries" (p. 64). Fifteen different positions are identified under three groupings (pp. 64-67):

Word Processing Specialists:
- Word processing trainee
- Word processing operator
- Word processing specialist I
- Word processing specialist II
- Phototypesetting specialist
- Word processing trainer
- Proofreader

Word Processing Administrative Support:
- Administrative secretary
- Senior administrative secretary
- Administrative support supervisor

Word Processing Management:
- Word processing supervisor
- Word processing manager
- Administrative support manager
- Staff analyst
- Information manager

Training for word- and information-processing positions may be obtained at the various educational levels: high schools, junior and community colleges, private business schools, and four-year colleges and

universities. In addition, many businesses have in-house technical training for some of these positions. Because of the movement toward the information age, the computerization of the business world, and the concomitant need to train professionals to manage all facets of the electronic office, the Office Systems Research Association (OSRA) is currently developing a post-secondary collegiate curriculum to meet this critical need.

Employment trends postulated by Rumberger and Levine (1984, p. 29) for four major occupational groups for 1960, 1980, and 1995 are shown below:

	1960	1980	1995
	(by percentage)		
Professional and technical	11	16	17
Managerial	11	11	10
Clerical	15	19	19
Sales	6	6	7

These figures suggest that over the next ten years the projected shares of employment for these groups will remain somewhat stable. However, the ways in which these groups will perform their work will change drastically because of the computer, possibly (but not necessarily) with concomitant effects on salary levels.*

*The Office Salaries Directory by the Administrative Management Society and the Salary Survey Results by the Association of Information Systems Professionals are two annual sources of office salary data.

IMPLICATIONS FOR EDUCATION

Based on this working paper, it can be concluded that the computer is having a dramatic impact on the ways all business functions are being performed. Therefore, several implications for education can be drawn.

1. With the current and projected proliferation of microprocessors, computer literacy for everyone in our educational system is essential.

2. Since the basic device for input into the computerized equipment is the typewriter keyboard, the sight method of keyboarding skill should be taught to everyone.

3. Rather than training for narrow, specific job specializations, students should be trained to be employable for a grouping of career-related positions.

4. Since many graduates of our educational institutions will be working in automated business environments, major curriculum revisions are needed at all levels of business education, teacher education, and office administration. Teacher certification and program content in business/teacher education and office administration must be revised to meet the needs of the electronic office.

5. Even though the total program content of these curricula needs study and revision, the movement from manual to automated systems already mandates the following changes:

- Since documents are being produced with word-processing software applications on micro/personal computers, the basic, traditional typewriter courses need major revision. Many of the manual functions now taught in traditional typewriting classes have been automated with the use of the word-processing software.
- With the increasing use of electronic dictation systems and their increasing cost effectiveness, the need for the shorthand skills is declining.

6. Future business education teachers and their students will need to learn how to use the microprocessor as a communications tool. Concepts and applications should be emphasized, rather than a high-level proficiency in technical machine operations.

7. The basic training of all students who enroll in business courses should emphasize thinking conceptually, solving problems, adapting to change, and developing effective human resource capabilities.

SELECT BIBLIOGRAPHY

Anderson, K. (1984, November). High-tech in office. USA Today, p. 1.

Friedrich, O. (1983, January 3). The computer moves in. Time, 121(1), 14-24.

Lacy, J. A. (1984, April). Future information-handling to include use of microimages. Information Management, 18(4), 16-17.

Letter cost -- up again. (1984, September). Management World, 13(8), 4.

McKendrick, J. (1984, November). An SBC in every office. Management World, 13(10), 14-15.

Naisbitt, J. (1982). Megatrends. New York: Warner Books.

Nofel, P. J. (1984, February). The information center. Modern Office Technology, 29(2), 74-80.

Office Automation Handbook. (1982). Xerox Corporation.

Office automation restructures business. (1984, October 8). Special report. Business Week, 118-25.

Rumberger, R., & Levine, H. M. (1984). Forecasting the impact of new technologies on the future job market. Project Report No. 84-A4, Institute for Research on Educational Finance and Governance, Stanford University.

Seybold, P. B. (1984). Professional computing in the office. 1984 Office Automation Conference Digest, American Federation of Information Processing Societies, Inc., 227-38.

Synders, J. (1984, December). Let's talk DBMS. Infosystems, 31(12), 36-44.

Stallard, J. J., Smith, E. R., & Reese, D. (1983). The Electronic Office. Homewood, IL: Dow Jones-Irwin.

Stallard, J. J., & Terry, G. R. (1984). Office systems management. Homewood, IL: Richard D. Irwin, Inc.

Wagoner, K., & Ruprecht, M. M. (1984). Office automation: A management approach. New York: John Wiley & Sons.

HIGH TECHNOLOGY EDUCATION: A PROGRAM OF WORK

The following publications have been developed by the Office for Research in High Technology Education for the U.S. Department of Education's Office of Vocational and Adult Education:

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