
**Office Workstations in the Home**

Board on Telecommunications and Computer Applications, National Research Council

ISBN: 0-309-57209-6, 168 pages, 6 x 9, (1985)

# Office Workstations in the Home

Board on Telecommunications and Computer Applications
Commission on Engineering and Technical Systems
National Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1985

NATIONAL ACADEMY PRESS 2101 CONSTITUTION AVE., N.W. WASHINGTON, D.C. 20418

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competence and with regard for appropriate balance.

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which established the Academy as a private, nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

**Library of Congress Cataloging in Publication Data**
Main entry under title:
Office workstations in the home.
Includes index.
1. Telecommuting—Congresses. 2. Organizational change—Congresses. 3. Industrial relations—Congresses. 4. Telecommuting—United States—Case studies.
I. National Research Council (U.S.) Board on Telecommunications and Computer Applications.
HD2333.037 1985 331.25 85-3022

ISBN 0-309-03483-3



Printed in the United States of America

# PREFACE AND ACKNOWLEDGMENTS

Electronic homework—the use of computers either full or part-time in the home to do work normally done in the office—is a new development made possible by technological developments that have made small computers more powerful and economical. To some analysts, electronic homework, or telecommuting, represents freedom from the drawbacks of the traditional workplace, results in economies due to reduced commuting, and perhaps, most important of all, an increased sense of worker autonomy and job satisfaction.

To other analysts, electronic homework is a modern and simply more sophisticated version of the sweatshops associated with cottage industries of the past. These analysts caution that while electronic workstations in the home may mean increased productivity and autonomy for certain groups of workers, primarily managers and professionals, for great numbers of the work force, particularly lower-paid clerical workers who lack the negotiating power of professionals, electronic homework is all too likely to develop into an involuntary arrangement based on piece rates and carrying no fringe benefits. The evidence gathered to date from existing and pilot homework programs involves relatively small numbers of workers who volunteered for their assignments, a fact underscored by labor union representatives.

Because the existing data base is small, the outlook for future

growth of electronic homework is problematical. It has been suggested that today's approximately 15,000 home workstations will grow to as many as 10 million by 1990; others forecast a more modest increase.

The full range of issues involved in electronic homework—labor, legal, organizational, social, and psychological—was the subject of a national executive forum entitled Office Workstations in the Home, held at the National Academy of Sciences, Washington, D.C., November 9 and 10, 1983. The forum, sponsored by the Board on Telecommunications and Computer Applications of the National Research Council, brought together the nation's experts responsible for the groundbreaking research on the subject. This volume, which is based on papers from the forum, presents for the first time in one source current knowledge on the issue.

I wish to thank the members of the planning panel (see page viii) for their fine work in developing and shaping this important forum, and our speakers, who enlightened us on the many aspects, positive and negative, of this phenomenon. Jerome D. Rosenberg, forum director and senior staff officer of the Board on Telecommunications and Computer Applications, and Lois A. Leak, administrative secretary, also deserve special thanks, as does Diane Maple, who edited the transcript of the meeting.

I also wish to extend warm thanks to our government and business sponsors, who made the forum possible: Apple Computer, Inc., Hewlett-Packard Company, IBM Corporation, and the U.S. Department of Agriculture.

MARGRETHE H. OLSON
Chairman

# CONTENTS

**Planning Panel** viii

**Introduction** 1
*Margrethe H. Olson*

I **Case Studies**

Overview 5
*Don Miller*

American Express Company: Project Homebound 8
*James G. Raney, Jr.*

Blue Cross/Blue Shield of South Carolina: Program for Clerical Workers 16
*Greg Geisler*

U.S. Army: Prototype Program for Professionals 24
*Mary McDavid*

Mountain Bell: Program for Managers 33
*Nelson Phelps*

Control Data Corporation: Alternate Work Site Programs 38
*Ronald A. Manning*
F International: Twenty Years' Experience in Homeworking 51
*V. S. Shirley*

II **Issues and Problems**
Legalities 59
*Donald Elisburg*
Effects of Work Location on Motivation 66
*Arthur P. Brief*
Use and Misuse of Workstations at Home 76
*Dennis Chamot and John L. Zalusky*
Discussion: Labor Issues 85
Discussion: Lessons Learned 95

III **The Future**
Technology Forecast 105
*Frederic G. Withington*
Clerical Workers and New Office Technologies 112
*Judith Gregory*
The Potential of Remote Work for Professionals 125
*Margrethe H. Olson*
Commentary 133
*Jack M. Nilles*

Appendix A: Control Data AWS Employee Survey 145

Appendix B: Control Data AWS Manager Interview Protocol 149

Appendix C: AFL-CIO Resolution on Computer Homework 152

**Index** 155

# PLANNING PANEL OFFICE WORKSTATIONS IN THE HOME

Margrethe H. Olson (chairman), New York University
Ted Climis, IBM Corporation
Donald Elisburg, Connerton, Bernstein & Katz
L. A. Fulgham, Hewlett-Packard Company
Glenn P. Haney, U.S. Department of Agriculture
Nelson Phelps, Mountain Bell
Frank Schiff, Committee for Economic Development
Yolanda A. Willis, Westinghouse Education Center
John Zalusky, AFL-CIO

# INTRODUCTION

Margrethe H. Olson

Telecommuting—people working at home with computers connected to offices many miles away—could reshape the way America works. Or it may be a short-lived phenomenon. In the meantime, it poses intriguing questions.

Is it new? Is it significant? Who will benefit? Who will not?

What is the origin of telecommuting? Alan Kiron coined the term "dominetics" in 1969 in an article published in *The Washington Post*. That article could have been written yesterday. Around 1971, Frank Schiff began talking about "flexiplace"; and around 1974, Jack Nilles began telling us about "telework." Now we hear, talk, and write about telecommuting, remote work, location independence, new forms of work, and technology push. The object of this collection of articles is to explore whether, in the words of *Megatrends* author John Naisbitt, "the computer will permeate the whole world of work." If that is the case, then is telecommuting a concept whose time has come?

The phenomenon has several aspects, all requiring examination if we are to gain some understanding of where telecommuting is today and where it will lead us tomorrow.

One major issue is the technology behind the trend. Is there a

Margrethe Olson is associate professor of computer applications and information systems, Graduate School of Business Administration, New York University.

technology push? With new technology, many more jobs may be handled relatively independently of location and schedule. But is this adequate reason for an employee to choose—and an employer to approve and even underwrite—work at home rather than a central location?

It is also an individual and psychological phenomenon. What is the relationship of the individual to work, to the workplace, to other facets of everyday life? How might the integration of work and nonwork activities change these relationships?

It is also an organizational phenomenon. What happens to the organization as a result of this new flexibility? What happens to organizational culture? Management style? Labor-management relationships? What new opportunities and problems are introduced for management and organizations? Finally, how will we unravel the complex web of legal implications surrounding telecommuting?

Analysis of fast-moving trends often follows, rather than precedes, realization of those trends. Companies are already experimenting with workstations in the home; hence, the organization of this book: we move somewhat unconventionally from the practical to the more theoretical.

Part I presents the experiences of five firms and the U.S. Army with electronic homework for the disabled; clerical, professional, and managerial workers; and the traditional independent contractor. Part II moves to the broad issues that surround the practices described in Part I (legalities, worker motivation, and the potential for worker exploitation) and then brings the main areas of controversy into focus in the panel discussions. Part III offers a look into the future of telecommuting—its technological development, its impact on female clerical workers, and its potential benefits for professional—and by extension—all members of the work force. Part III also ends with commentary, this time by an individual expert in the field.

It is our hope that the comments and experiences of all the contributors to this volume will foster a more realistic understanding of the positive and negative implications of telecommuting, now and in the future.

# PART I

# CASE STUDIES

# Overview

Don Miller

The twentieth century has seen an unprecedented amount of change. The Industrial Revolution, which started in the eighteenth century, spurred radical changes in the social structure of the family, government, and workplace. These changes have been accelerated by a continued flow of invention. The inventions, in turn, are being fueled by very large expenditures for research and development, providing opportunities for improved living standards. Yet, people still feel overwhelmed by complex new technology.

In 1936 President Franklin D. Roosevelt commissioned a study to determine what major technological breakthroughs could be anticipated in the following 25 years. The study group was asked to project the effects of such inventions on society and to suggest actions the government might take to minimize the potentially undesirable ones. This august group, chartered under the auspices of the National Academy of Sciences, carefully documented the long time it took for inventions to reach maturity. They recognized that the telephone and television had still to make major impacts on life in the United States. The anticipated inventions of major interest to the study group were the mechanized cotton

Don Miller is San Jose laboratory staff manager, General Products Division, IBM Corporation. Ted Climis, also of IBM, assisted in the development of this article.

picker and the photoelectric cell. Atomic energy, jet aircraft, rocketry, and computers were completely overlooked. No mention was made of major medical advances that had significantly lengthened life expectancy.

The attitude of the Roosevelt Group was not unlike that of the *New York Times*, which expressed dismay that a genius named Robert Goddard wasted so much of his time in childish experiments on rockets. During the same period a noted British admiral developed a very learned report proving with great dignity that the scoop propeller would be a failure since it was impossible to steer a ship from the rear.

Despite such an uneven track record for foreseeing major developments that will significantly affect our society, the rate of change continues to accelerate. Thus we need to continue to select developments with a potential for causing significant changes and then evaluate their consequences. One such change is the advent of telecommuting—the use of inexpensive yet powerful computers with sophisticated telephone linkage systems. New developments in the information processing industry that make the electronic cottage or home office workstation possible have attracted much attention. The mere mention of the concept rapidly elicits strong emotions and polarizes discussion.

The following case studies place this phenomenon in perspective. They are not blueprints. They provide a sampling of experiences, some successful and others less so, pointing out why such projects were initiated, the levels of expectation, and the results. They reveal the potential that exists for positive results without minimizing problems and unexpected side effects.

The home workstation is only one element among many that are causing changes in the workplace. The rise of mail order operations, the entry of large numbers of women into the work force, changes in energy supplies, transportation policies, a population with reduced mobility, and different lifestyles are interacting and influencing the way we work.

We have chosen to focus on one of these major developments—specific approaches and responses to homework programs using new information processing technologies. Common threads running through the case studies are (1) the swiftly growing need for information processing, (2) concerns about potential exploitation of the work force and regression in areas where social progress has

already been made, and (3) opportunities to further social progress and improve work activities.

Two themes emerge from a review of these projects: the rate of acceptance of new ideas is less affected by the technology than by the willingness of society to experiment with new ideas and methods; and new support structures as well as changes in the current support structures must be developed before any significant benefits from this phenomenon can be realized.

We are not standing on the brink of an abyss, nor are we facing any kind of an incipient revolution. Major changes seldom occur in such an uncontrolled environment. There is time for further investigation, analysis, experimentation, and evaluation. At the same time, forecasts indicate that more than 10 million personal computers will be installed before the end of this decade. A computer-literate generation is already graduating from our school system. It would be unrealistic to assume that such capability will not be used or that further advances will not occur. For areas such as programming development the economic benefits of homework can be demonstrated, and the acceptance among professionals is quite high. In other areas many questions remain to be asked and answered. The electronic homework concept should be assessed as one more tool to assist in managing a work force already in transition. At the same time, business sense should cause us to apply cost and productivity measures that lead to successful innovation. We believe that the information—and ideas—presented in these case studies provide a basis for initiating intelligent investigations. We also hope that they will provide the motivation to experiment and arrive at new and informed conclusions.

# American Express Company: Project Homebound

James G. Raney, Jr.

On October 15, 1982, American Express International Banking Corporation began a pilot test of Project Homebound, a home-based alternative office system for the disabled. It involved the conversion of 10 home sites throughout the boroughs of New York City into fully automated electronic word processing workstations.

Using a touch-tone telephone, a user dictated into a round-the-clock central dictation system from anywhere in the world. A homeworker accessed the system and transcribed the dictation on a word processing terminal. The typed data was transmitted via a computer-linked data communication line to a control center, where it was printed out. If revisions were required, the document data were transmitted back to the home site via a telecopier.

The pilot test showed Project Homebound to be viable and cost-effective. The performance of the homebound participants demonstrated that there is a rich, basically untapped resource of trainable, extremely competent, and highly motivated people.

On Labor Day, 1983, the system was fully integrated into the company's total operation, and the homebound participants, who had been employed as independent contractors during the pilot,

James G. Raney, Jr., is senior vice-president, Global Operations and Systems, American Express International Banking Corporation.

became regular, full-time, payrolled employees of American Express.

## BACKGROUND

Project Homebound evolved in an environment influenced by new technology, the potential of an electronic cottage industry, business and community concerns, corporate social responsibility, and the desire to tap the abilities of unemployed handicapped individuals.

According to a prediction made by the Center for Futures Research at the University of Southern California, there could be as many as 5 million people employed at home in computer-related jobs by 1993. Another prediction suggests that development will occur even sooner, before 1990, and that the figure will be as high as 10 million. In *The Third Wave*, futurist author Alvin Toffler foresees a revolutionary new production system with a potential for rendering many of today's operating concepts unrecognizable.

In New York City, as in many business communities, there is concern over the continually escalating cost of office space and the increasing shortage of space available for company expansion. There is also growing concern over the steadily rising cost of transportation and the effects of long distance commuting on a working population that is no longer clustered in urban areas. Therefore, it is only logical to investigate the option of a decentralized office system offering technical and clerical support.

It has become increasingly apparent that the private sector is expected to play a more substantial role in helping to solve some of the social problems of this country. The private sector spends approximately $6 billion yearly on disability payments, and more than $40 billion are spent by the federal government on various social service benefits. President Reagan has emphasized the need for government and private sector partnerships, and has encouraged private sector initiative in the area of social responsibility. Meanwhile, the handicapped population has been continually seeking a fairer share of employment opportunities, an opportunity to be self-sufficient, contributing members of society. Our company has a long-standing commitment to this goal.

The coming of age of high-technology and the advent of telecommuting and the electronic cottage concept have created a potential employment opportunity for a previously invisible seg

ment of the unemployed handicapped population: those men and women who are unable to commute to work but who could otherwise compete in the traditional job market.

These physically disabled homebound people come with a set of credentials that renders them uniquely qualified. They are already accustomed to a relatively isolated environment, and the systems developers and implementers are free to concentrate primarily on the technical aspects of the home workstation experiment and do not need to focus on the social and psychological implications.

## EQUIPMENT

Project Homebound is the first home-based electronic word processing program to have tested and proven the feasibility of a totally telecommunications-based, automated off-site word processing workstation. It proves that work done at a remote location can have a production turnaround identical to that done on-site.

Each home workstation is equipped with a Wang WP-5 stand-alone word processing terminal, the Lanier "Telestaff" central dictation system, and an Exxon SQIP-2150 telecopier unit. Each piece of equipment is linked by touch-tone telephone lines to a control center at American Express headquarters.

The central dictation system to which material is telephoned consists of endless-loop recording tanks, a supervision console, and a printer, all located in the control center.

Ten tanks are used. Each tank has its own pair of telephone lines, one for incoming dictation and one for outgoing transcription. The tanks can simultaneously accept dictation and release dictated material for transcription. Because there can be only one dictator and one transcriptionist accessing a single thank at a time, the incoming and outgoing telephone lines connected to each tank are programmed to hunt sequentially to the next respective available tank line.

Through the supervision console, the control center can identify what is stored in each recording tank at any time. The identification of each document consists of user identification code, date and time of dictation, and its length in voice-minutes. The supervision console can also identify which documents have been completed, when, and by whom. Because the console allows the man

ual inputting of data, information about hard-copy assignments also can be logged into and monitored by the system.

The printer, which is a part of the supervision console, can generate reports on whatever relevant usage and production information is sought.

The telecopier, a method of photocopying over telephone lines, dispenses with costly and time-consuming courier and postal services. Hard-copy assignments are transmitted to the home sites by the control center, which dials the line in the home. The home unit, totally unattended, can open up the telecommunication line, accept copies, and terminate the connection.

The word processing terminals in the homes, as well as two central mainframe computers, are equipped with telecommunication protocol software and data transmission lines. Keyboarded data are transmitted to the control center through one of the mainframes via dataline dial-up. The transcribing unit is equipped with a headset and either a foot pedal, for those who use their lower limbs, or hand-control set, and a dictation control phone through which the transcriptionist accesses the central system, selects the recording unit from which to transcribe, and manipulates the speed, sound, and voice-recall controls.

## MONITORING AND CONTROL

A carefully devised monitoring system is essential for measuring and assessing the performance of a homeworker and for producing the necessary administrative data. All work flowing through the control center is tracked and monitored, providing an accurate measurement of both the volume of workflow and the actual use of the overall work-at-home system.

The supervision console has been programmed to automatically log assignments according to user, function or officer title, division or department, and user-department chargeback account number, all coded into the user identification code. The printer is able to generate detailed summary reports of use and production in a variety of formats according to the specifics of a given administrative need.

The word processing terminal automatically registers production line count and on-line system time at the conclusion of each document. This partially measures the production of each homeworker. The transcribing unit of the central dictation system au

tomatically logs in the identification code of the transcriptionist upon completion of each dictated document. The supervision console of the central dictation system also allows the manual inputting of data pertaining to hard-copy assignments.

A daily timekeeping form, programmed into the word processor, necessitates the maintenance of a daily production log by the homeworker. The information to be manually entered consists of document name and originator, exact time started and completed, whether the document is a dictated assignment or telecopy, and whether it is an original assignment or revision. This approach accounts for the off-line time involved in producing a document, which is as important as on-line time in properly assessing the production of a homeworker.

## PROBLEMS AND SOLUTIONS

We encountered problems in three areas: the installation of additional telephone lines in each of the homes, adaptability of telecommunications software, and transmission of data from the home site through a central computer to the control center.

The installation of three additional telephone lines, one for each piece of equipment, was ordered for each home workstation. We soon discovered, however, that certain residential structures, depending on the year of construction and occasionally on the area, were cabled for a limited number of lines per living unit. For apartment buildings, written approval from the owner was required to pull additional cabling into an apartment. In some cases, pulling a cable up the side of a building was required to access an upper floor. Without proper authorization this would constitute unlawful defacement of private property.

We also discovered that the software's capabilities were not wholly satisfactory for large-scale off-site telecommunicated word processing. The volume of work and the length of documents produced caused uncontrollable disk overflow at the home sites. The vendor rectified this problem.

The flow of word processing data to the control center through the data-processing function of the intermediary computer resulted in total format distortion. We solved this problem with additional data processing programming to recapture the original data format function at the conclusion of transmission through

the computer. This finally achieved the level of computer automation initially envisioned.

Vendor commitment above the call of duty was essential to Project Homebound. Vendors provided equipment installation, follow-up service calls at each home, and training at each site. This was the first time that the companies involved offered individual in-home service and training. The extra effort demonstrated by vendors, as well as the personal commitment of our own staff, helped Project Homebound become a success.

## HOME WORKSTATIONS AND THE LAW

A number of legal factors affect the acceptability of establishing a home-based work force: other residents of the affected area; the personal welfare of the homeworker, including protection against exploitation; and the physical safety of the homeworker.

While zoning regulations differ greatly from area to area, common rules governing home workstations include: (1) that there be no business transacted on the premises involving heavy physical traffic, (2) that work being done is strictly service-oriented (i.e., work performed for a company headquartered at another address), and (3) that the noise level is not out of the ordinary.

The Occupational Safety and Health Administration (OSHA) considers the employee's home an inspectable location, although it is improbable that OSHA would conduct an inspection unless there were a request, complaint, serious accident, or fatality. OSHA does not exempt the home from its rules on safety of the workplace. These rules include: (1) smoke detectors in the work area; (2) an ABC fire extinguisher that can be manipulated by the employee; (3) clear, unobstructed exits; (4) removal of hazards that can cause falls; (5) adequate electrical circuitry with equipment preferably on a separate circuit, with 3-wire connections and 110 or 120 amperage; and (6) furniture appropriate for the equipment. Care should be taken that children do not have access to the equipment.

Federal law (Section 516.31 of the Code of Federal Regulations), which covers wage and hours, directs that a homeworker handbook be maintained for each nonexempt homeworker. Because the dual recordkeeping system of Project Homebound provides adequate mandatory documentation for the proper computation

of both regular time and overtime worked, rendering a homeworker handbook superfluous, American Express has petitioned the Wage and Hours Division of the Department of Labor for a waiver of this requirement.

## RECRUITMENT AND TRAINING

The New York City Private Industry Council (PIC) is one of the institutions originally created by Congress under Comprehensive Employment and Training Act (CETA) programs to find ways to train the chronically unemployed for unsubsidized jobs within the private sector.

PIC heard of Project Homebound while we were formulating recruitment and training strategies and notified American Express of the availability of 10 fully trained, physically disabled, homebound word processing operators. These operators had been trained by Brooklyn College in an earlier PIC-directed project sponsored by the Equitable Life Assurance Society.

The participants in the Equitable program had been carefully screened, evaluated, and trained. From an initial 200 applicants, 43 were accepted for evaluation. The final screening provided 14 trainees, all of whom completed the training program with exceptional success. Equitable hired 4 of these 14 graduates and worked actively with PIC to place the remaining 10 within the private sector. After a visit to home sites, these 10 graduates were retained for the Project Homebound pilot.

## MANAGEMENT OF HOME-BASED STAFF

The electronic cottage concept encompasses the relative isolation of the home-based work environment. Management must look at the sociopsychological implications of this situation. It requires formal study by social scientists and business management theorists. In the meantime, there are only the data from a small number of programs on which to rely.

Standard management practices and techniques are, for the most part, inapplicable. Remote staff management is an uncharted course, and "telemanaging" has as yet no proven set of guidelines. The need for special training in effective and efficient teleworking techniques became apparent during the Project

Homebound pilot. Succinct instructions and answers to questions are essential, as is control of conversations.

Office acculturation, the subconscious absorption of working knowledge as opposed to that acquired through a direct learning process, is an informal but very important part of developing knowledge. In the absence of the information exchange provided in a traditional workplace, good communications become crucial. Instructions to home-based workers must be explicit, and expectations fully and clearly defined, until total familiarity with the standards and specific requirements of a company can be assured.

The predictions of Toffler and the Center for Futures Research at the University of Southern California have the ring of real possibility. There is no question that computer technology is a governing factor in the direction our lives will take in the future.

All experiments with the electronic cottage concept have tested the technology of commuting to work via telephone lines. When weighed against initial expectations, not all of the efforts have been considered totally successful, but none can be considered total failures. Put in perspective, each was a visionary exercise, a ground-level test of an advanced concept of the future.

Project Homebound and other similar experiments have provided invaluable knowledge on which to base further efforts.

# Blue Cross/Blue Shield of South Carolina: Program for Clerical Workers

Greg Geisler

Prior to the Industrial Revolution, homework was commonplace; it is only in recent history that we have come to expect and accept the notion of a clustered work force, better known as the factory or office. With industrialization, clustering became necessary to realize the economic advantages that assembly lines offered in factory settings and to provide the communication network needed to support office functions.

Is this concept of clustering archaic? No, but the utility of this notion is becoming less of a factor. Continual advances in information technology are enabling individuals to be effective members of the work force at arm's length—at home. This emerging technology will significantly improve the way in which we communicate and, as a consequence, will significantly alter the organization of the work force.

Reorganization of the work force is not a lightweight matter. The premise that working at home is desirable and desired by many may be easily accepted by the office employee, but not so easily accepted by the manager or employer.

Regardless of the type of work the telecommuter does, management is faced with new issues. How do you evaluate the perfor

Greg Geisler is president of G Geisler Group, Camden, South Carolina, and former director of the Information Center, Blue Cross/Blue Shield of South Carolina.

mance of someone who is not in the office? How can you manage people you don't see? James Connell, of Office Research Technology in Pasadena, California, distinguishes two types of management: "Some managers feel that an employee has to be checked all the time or the employee will goof off. The other attitude is that a valuable employee will want to do a good job and doesn't need to have an overseer. This second philosophy has to be developed if telecommuting is to work."

Management in general is struggling with the problem of incorporating technology and at the same time accommodating employees' needs and altering management's style. Many businesses are dodging the issue altogether and advocating the status quo. Others are jumping in with pilot projects and funding in the belief that the opportunity lost by delaying is substantial. A third group is just plain confused and suffering from the widespread and easily contracted disease of "analysis paralysis."

These symptoms are consistent with the views of Dr. Richard Byrne, who teaches business executives how to get over the fear of using computers.

Actually, Byrne says, "Managers are not, per se, afraid of computers. It's really change that they are not in control of that is frightening. After all, an executive's responsibilities include keeping things under control. They no more inherently dislike computers than they dislike a hotel suddenly moving them from one room to another . . . even if the new room is a suite and overlooks the ocean. Unanticipated change scares most people, not just executives."

Byrne also pinpoints three types of attitudes. There is the attitude of the person who hasn't had the technology-induced mid-life crisis. To put a number on it, let's say this attitude represents people under age 42. They know that the mix of technologies, of satellite communications, videoconferencing, personal computers, and the like is going to affect them directly. They are coming to terms with this now.

At the other end of the spectrum is what Byrne calls the "over-56" executive who has a reasonable chance of escaping the new technology. That leaves the 42 to 56 group. "That's the group that's in trauma," says Byrne. "They don't want to face this progress, but they know they have to. To them it's a real problem."

Let me speak for our executives at Blue Cross and Blue Shield of South Carolina. They are definitely not traumatized by the

emerging technology. Our teleprocessing efforts were initiated in 1973, and telecommuting was introduced in 1978.

It is generally agreed that the sectors of society most directly affected by the whole information age are professionals and managers. They are the ones who derive the most direct benefit from personal computers and other new tools of electronic communication. The motivation behind this entire movement is to improve the productivity of the white-collar worker—the portion of the work force which comprises 70 percent of the average company's personnel expense. I believe that this purpose is well founded.

This is not to say that personal computers and the rest of the technology will have no impact on our clerical workers, but the potential is not as dramatic as that for professionals. It is simple arithmetic: Which generates the greatest return, a 15 percent increase in productivity for a $5-an-hour employee or one who makes $20 an hour?

At Blue Cross we recognize and accept that our professionals and managers are the target group for the new technologies. Besides, in years past, like most other companies, we have expended so much of our energy trying to improve the productivity of only our clerical and blue-collar workers that there is little room for further improvement, short of replacing them with robots. Just for the record, we do not intend to do that!

## THE COTTAGE KEYER PROJECT

In 1973, it was decided to begin the development of a telecommunications network that would tie all of the hospitals in South Carolina to our corporate offices in the state capital, Columbia. This network would be the vehicle through which the hospitals would submit Blue Cross claims directly to us without the need for hard-copy paper and mail service and without the inherent delays. As a result, we are now recognized as pioneers in the concept of "paperless" insurance claims and probably have the highest percentage of paperless claims submission by any insurance carrier in any state.

In 1978 our company attempted telecommuting for the first time. The purpose was to develop a procedure to facilitate the coding and keying of physicians' Blue Shield claims. As just noted, we had been very successful with claims submitted by hospitals (Blue Cross claims), but a high percentage of the claims

submitted by physicians were still being handled conventionally. The doctor was filling out a claim form and mailing it to us a week later. Upon receipt, coding and keying of the claim was necessary before it could be processed.

We had no preconceived ideas of project results and did not establish any rigid goals. No formal monitoring or measuring was imposed on the original participants. We were primarily interested in determining the feasibility of expanding the project and observing the attitudes of those affected.

The pilot project began with the selection of a husband and wife team. This was accidental; we did not seek this exact combination, but in retrospect, this arrangement turned out very well. The husband was a manager of one of the claims departments and quite familiar with the manual claim submission process that we were trying to automate. His wife was a typist who knew nothing about the claims process and was not accustomed to sitting in front of a terminal keying for *x* number of hours.

Each evening the husband would take home a new stack of claims that had already been screened and coded and were now ready to be keyed. In the morning he would return with any claims that she had completed keying so that the hard copy could be permanently filed. During the day, at her convenience, she would key the Blue Shield claims. The next day the cycle would repeat itself.

The luxury of not having to make a daily round-trip to Blue Cross is readily appreciated, particularly when young children are in the home.

The major result of this husband and wife working relationship was a close and candid scrutiny of the methodology of paperless claims submission. This constant questioning revealed some serious flaws, not in the accuracy of the data, but in the ease of use of the system. The objectivity necessary to spot these flaws did not exist in the hospitals that had been using the system for the past five years, nor did it exist with the programmers who developed it.

Since its inception in 1978, the "cottage keyer" project has grown to include 14 employees who are now considered a vital element in our claims submission process. The ground rules for our cottage keyers are that the keyer is responsible for paper expense; the lease of the equipment, which amounts to almost $2,500 a year; and is considered a part-time employee. Blue Cross in turn is responsible for all maintenance of the computer, contri

butions to a pension fund, and payment of 20 cents for each claim keyed. No other benefits are provided. I realize that it may seem incongruous for a health insurance carrier to deny health insurance benefits to its own cottage keyers, but this policy applies to all part-time employees, not just those participating in the cottage program.

We have experienced zero turnover in the five years the project has been in effect. We have even had our first retirement. In fact, had it not been for the cottage program, the retiring keyer would not have been able to continue work at Blue Cross because of a family situation that required all of her time.

The requirement that keyers lease the equipment is a very direct way of stating that we depend on them and expect a certain level of performance from them. In other words, the keyer is expected to key the claims assigned in a timely manner, and the lease of equipment serves as a constant reminder of this commitment. In the near future this approach will be abandoned. As we convert from the very specialized machines we are now using to general purpose personal computers, specifically the IBM PC, as our vehicle for claims submission and provisions are made for our cottage workers to purchase these machines at our cost, new rules will be established.

Our cottage keyers and coders are generally women, in their thirties, with one young child at home. Their husbands work at Blue Cross with full benefits. The keyers are well organized and self-disciplined. They often work odd hours. We will find them signed on at 6 a.m. or 7 p.m. at night. Routinely, they work between 8 a.m. and noon.

## Work Load Statistics

Sixty-five percent of all South Carolina Blue Shield claims are keyed in cottage; 30 percent of all South Carolina Blue Shield claims are coded in cottage. Thirty percent of all South Carolina Major Medical claims are keyed in cottage; 40 percent of all South Carolina Major Medical claims are coded in cottage.

**Productivity Statistics**

| | Hours Paid | Standard Hours Produced | Productivity |
|---|---|---|---|
| In-office | 37.5 | 28.5 | 76% |
| Cottage | 30.8 | 31.3 | 102% |

We are quite pleased with the performance of our in-office keyers and coders. The productivity figures stated above are based on units produced for hours paid, which means that hours not worked because of illness or holiday or annual leave have been included. This makes the comparison with cottage workers possible since they are paid on a piece rate with no allowance for illness, holiday, or annual leave.

The standards established at Blue Cross are based on an "optimum day's work," not a "fair day's work." Therefore, we do not expect performance above 90 percent. When productivity is calculated as above, using hours paid whether worked or not, substantially lower figures are of course acceptable.

If we are pleased with our in-office productivity, we are thrilled with the cottage figures. We expected work done at home to be below standard. In fact, at the outset we didn't expect more than 85 percent productivity. The machines used by the cottage keyers were Texas Instrument Silent 700s, which required a pedal on the floor and had limited editing capabilities compared with the mainframe-linked terminals used by the in-office keyers. The home environment offered distractions, and there was no supervision. How could there be this jump in productivity?

The best explanation I've come across is the oft-cited experiment conducted by psychologist Herbert Lefcourt. Two groups were asked to solve complex puzzles and do intricate proofreading in the presence of a loud, randomly occurring noise. One group was given a button that would switch the noise off; the other wasn't. The group with the switch solved five times the number of problems and made far fewer proofreading errors, even though not a single subject pressed the button. Thus there appears to be an incredible motivational value associated with freedom of choice. The granting of even a modicum of apparent control can increase people's productivity immensely.

### Error Rate Statistics

The in-office keyers had an error rate of 3.0 percent, while the cottage keyers had an error rate of 0.5 percent.

This statistic seems to lend further support to the above theory. Otherwise, how can performance be higher in an environment that lacks Muzak, ergonomic furniture, and scheduled coffee breaks?

### Earnings Comparison

| | Average Base | Lease | Benefits | Gross |
|---|---|---|---|---|
| In-office | $11,285 | $0 | $3,611 | $14,896 |
| Cottage | $17,916 | ($2,436) | $806 | $16,286 |

Our in-office keyers work an average of 37 1/2; hours a week. They are paid on a hourly rate with the average take-home rate of $7.59 an hour, which includes additional benefits. This make the average in-office keyer's salary $11,285 a year. Cottage keyers must pay a monthly lease of $203 for the computer, which amounts to $2,436 a year. The cottage keyers make an average of $12.18 an hour, after deducting for their terminals. Hourly in-office keyers receive at the company's expense additional benefits, which include life and health insurance, sick leave, annual leave, and pension. Cottage workers receive a noncontributory pension.

The cottage employee is grossing on the average 9 percent more than the hourly employee. This is consistent with the increased productivity of the cottage worker. Further, the company avoids certain operating expenses such as additional floor space and office equipment, expanded cafeteria functions, and enlarged parking facilities.

It can be argued that unequal pay scales for similar job descriptions may be undesirable. We have found the opposite to be true. Clerical workers understandably have limited promotional opportunities, but because of the cottage program, the possibility exists to "advance" to a more desirable cottage position without having to absorb any new responsibilities. So, again, what could have been a negative situation has become a positive one.

Another point of contention can be the decision to classify our cottage workers as part-timers. It should be remembered that our

part-time cottage keyers are earning more than their full-time counterparts. Being classified as a part-time employee carries with it the privilege of variable working hours and the inclination to request and to expect this privilege. Consequently, the cottage keyers exercise this option without any stigma attached. If a keyer is going to be able to work only 20 hours one week, she contacts her in-house supervisor and her work load is adjusted accordingly. Just as Dr. Lefcourt would have predicted, though, this option is not abused. In fact, it is not uncommon for one of the other keyers to volunteer to pick up the slack.

Is telecommuting a Trojan horse? We think not. We at Blue Cross expect to expand our commitment to cottage keying substantially to include other claims areas, and will be providing a personal computer or access to one for all of our professional and management people.

Those who are still not convinced should be in a business that technology cannot leverage, like custom cabinetmaking, or have a market absolutely cornered. Anything less, and these new technologies are going to be used by your competitors against you.

# U.S. Army: Prototype Program for Professionals

Mary McDavid

In early 1976 the U.S. Army's Automated Logistics Management Systems Activity (ALMSA) was assigned the task of designing and developing an interactive computer-based office support system using state-of-the-art technology. Computer resources were purchased on a time-sharing basis from a company located in Cupertino, California, and the project was well under way by early 1979.

An increasing demand for these interactive systems resulted in system development efforts competing for the same computer resources as those organizations using the automated systems. The contractual arrangement provided for service availability for 20 hours per day. Only 8 to 10 hours of the available computer time were being used, however, because ALMSA operated on a one shift-per-day basis for all organizations except the Computer Operations Division. Employees assigned to this project were highly skilled, specially trained individuals and were unwilling to volunteer for a second- or third-shift tour of duty. An agreement between ALMSA and Local 1763 of the National Federation of Federal Employees (NFFE) allowed placement competition between internal organizations. It was likely that the affected employees

Mary McDavid is chief of the Management Engineering Office, U.S. Army Aviation System Command.

would apply and be accepted for reassignment to a prime-time shift position elsewhere. Work at home offered a solution: it was an alternative to purchasing additional equipment or computer access, and it assured the retention of fully trained, highly specialized individuals.

Planning for a prototype work-at-home alternative involved three steps: a feasibility study, approval of a request to begin the prototype, and implementation of the proposed prototype.

## DETAILS OF THE PROJECT

### Feasibility Study

A task force was established to document the potential advantages and disadvantages of a homework program. This group researched the feasibility of government participation in the program, the potential impacts on the organization and the workers and their families, and the methods available to monitor and control work load and measure productivity.

The task force determined that an increasing number of non-governmental business organizations were experimenting with homework, using such programs to reduce energy consumption, expand office facilities, and make maximum use of computer resources. The group's research indicated that the pool of potential workers could be expanded by hiring the handicapped, retired personnel with extensive specialized knowledge and experience, and single parents who need to be at home with small children.

The task force concluded that the manager and worker of the future would be faced with drastic changes in the work environment as new technology linked computers with communications. This technology would eliminate the need for information workers to be located in the same office with coworkers or supervisors.

### Approval Process

The study was staffed through the legal, personnel, data processing, and comptroller organizations, and a formal request was made for a homework prototype.

The study was forwarded to the U.S. Army, Development and Readiness Command Material (DARCOM) headquarters, and the chief of staff requested a briefing prior to a final decision. The

briefing provided details on the ways supervisors would monitor and control the activities of employees working at home, an overview of the anticipated benefits to management and employees, and a live demonstration of on-line control features.

Approval of the prototype program was received in May 1980. The chief of staff directed that appropriate negotiations between the local union and ALMSA take place prior to implementing the prototype program. A project officer was assigned to resolve outstanding issues, develop the prototype guidelines, coordinate implementation with the local union, monitor prototype status, and document the results.

## Implementation

The prototype began October 6, 1980 and was limited to four computer specialists and a supervisor from the Management Information Systems Division. Participation was voluntary, and the employees were allowed to select a second- and third-shift tour of duty between 3 p.m. and 6 a.m. The scheduled tour of duty did not have to be eight consecutive hours. These employees were required to work on-site every other Friday. The employees designated an area as work space within their residences, and ALMSA provided office furniture, terminals, office supplies, and direct communication lines.

The employee and supervisor signed a written work agreement addressing scheduled assignments, specific tour of duty, work location, protection of government equipment, security requirements, and other miscellaneous directives required by the prototype guidelines. Each employee also signed a "hold harmless" agreement releasing the government from liability due to personal injury or property damage as a result of installation and use of government equipment in a personal residence.

## Problems

Preimplementation problems included difficulties with the installation of communications equipment, government liability, protection of government property, and workmen's compensation.

*Communications devices.* Installation of communications devices was one of the most difficult problems encountered. Participants were using computer resources in California via either direct lines or a telephone with an acoustically coupled modem when working on-site. The U.S. Army Communications Command determined that providing telephone service to a private residence was in direct conflict with federal law (Federal Statute 31 U.S.C., Sec. 1348). An electronic link for computer access was required, and participants were willing to use their own telephones during the prototype. However, federal law (Rev. Statute 3679, 31 U.S.C., Sec. 1342) prohibits government acceptance of voluntary service from individuals. The ALMSA legal department defined employees' use of their own phones for eight hours each workday, without reimbursement from the government, as acceptance of voluntary service. To comply with the law and provide a means for linking to the computer, direct communication lines without voice capability were installed in the participants' homes. A legal opinion regarding the occasional use of an employee's telephone for official business allowed the participants to use their telephones to communicate periodically with peers or supervisors.

*Government liability.* Installation of direct lines solved one problem but created another: how to protect the government in the event of damage to personal property as a result of installing the communication lines or through the use of the government-owned equipment. A hold harmless agreement was developed for each employee to sign as a condition of participation in the program.

*Protection of government property.* Liability for loss or damage to government property involved the standard of care applied to such use. It was determined that standards for the protection of government property applied equally to on-site and government property in the employee's home, and pertinent standards were included in the work agreement signed by the participants.

*Workmen's compensation.* Federal regulation (Title 5, U.S.C., Sec. 81012) covers federal employees injured while on duty. To avoid possible problems in determining whether an injury was

incurred while the employee worked at home, the work agreement stated the specific schedule of hours to be worked and the location for each workday. Program participants had to obtain a supervisor's approval if they wished to change their work schedules.

On March 31, 1981, a request for expanding or extending the homework program was submitted to DARCOM headquarters. The supporting data for the first four months were positive from the standpoints of productivity, increased utilization of computer resources, increased employee morale, and successful supervisory control of employees working at home. The data and request were forwarded to the original reviewing organizations for comment and recommendations prior to the submission of a final report on the prototype results.

Preparation of the final report began in March 1982. Statistics accumulated during the 12 months prior to the prototype were compared with those collected during the 18-month prototype period. Performance in terms of CPU efficiency rate—computed by dividing the number of hours an employee is logged onto the computer into the number of resource units used by the employee—and in terms of computer connect time—percent of available time versus percent of computer connect time—and types of tasks performed were reviewed for both the on-site employees and those working at home. The history file of electronic messages was reviewed to analyze problems encountered, supervisory, peer, and program participant interaction, and to assess employee morale. The effectiveness of supervisory control was measured by reviewing system-generated statistics, electronic communications, and the status of projects completed.

## RESULTS

### Supervisory Control

Supervisors were able to monitor and control the output of homeworkers by evaluating statistics automatically provided by the computer operating system: actual number of hours each individual logged onto the computer, actual number of resource units used by each on-site and work-at-home employee, and specific files and computer host used identified by individual names.

This system also provided electronic commands that allowed the supervisor to observe what each individual was doing at any given time. A program was written that allowed the supervisor to see what program code was modified and added by each employee during randomly selected dates. All levels of management associated with the prototype believed that supervisory control of homeworkers was not a problem. They felt that watching the employee work on-site did not ensure that a supervisor really knew what an employee was doing at all times during the workday.

### Increased Computer Use

There was a 64 percent increase in the average number of computer resource units used per month, providing increased computer use without additional cost. The assignment of three homeworkers to second-and third-shift tours of duty meant that more of the time available under the contract was used.

### CPU Efficiency Rate

Prior to the prototype period the combined CPU efficiency rate of the four homeworkers was 40 percent greater than that of the three on-site employees. During the prototype period the CPU rate of the homeworkers jumped to 102 percent of the on-site employees, a 62 percent increase. The work location of three of the homeworkers remained unchanged throughout the prototype. The CPU efficiency rate for these individuals increased 25 percent, 69 percent, and 80 percent. When one of these three employees was selected for promotion and returned to work on-site for a 6-month period, his overall prototype CPU efficiency rate declined 1.6 percent.

### Computer Connect Time

The percentage of time the on-site and homeworking employees spent connected to the computer is important since work assignments were accomplished primarily on-line using a computer. The percentage of available time the homeworkers spent on-line ranged from 71 to 108 percent. Overall, the combined average computer connect time of the homeworkers increased 93 percent

during the prototype period. These statistics, combined with an increase in CPU use, indicate that productive tasks were accomplished while on-line.

### Cost Savings

The homework program made available computer resources for an additional 8 to 12 hours per day without additional cost. The additional cost directly associated with homework resulted from the installation and monthly charges of direct communication lines, but communication lines would also have had to be provided for the on-site employees assigned to develop and field interactive systems. All other equipment, supplies, and furniture provided to the work-at-home employees would have been required regardless of work location.

### Employee Morale

Employee morale increased, and the program was fully supported by the local union. The homeworkers preferred homework to on-site work. They felt more productive during the prototype period and saw the program as a privilege rather than a right. Employees working on-site felt the program had little, if any, impact on their work environment.

### Personal Use of Government Resources

Supervisory observation prevents on-site employees from using government equipment for personal use, but an on-site employee can create files, execute jobs, and delete files, leaving an audit trail that tells very little about how the computer resources were utilized. The homeworkers used a computer which enhanced the monitoring of computer resources use. Two key features were the supervisor's ability to randomly review file content and the ability to compare file size to allocated directory space, revealing any files an employee had attempted to make invisible. If an employee had files of 230 pages versus directory space utilized of 270

pages, the supervisor would know that something was using the other 40 pages of allocated directory space.

## THE EXTERNAL AUDIT

The final report was reviewed by officials at DARCOM headquarters. One official expressed concern that allowing federal employees to work at home without direct supervision would only increase the public's belief that federal employees receive excessive benefits that are unavailable to the general public and that they are not required to adhere to the same work standards as employees in the private sector. This prompted a recommendation for an external audit to evaluate the study results and the potential for fraud and abuse.

The audit was initiated on March 21, 1983, almost a year after the study period ended. Prior to completion of the project, there were several major changes that affected the prototype. Supervisors changed, and one of the homeworking employees returned to on-site work. Contractor-owned and-operated computer resources, used on a time-sharing basis, were replaced for most system development work by a computer system located at ALMSA. Supervisory control procedures changed in accordance with the new hardware and software.

Government-accepted standards for measuring computer analyst or programmer productivity are nonexistent. The methods used in the ALMSA study to measure productivity—CPU efficiency, lines of program code created, percent of computer connect time, and category of work performed—were not accepted by the external Army auditors. They also concluded:

- that the study report did not prove a productivity increase;
- that the "hold harmless" agreements signed by the employees to release the government from liability for personal injury or property damage satisfactorily resolved the liability issue;
- that the system control features of the previous and current hardware configurations created the potential for the homeworkers to use government equipment for personal purposes; and
- that the benefits from morale improvement were not quantified and were difficult to measure precisely.

The final audit report concluded that the risks of fraud or abuse exceeded the potential benefits and recommended that the program be discontinued.

## CONCLUSIONS AND RECOMMENDATIONS

ALMSA management, after reviewing the prototype experience and the external audit, remains confident that homework programs can provide benefits to management and employees. Homeworkers offer organizations an alternative to increasing office facilities and computer resources through use of second-and third-shift assignments. Homework programs can aid the government by obtaining and retaining highly skilled, specialized employees since the savings in work-related expenses help compensate for the lower salaries available in the public sector. ALMSA management also believes that homework programs should be used on a selective basis for those projects that would benefit from an environment free of distractions, require increased computer connect time, and expand opportunities for the hiring and placement of severely disabled individuals.

ALMSA management also cautions that selection criteria and program guidelines for future homework programs should be documented in detail and carefully coordinated prior to implementing a program. Supervisors and employees must be carefully selected and have proven work records. Participation should be voluntary since homework is not suitable to all home environments.

The ALMSA prototype provided useful information to management on the organizational, psychological, and social impacts this type of program can have. The communication and liability issues encountered indicate a need to review and update relevant government laws and regulations. The belief that an employee must be seen to be adequately supervised and concern about the public perception of the federal employee will add to the difficulty of implementing future homework programs for government agencies.

# Mountain Bell: Program for Managers

Nelson Phelps

Mountain Bell is a telephone utility that became part of U.S. West Corporation as a result of the AT&T divestiture.

Mountain Bell's area of service spans seven intermontane and western states (Colorado, Wyoming, Utah, Idaho, Arizona, New Mexico, and Montana). The corporate headquarters is in Denver, with secondary administrative centers in Albuquerque, Phoenix, and Salt Lake City.

Mountain Bell began looking at the possibilities of home-based work in late 1979. At that time the corporation was conducting middle-management seminars with full participation of its officers. Middle managers were encouraged and challenged to look for innovative ways to address the increasingly difficult task of recruiting and retaining the skilled personnel needed for the future.

In January 1980 we selected a technical training group for a trial run of home-based work. This group was composed primarily of technically oriented managers who were responsible for course development and delivery of training courses for computer programmers.

At our first meeting we discussed the purpose of the trial and reviewed our preliminary concerns and questions. We agreed that

Nelson Phelps is director, Training Operations, Mountain Bell.

the trial would include only volunteer, management-level employees who had no supervisory responsibilities.

Eight managers who met these criteria were selected to participate in the trial. Their length of service with the corporation varied from less than 5 to nearly 30 years. All were course developers who wrote instructional material for training computer programmers. They used Texas Instruments terminals tied into the corporation's Honeywell timeshared computer for their developmental work. The managers were located at Mountain Bell's training center, located approximately 15 miles southwest of the corporate headquarters in downtown Denver.

One of the first steps was to look at the questions and concerns our managers had about working at home. We listed these on an easel at our first meeting and asked each manager to select one category and research it before our next meeting. This was necessary to resolve or clarify as many concerns and questions as possible before formally initiating the trial.

Following are primary concerns along with suggested resolutions.

1. *Legalities*: (a) local and state zoning laws, (b) accidents while working at home, (c) Denver occupational tax.

   *Resolutions*: (a) State and local zoning laws did not prevent an employee from using his residence for work; (b) an employee is fully covered by the company's benefit and insurance programs while working at home; and (c) the Denver occupational tax is assessed on the basis of the employee's primary reporting location.
2. *Effect on family interaction*: Depending on individual circumstances, personal relationships at home could be threatened or strained. The family members might have to reschedule home activities, and noise levels might create a problem.

   *Resolution*: During the trial each manager would have a chance to assess his or her own family situation and its possible impact on work productivity. Some anticipated no difficulty since they lived alone or other home residents worked at other locations during the day.
3. *Need for a specific work area in the home*: An isolated work area free of noise and removed from interruptions is a must.

   *Resolution*: Each manager had to determine whether this would be possible in his or her home environment.

4. *Communications*: The employee must be accessible during normal work hours, 8 a.m. to 5 p.m. A telephone line is necessary to tie the terminal into the company's time-share computer.

   *Resolution*: An additional telephone line would be installed in each home work location. Core work hours would be established so that necessary communications could take place.

5. *Isolation*: An employee may miss office social contacts. Some participants expressed fear that they could be passed over for a promotion because they were out of sight and forgotten.

   *Resolution*: Each individual agreed to evaluate his or her own experiences during the actual trial.

6. *Productivity*: New methods for evaluating employee productivity would be required.

   *Resolution*: Existing management-by-objectives and measurements of course development, currently reviewed quarterly, would be expanded so that each manager and supervisor could review the weekly results during the trial period. Specific measurements were agreed upon before the trial began.

The work-at-home trial formally began in early March 1980 and continued until November 1980.

The previously agreed-upon measurement process, weekly review, and new log system were implemented. Each participant worked at his or her normal office location one day a week. This enabled participants to review their progress with their supervisors. It also allowed supervisors to conduct staff meetings and review project and work status with the group as a whole.

At the termination of the trial in November 1980, five of the original participants were still working at home. Three had returned to their work locations before completion of the trial. After approximately two months of the trial, one manager had gained 20 pounds, 15 of which she directly attributed to working at home. Although able to discipline herself to complete her work assignments in her home environment, she said she was not able to stay away from the refrigerator and found herself "constantly eating."

Another manager requested that he be allowed to terminate his participation in the trial because of serious difficulties encountered with his nonworking spouse. He reported that while he worked at home his wife felt that he was watching to see whether

she did her housework or watched TV soap operas. He also stated that serious marital problems existed prior to his participation in the work-at-home trial. This manager has since been divorced.

The third participant was unable to adjust to working at home. He missed the social contact at his normal office location and had difficulty adjusting to the self-discipline needed in a work-at-home environment.

At the completion of the trial, results showed almost a 50 percent increase in overall productivity for the composite group.

There was a definite initial drop in productivity for the composite trial group that lasted into the fourth week of the trial. This was primarily due to the initial adjustment to working at home and varied with each individual.

The following observations were made by the trial group as a whole:

1. It takes approximately one to two weeks to get into the routine of working at home. This includes establishing a work location that is acceptable to everyone at home, getting the necessary supplies and materials that are needed, and getting into a set work schedule.
2. Each participant felt it was necessary to report to his or her regular work location at least once each week to do such tasks as handling mail, meeting with his or her supervisor and peers, and handling other interoffice communications.
3. Because of the use of data terminals it is necessary to have a second telephone line at the home location, especially if a spouse is at home regularly.
4. There are fewer overall interruptions and distractions at home, usually allowing participants to work for a longer period of time.
5. Automobile insurance rates and gasoline and drycleaning costs were reduced.
6. Work hours outside the traditional 9 a.m. to 5 p.m. helped overall productivity. Several participants worked regularly beyond the normal eight hours a day because it was convenient and easy to do while at home.
7. Communications between managers and supervisors were crucial. Supervisors found it difficult at first to adjust to an employee working at home, and felt the weekly status review to be critical. Most managers were able to adjust to their employees

working at home; however, they were almost unanimous in reporting that supervising employees from a distance made their jobs more difficult.

Since completion of the initial trial there have been several additional trials with other Mountain Bell work groups. Most have involved management employees who are primarily assigned to staff functions and do not use computer terminals.

Many managers are still hesitant to use homework even though it promises the potential reward of increased productivity. Some of this certainly stems from conservative, traditional management styles. In many cases job duties are not seen as adaptable to a work-at-home environment.

Working at home continues to be a viable option at Mountain Bell. As new technology facilitates the use of communicating terminals in everyday work functions, we will continue to support and encourage this alternative.

# Control Data Corporation: Alternate Work Site Programs

Ronald A. Manning

Changing employee populations, rising energy, and transportation and real estate costs, as well as the need to increase employee productivity and maintain a positive quality of work life, have led the business community to consider innovative alternatives to the traditional large, centralized office work setting. Control Data Corporation (CDC) has attempted to address these issues by using alternate work sites, such as home and satellite offices. This flexible approach enables managers to adapt a work situation to the employee's lifestyle.

Alternate work sites (AWS) are largely possible due to recent technological advances. Many people can now work in a remote location using electronic mail, terminal access to corporate databases, and personal workstations. Any function that requires input and produces output and that can be transmitted from one site to another via a communications link is eligible for AWS consideration.

The AWS plan is one step toward state-of-the-art office technology. Its goal is to provide management techniques and mechanisms that enable an employee to work full- or part-time in a location that enhances productivity, motivation, and job satisfaction.

Ronald A. Manning is general manager, Corporate Forecasting and Analysis, Control Data Corporation.

## BACKGROUND AND CONCERNS

Control Data Corporation was started in 1957 by William Norris and a small group of engineers who left Sperry Rand and announced that they were going to design and build the world's largest computer.

Within 5 years the company was making the world's fastest computers, and over the next 20 years what started as a handful of engineers working in a Minneapolis warehouse became more than 50,000 employees doing business in 47 countries around the world. CDC has offices in 25 countries. Revenues have gone from zero to more than $4.3 billion; in 1983 CDC reached number 80 on the Fortune 500.

In addition to producing the world's fastest computers and being the world's largest independent supplier of computer peripherals, CDC is involved in data, computer, and financial services. The company is also known for its innovative management philosophy—how it structures and applies resources for the benefit of the company and its employees. Control Data's AWS program is one example.

CDC has a number of people in different job categories currently working in the AWS pattern. Some participants have both an alternative work site and a central office station, with more than half of their work assignments completed on the alternate sites.

There are four major areas of concern associated with the use of AWS: legalities, logistics, management, and personnel.

### Legalities

The legal questions that come into play involve state and federal regulations, and corporate policies and procedures. While alternate work sites do not pose large legal problems, certain areas of management responsibility need particular attention, including security, privacy and customer information, municipal ordinances, safety and environmental considerations, insurance, participation (Letter of Understanding), eligibility and selection criteria, nonexempt AWS participants, tax matters, and limits in the workday. (See pages 59–65 for more details on legalities.)

## Logistics

Logistics are critical. To be successful any AWS program requires excellent planning and full understanding by all involved.

The AWS program changes the structure and flow of work and communication, requiring special attention to the management and control of remote workers, space scheduling and long-range facility requirements, selection of equipment and office technologies to support remote employees, and evaluation of the success of the program.

One must carefully analyze and schedule the implementation of the equipment, supplies, and support that employees need to achieve assigned tasks. These might include telephone installation, terminals, communications (internal and external), mass mailings and job postings, computer software support, office supplies, and office support (clerical and secretarial).

## Management

The manager and his or her task force are the catalysts for making AWS a success. Some managers will not be receptive to the AWS concept due to their reluctance to manage workers from whom they are physically separated. These concerns must be addressed through management-awareness training and ongoing roundtable sessions for participating managers. Managers are most concerned about the following five issues when they are confronted with supervising AWS programs:

1. *Communications.* The AWS program increases the need for both formal (meetings) and informal communications.
2. *Productivity.* Productivity of employees, prior to and after the initiation of AWS activities, must be understood. The impact of the AWS concept on personal productivity must be measured and interpreted.
3. *Work selection criteria.* Some classifications of work are better suited than others for AWS. One criterion is whether or not specific outputs or deliverables are defined.
4. *Reporting.* It is especially important for AWS managers to submit periodic reports summarizing the effect, impact, and productivity in the use of AWS.
5. *Cost/benefit analysis.* Specific information to be measured

or analyzed needs to be gathered and reported to provide crucial feedback on AWS.

### Personnel

The AWS personnel pattern is designed to provide management with mechanisms that promote flexible use of human resources, efficient use of facilities, and improved productivity. Elements of the AWS personnel practices fall into five general categories, coinciding with management responsibilities:

1. *Staffing.* The ability to attract and retain qualified professional employees will be particularly crucial in the next decade. AWS could be a valuable alternative to traditional staffing practices.
2. *Compensation and benefits.* Equity should be maintained between AWS participants and nonparticipants. Performance appraisals, use of benefits, time cards, paycheck distribution, mileage reimbursement, and other administrative functions need to work smoothly in a decentralized environment. Career advancement opportunities need to be clearly communicated.
3. *Education and training.* As the AWS program is implemented throughout an organization, orientation and awareness training of managers and participants is required on an ongoing basis. These programs should stress the need for effective communications and outline management guidelines.
4. *Employee and labor relations.* Existing corporate policies and procedures, state and federal, as well as regulations governing personnel activity should be used wherever possible in the AWS organization. Additional policies and management guidelines should be designed to cover unique situations.
5. *Family and social issues.* The psychological and sociological impact of AWS on employees and their families can affect organizational commitment, promotional opportunity, and productivity. Attention must therefore be paid to the employee's home and family environment.

## HOMEWORK: A CONTROL DATA AWS PROGRAM

Control Data Corporation's Homework program is a vocational training and employment preparation program for people who are

disabled. Using a combination of education, consulting services, and a computer-based instruction system, the Homework program trains participants in business applications computer programming. The program is set up at homes or apartments, rehabilitation centers, hospitals, and nursing homes.

Many participants have no other alternative for vocational training and employment. Some have previously been considered unemployable, including individuals who are severely disabled due to injury or illness, have a progressive disability, have a fluctuating health condition, or were born with a disability.

The Homework program consists of three phases:

*Evaluation and selection*: Potential students are identified. Motivation and mental abilities are the main criteria for qualification. Most physical disabilities can be accommodated.

*Training*: Students are prepared for entry-level positions in business applications programming.

*Job placement*: Graduating students are placed in competitive, full-time positions.

Homework participants receive training through PLATO, a computer-based education system capable of delivering high-quality, individualized, student-paced instruction integrated with conventional learning activities. Once training starts, a student is required to work a minimum of 20 hours per week. A benefit of the Homework program is that the student and the instructor determine an individual training schedule that is very flexible. The PLATO terminal can be used 18 to 22 hours a day, 7 days a week.

Through the Homework program, CDC is using its computer and human resources to address one of society's unmet needs: employment opportunities for handicapped people. The result is a viable, profitable business venture.

## HOW WELL DOES AWS WORK?

In November 1982 CDC evaluated its AWS pattern. The findings were based on a questionnaire survey of participating employees and structured telephone interviews with their managers. Specifically, the evaluation focused on the impact of AWS on productivity, costs, benefits, administrative issues, career and orga

nizational functioning, and the social and psychological effects on employees and their relationships with coworkers and family members.

Within the past four years, a small number of employees in courseware operations, PLATO development, and professional services have participated in pilot AWS programs. They included programmer analysts, education analysts, senior consultants, a branch manager, and a general manager. Job duties and responsibilities included the design and development of courses, text, and software; presales marketing support; system design; programming; consulting; and system support.

Employees selected for the AWS pilot program were at varying grades, tenure, and performance levels. Tenure with CDC ranged from 1.5 to 20 years, with an average of 5.5 years. Present job tenure ranged from 6 months to 5 years, with an average of 30 months. Length of involvement in AWS programs varied from 6 to 48 months, with an average of 20 months.

Employee job sites were scattered across the country, some with managers in the same general geographic location or same city, and others managing via long distance to cover different regions. Twenty-five employees worked out of their homes and two worked at satellite locations (i.e., another CDC site). Actual daily work patterns varied from one day per week at the AWS to full-time at the AWS, with an average of three days per week.

Work pickup and delivery was generally accomplished through employees carrying work between their homes and offices. Several employees relied heavily on transmitting and receiving work via terminals and telephone. Employees occasionally used interoffice mail and coworkers for pickup and delivery. In situations where employees worked great distances from the central office, the U.S mail was used.

Managers considered a variety of factors in selecting employees for involvement in the AWS project. A majority of the managers stated that personal characteristics and work habits were of critical importance in selecting AWS participants. In general, managers chose individuals they believed were well organized self-starters with good problem-solving and communication skills.

During September and October of 1982, 35 employees from courseware operations, PLATO development, and professional services became involved in formal AWS arrangements and were

asked to complete an evaluation survey. In addition, the managers of these employees were contacted by telephone and asked to evaluate the program. Separate survey protocols were developed for employees and managers (see Appendixes A and B). Twenty-seven AWS employees completed survey questionnaires and 20 managers of AWS employees were interviewed. Comments provided by the managers represented the work of 25 AWS employees.

## Advantages of AWS

Employees cited many advantages to AWS arrangements. Most frequently mentioned were the reduction in commuting problems and an improved work environment.

Employees specifically pointed to reductions in commuting time and costs, parking and accessibility problems, and stress associated with metropolitan areas. In the traditional work setting, they said, work schedules often revolved around commuting schedules rather than the flow of work. Many were frustrated that they often had to stop in the middle of a task to catch a bus. Working at home, on the other hand, allowed them to work when they felt most productive, often early in the morning or at night. Working at home allowed them to take breaks when needed, or work continuously when they were deeply involved in a task.

Employees also found that they could work at home with relatively few interruptions or distractions. Many tasks, such as writing, reviewing, and editing, took considerably less time to complete at home.

Employees who commented on performance appraisals felt that AWS involvement had improved their job performance, and that this was reflected in their performance appraisals.

Employees experiencing positive effects of AWS participation pointed to increased levels of productivity, additional responsibilities, and higher quality of work resulting from that involvement. During the AWS period employees mentioned receiving merit raises and awards for excellence. They felt that participation in AWS contributed to these accomplishments.

## Disadvantages of AWS

Employees cited few disadvantages to AWS involvement. The most frequently mentioned disadvantages focused on the reduc

tion in personal interaction with coworkers. They often felt removed from the information channels of the office and missed out not only on the social aspects of the office but also on the information and training informally available in an office setting.

Several employees reported they made a special effort to contact coworkers and managers (e.g., scheduling a staff meeting to correspond to their visits) on days when they were in the central office in order to maintain their visibility.

Another disadvantage cited by some employees was the difficulty in separating home and work. A few people found it difficult to know when they should stop working; their work was taking up more of their personal time. A few employees noted that their homes were not set up for an office, making it difficult to separate the home environment from their work.

### Productivity and AWS

All 27 employees reported that they were most productive when working at their alternate site. Productivity increases reported ranged from 5 percent to 100 percent, with an average of 35 percent. The blocks of uninterrupted time and the employees' ability to concentrate were listed as major factors contributing to increased productivity at home. Many found their home environment to be less stressful than the office, thus improving productivity. Several employees also said that they were most productive at night or early in the morning, and the AWS project allowed them to work at these times.

Employees identified certain job duties as most suited for alternate work sites. They reserved duties that required high concentration and blocks of uninterrupted time, such as design, development, documentation, writing, review of materials, research, financials, and coding and programming, for their alternate work site. They reserved duties that require face-to-face interaction, such as departmental and team meetings, brainstorming, coordination and supervisory tasks, and some customer interface, for the central office. While employees generally believed that AWS involvement has the most profound effect on those tasks best suited for work at home, several mentioned that they have learned to plan and structure all of their work more effectively. As a result, they worked more efficiently and reported increased productivity as an indirect consequence of AWS.

Managers noted that many AWS employees were high performers to begin with and that productivity increases were difficult to measure. While managers had more difficulties than employees in estimating changes in productivity, managers agreed in 15 cases that employee productivity had improved with AWS participation. Managers' estimates of productivity gains also appear to be more conservative and perhaps more realistic. However, the mean productivity increase estimated by managers was 20 percent. In some cases, retention of valuable employees rather than increased productivity was the primary motivation for the AWS arrangements. Being able to serve a client region and, of course, higher employee satisfaction, were also cited by managers as reasons for AWS arrangements. One manager estimated that one AWS employee became 75 percent more productive. Several managers noted that projects completed by AWS personnel often came in ahead of schedule and under budget, indicating an increase in productivity.

Two managers indicated a slight decrease in productivity due to the tasks assigned or the difficulty in assigning sufficient work.

The remaining managers reported no change or were hesitant to estimate a change because they had not managed the employee prior to the AWS participation. Although performance was viewed favorably, some managers noted that AWS employees may be underutilized occasionally because they are not as immediately available to the manager as are the employees in a central office setting.

## Costs, Savings, and AWS

There are several approaches to viewing the cost of AWS. The approach taken here views only the incremental costs resulting from participation in AWS. The largest cost item is telephone installation and charges, which can be significant since AWS situations require long distance communications. Computer-related equipment costs, though high, were not viewed by managers as incremental costs due to AWS, since most employees in the experiment would have had terminals in their traditional offices. However, an expanded AWS project might necessitate more terminals to meet expanded communication requirements and because the

project could reduce the current sharing of terminals provided by a central office setting.

Phone installation costs ranged from $30 to $100, with an average of about $60. Monthly costs, including long distance expenses, averaged $60, and ranged from $12 to $300. Work-related long distance costs were submitted by the employees in their monthly expense reports.

Costs for items such as postage, supplies, and administrative support were considered nominal and specifically mentioned in only four or five cases. These were on the order of $5 to $10 per month.

Terminal costs, although not considered by managers as an incremental cost due to AWS, ranged from $60 to $395 with a median of $90 to $115. The range in cost is due to the inclusion of network subscription costs for some employees.

In five instances, added travel costs were incurred by CDC to transport AWS employees to the central office. These costs ranged from $190 to $4,000 a year and varied depending on the distance employees traveled and the frequency of their trips to the central office. The higher costs involved persons working in areas other than regions where the central offices were located.

Savings to CDC were cited in areas of employee retention, productivity increases, and office space.

When asked to identify savings to CDC resulting from AWS, most managers pointed to increases in employee productivity. While managers found this area difficult to quantify, a few noted that some projects completed by AWS employees had come in $5,000 to $7,000 under budget.

Employees reported minimal costs resulting from their AWS involvement. Those employees opting to pay for additional phone lines reported costs of $12 to $15 for monthly phone charges. They did not view this expense as a problem, but rather saw it as a trade-off for their reduced commuting costs and the opportunity of having a terminal at home. Other costs included increased utility bills and miscellaneous supplies. These costs were not quantified by employees and were generally viewed as minimal.

When asked to identify savings to themselves resulting from AWS, employees pointed to savings in the areas of travel cost and time, clothing, and child care. In many cases, employees also noted that the availability of AWS arrangements allowed them to continue working for CDC.

### Managing AWS

AWS appeared to have some effect on management practices. Several managers indicated that it was necessary to spend a little extra time with AWS employees during the initial stages of the program, and that advance planning was necessary in scheduling staff meetings. These changes were viewed as minor adjustments, not major changes.

Most managers stated that weekly progress reports from AWS employees were more detailed than those of central office employees. They also indicated that they relied on written reports rather than face-to-face monitoring for AWS employees; many used PLATO and the telephone for monitoring the progress of AWS personnel. In some cases, managers set up special times for accounting and progress monitoring procedures for AWS personnel.

### Career Development

Employees had mixed feelings about the potential impact of AWS on their career development. Eleven believed that AWS involvement would have no effect on career and promotional opportunities; nine believed that the increased productivity allowed by AWS participation would have positive career consequences. These employees felt their job visibility was dependent on the quality of their work, not on their physical presence in the office.

The remaining seven employees believed that AWS would negatively affect their careers because of loss of visibility in the office and potential removal from the office information network.

A majority of managers indicated that the somewhat reduced levels of organizational contact and visibility could potentially have an adverse effect on the career development of AWS employees, particularly in the case of employees interested in management opportunities. Managers attempted to resolve this by assigning AWS employees some leadership roles and additional responsibilities for client contact.

## RECOMMENDATIONS

Managers and employees made several recommendations about the possible continuation and expansion of AWS. These

recommendations covered participant selection, participation levels, and communication and measurement procedures.

### Selection of Participants

The selection criteria should reflect both employee characteristics (e.g., is a self-starter, has good communications skills), as well as the nature of the employee's work (e.g., job does not require constant contact with people).

Employees believed that individuals who can work independently with minimum interaction and can budget their time well are best suited to AWS. They felt that jobs dealing with work on terminals and work with customers on-site are well suited for AWS and that evaluations should be undertaken to determine what other types of work are adaptable to alternate work sites.

Some recommendations concerned the level of involvement by managers and personnel in the selection process. While line management realizes that it is necessary to bring personnel and higher levels of management into the AWS participant selection process, they would like to see the process simplified so that timely decisions can be made. They stressed that the primary decision in the selection process should be theirs.

Finally, it was emphasized that employee involvement in the AWS program should be on a voluntary basis.

### Level of Participation

One recommendation concerned the amount of time AWS employees spend at their alternate work site. It was felt that some degree of office contact is always necessary. In a similar vein, some managers and employees stressed the need for all employees to have their own "spot" at the central office, even if it is shared with other AWS workers, to help the employees maintain identity in the organization.

Finally, several managers felt that the scope of the program should be expanded to include management, and that they could benefit from having some uninterrupted blocks of time to work on budgets, salary matters, and various reports. They did not feel that being out of the office one or two days a week would pose major problems.

### Communications and Measurement Procedures

Several managers specifically mentioned the need to develop productivity measurements for evaluating both AWS and non-AWS employees. Although all of the managers believed an AWS arrangement positively affects employee productivity, there was some desire for more objective methods of assessment.

Managers and employees stressed the need to foster effective communication channels between AWS employees and the central office. One manager suggested some sort of orientation for both AWS and non-AWS personnel. Making everyone aware of the structure and goals of the program would enhance the understanding necessary for a successful program and could help to reduce the communication problems experienced at the onset of the program.

Formal AWS arrangements have existed within CDC for more than four years. Some employees are now reporting to a second or third manager in an AWS arrangement. This report represents the third time AWS managers and employees have been formally surveyed or interviewed to learn their reactions and evaluate the success of these pilots. Overall, managers who have been involved in these programs view them quite positively.

Employees are also positive about AWS arrangements, indicating increased job satisfaction and satisfaction with the company. This is not surprising due to the voluntary basis of the program.

## THE FUTURE

In late September 1983 at least 36 CDC employees in 16 divisions were assigned to alternate work sites, usually their homes.

While we foresee no formal company program to promote the use of alternate work sites by able-bodied employees, we expect continued growth of this pattern as managers seek the best possible way to tailor the workplace to each employee's life situation and to the company's needs for skilled, committed people and maximum productivity.

# F International: Twenty Years' Experience in Homeworking

V. S. Shirley

Independent of any computer manufacturer, F International (FI) offers a comprehensive range of data processing services, including consulting, project management, hardware and software evaluation, business and systems analysis, design, specification writing, software development, user and technical training, and computer installation support.

Eight hundred fifty people, most of them women and working part-time, are involved worldwide. Nearly all work from home. Revenue derived entirely from services, and not from hardware or products, is $10 million. This characterizes FI as a small business. What is different about FI is that the whole business operation takes place in people's homes.

FI started off doing entirely what is now called programming, the development of software. Today, less than 40 percent of our work involves the development of software and, of this, 30 percent is on-line, using telephone lines to connect technicians to a computer center.

Now that computer technology is geared to interactive terminals, home-based workers go on-site more than when batch processing, submitted overnight and sometimes even by post, was standard practice. FI homeworkers have accepted this trend be

V. S. (Mrs. Steve) Shirley is founder and president of F International.

cause homework does not satisfy all their needs for stimulation and social contact. In time, as computer equipment and communications become less expensive, the pattern may well turn full circle.

In a typical month we handle 200 computing and telecommunicating projects for 120 clients, generally Fortune 500 companies. Projects involve as few as 2 people working together or as many as 75 people, sometimes working in more than one country. The smallest team consists of two workers because every project—even in a consulting environment—must be strongly managed.

A project may last six weeks or more than three fiscal years. It may peak at 50 people and then die down. A project may be cancelled—suddenly, within a month, 30 people become available and have to be scheduled for other work.

As a consulting company, FI must show a profit and make its cash work in order to survive. All FI employees are effectively home-based and working in a managed environment to make each project profitable. It's working: we get a phenomenally high 66 percent return on capital employed.

In addition to its size, FI differs from other case studies in that it started with the idea of homeworking. FI employment policy is to utilize (not necessarily employ) whenever and wherever practicable the services of people (not necessarily women) who are unable or unwilling to work in a conventional way. In different countries and at different times, the conventional way may vary. For example, the way we appear in New York, where we now have a small office operating in a build-up mode, may differ from the way we operate in a European city where the work load has stabilized.

Three quarters of the staff work freelance on a project-by-project basis generally related to client needs or internal needs such as computerizing the FI accounting system. The panel of available freelance people is considered part of the corporation and works in a flexitime mode from individual homes.

Members of the FI work force are predominantly women looking after young children or elderly family members, disabled people, and men and women who choose to work at home because they like it.

FI includes husband and wife teams, couples who have chosen to reverse the conventional division of child rearing and money earning, and people who purposely seek the flexibility to pursue other occupations. Flexible employment contracts that accom

modate other life interests allows people a freedom not often experienced in other organizations.

Managers are homegrown as well as home-based; very few have come in from outside. The FI aim is to offer careers, not just work. Once we have successfully inducted people into the organization we expect to retain them for many years. Eighty-nine percent of our workers have been with us for more than 1 year, 34 percent have been with us for more than 5 years, and 8 percent for more than 10 years. Each very skilled worker has a minimum of four years data processing experience and is inducted into the freelance panel as carefully and as seriously as are the full-time employee staff members.

The typical work schedule is unexpectedly unlike the homeworker stereotype. Time and place vary, but workers generally average 20 hours during a 7-day week. Panel members are allowed to turn down assignments, but once committed, they show a great deal of professional dedication to a project. Although fixed hours are not required there is a tendency for homeworkers to set their own. Training is often done on weekends.

Ninety-six percent of the work force is female, largely because the opportunity to work at home attracts a large number of people, like myself 20 years ago, who want to continue working from home while caring for their families.

A quiet, uninterrupted work area is essential for creative software development. Working from home makes a telephone essential, but few FI homeworkers have a mass of electronic gadgetry. FI has experimented with visionphones and teleconferencing and is investigating Micronet, which uses personal television sets, on which F International might base a crude wide-area network.

One workstation customized for a disabled person working 20 hours per week on an administrative task cost $35,000, but that is unusual. Any equipment provided for home use by FI is always paid for and insured by FI.

People do have microcomputers at home and, increasingly, their own personal computers. This is changing the way in which work is done. A consulting project may, for example, involve the reworking of a voluminous report with appendixes and many diagrams. Formerly, these began as dictated tapes or manuscripts, given to a pool of stenographers who worked at home on a series of compatible typewriters. The FI typing pool peaked at 16 home-based workers in 1978. It has since been displaced by advances in

the technology. Consultants now key their text into their own personal computers. There also are word processors in the central offices. All FI offices have compatible equipment, and straight copy typing work done at home is no longer economical.

FI maintains 10 offices worldwide. European operations are directed primarily from five regions in the United Kingdom plus associated companies in other countries. In Scandinavia FI operates in a business house with relatively sophisticated telecommunications equipment. FI also operates in Holland, where the labor laws do not allow a company to engage people on a freelance basis, but require that workers be employed in an artificial series of fixed-term contracts.

FI started in the USA early in 1983, but the connection goes back to 1978, when there was a friendly association with a U.S. corporation with branches in New York and California, established under a 2-year license from F International. After a profitable growth phase, the firm dropped to one branch and incurred losses. The corporation merged very painlessly into FI early in 1983 and now operates from small offices in Tarrytown, New York.

F International's American operations differ from the European. In the United States the work force is only 84 percent women. Far more American workers hold degrees, far more have their own equipment. The work force is more mobile and more oriented toward sales than toward project management.

We believe strongly in project management because this is what our multinational clients want. The fact that work is done at home is almost incidental to the corporate service. As a business entity, we do all the things that any firm does—the whole corporation is a homeworking one.

The characteristics of full-and part-time, office-and home-based, salaried and freelance are interpreted as independent variables so that all combinations of characteristics occur. Only 5.75 percent of the work force is conventional, i.e. salaried, office-based, and full-time.

In the first quarter of the fiscal year 1983 the average of weekly hours worked, including travel time, was 17.1, with 35 percent of that time spent at home. These figures indicate the very part-time and still relatively remote nature of the work force.

Communications are highly dependent on telephone and postal services and on a few key people, mainly executive secretaries,

remaining in relatively fixed locations at fixed hours while the rest of the organization revolves around them. Technical bulletins and newsletters help spread professional and personal information through the network; these are circulated by post and courier services, as are a multiplicity of papers, files and memoranda, cassettes, and, occasionally, floppy disks.

Telex, telephones with answering equipment, and, most recently, telecopiers are used heavily. While operating facsimile equipment is still much like watching grass grow, FI gets enormous value from distant colleagues being able to transmit scribbled notes to each other. Such equipment not only spans the time differences between countries but also protects people's privacy at home by, in effect, preserving work messages until the homeworker chooses to deal with them.

F International is still a private corporation, though the equity is being slowly transferred for the benefit of the work force. Pretax profits have averaged 11 percent where the industry norm is 9.5 percent. That is not luck, but good management and high productivity, which I believe uniquely demonstrates the economic success achievable among a network of people linked by trust as well as by telecommunications.

Because we are involved in an ever-changing technical field, a significant part of FI revenue is spent on ongoing retraining of workers. Training is also important for developing our own managers, including those at the top.

After 20 years in practice, the FI approach has revealed weaknesses as well as strengths of home-based work.

The weaknesses include:

1. The bulk of the work force, the panel, is relatively immobile and does not provide a source of future management.
2. Communications, both horizontal and vertical, and facilities for gathering opinions and ensuring an understanding of strategies and policies are necessarily formalized and extremely expensive.

The strengths include:

1. The employment philosophy is very much in keeping with the free enterprise trends of the Western world, and F International has developed a method of management and project control

that enables its multinational teams to work effectively and economically within this philosophy.

2. The need for new management personnel allows people to develop effective management styles without having to unlearn practices that are inappropriate for teleworking.
3. Overhead costs are variable, not fixed, since they involve management and communications rather than rent and rates.
4. A professional approach to project development and control is an obvious need and is widely accepted rather than resisted.
5. F International has access to a skilled, self-disciplined work force in short supply.
6. High-caliber people give exceptional performance and value when they are trusted and managed well.
7. Productivity has proved to be significantly higher than average.

FI is not an experiment. It is different from most trial homework projects because it is almost 100 percent home-based; it is predominantly female; it is a first generation, entrepreneurial company just moving into a professional management mode. It is not a prototype; it is not a pilot study. It is a business operating in a new way.

# PART II

# ISSUES AND PROBLEMS

# Legalities

Donald Elisburg

The home workstation phenomenon has created the potential for dramatic changes in business opportunities. As with every great new opportunity, however, there are no free lunches. Specifically, there are legal issues that should be considered by anyone considering electronic homework. There are people and worker problems that must be considered when thinking about this extended relationship between office and home.

Most electronic homework experiments done in the last few years have involved the executive- or near-executive-level employee, the professional who may qualify as an independent contractor (writers, editors), or the owner who likes the idea of working at home. Some of the experiments have been with production workers and disabled employees. It is clear, however, that we do not have broad experience in this country with the use of large numbers of people doing traditional video display terminal (VDT) work on a production line basis. It is also clear that if this new form of office work is to provide an opportunity for more than a handful of people, it will be in the arena of production.

Consequently, the legal relationships involved in this work arrangement are, for the most part, the same type of personnel and

Donald Elisburg is a partner with the law firm of Connerton, Bernstein & Katz, Washington, D.C.

employee benefit problems that any executive faces in the regular course of running a company. Issues may involve labor standards and protective laws, labor relations and collective bargaining, fringe benefits and insurance, safety and health, and local zoning laws.

Situations that present unique or unusual problems are not the norm. Most real problems develop when someone tries to bypass the existing legal protections either by taking a shortcut or by trying to avoid one of the labor standards that give American workers a measure of economic security and protection from exploitation on the job.

## LABOR STANDARDS AND PROTECTIVE LAWS

The principal legal problems will arise within the panoply of labor standards and protective laws such as the Fair Labor Standards Act (FLSA), federal, state, and local equal employment opportunity (EEO) laws and regulations, the Occupational Safety and Health Act, the Service Contracts Act (for federal contractors), workers' compensation statutes, and various federal and state child labor laws.

There has been much litigation over the years on the standards for determining whether a worker is an employee or an independent contractor. While there may be slight differences in the analysis between various agencies of the government, I believe that the standards set by the FLSA apply to electronic homeworkers.

The FLSA protects a worker by requiring the payment of minimum wages and overtime, maintenance of records, and prohibitions against the use of oppressive child labor. It is also the statute that has been traditionally used to protect against abuses of workers in the homework industries.

Basically, the FLSA defines an employee as one who is suffered or permitted to work. This is guided by a judicial policy of construing the term liberally, without adherence to common law definitions. Employees are those persons who, as a matter of economic reality, are dependent upon the business to which they render service. Dependence seems to be the operative word, and the courts have defined five criteria for its evaluation:

- *Control*. Does an individual exert such a control over a meaningful part of his or her business life that he or she stands as

an independent party? Neither the right to hire employees nor the right to set one's own hours necessarily indicates sufficient control to render a worker an independent contractor.

- *Opportunity for profit or loss*. Does the individual control major factors that determine profit, such as price, location, advertising, and volume? Does the individual stand to lose his or her capital investment, if any, in the business' operation?
- *Investment*. Is risk capital involved? Is it the individual or the employer who assumes the cost of equipment, utilities, insurance, rent, and setting-up costs?
- *Permanency*. Can an individual be shown capable of terminating his or her relationship with the employer and taking his or her operation—something more than labor—elsewhere? (The permanency of a long relationship with an employer is usually evidence of dependence on the employer. Subjective satisfaction of an individual does not preclude a finding of dependence.)
- *Skill*. Who contributes business acumen and initiative? Routine work that requires industry and efficiency is not indicative of independence and nonemployee status. Initiative is a key element of independence. This comprises control of such components as advertising, pricing, and choice of whom to deal with.

Interestingly, there have been a number of homeworker cases in which the work was not knitting or sewing or making jewelry, but office and clerical production, such as typing of labels, ditto masters, and other direct mail operations. In one case the defendant provided label-typing services to a mail advertising firm. Typists picked up work materials at the defendant's house and returned them when completed. The typists were supplied the labels and the names and addresses to be typed. The rate for and return of completed material were unilaterally set. Using the criteria described above, the court found the typists to be employees.

Most electronic homework scenarios involve workers who should be defined as employees. They do not have the requisite skill, investment, or opportunity to be considered as independent contractors. Most are not able to invest in their own equipment or do anything but work at the particular job they have been given.

Accordingly, these employees must be seen from the personnel point of view, and in that connection, some of the very significant requirements that must be considered in the homework context are hours, pay, and records.

Homeworkers must receive the minimum wage and time-and-a-half for hours over 40 in a workweek. The key is controlling the time an employee works. If the worker is paid for piecework, that rate must be equivalent to the minimum wage. A major problem in homework is the maintenance of records. Employees must be given sufficient incentives to keep accurate records. They must not be asked to meet quotas that would lead them to work more hours than they record. If the electronic homework is done under a government service contract, the worker must be paid and records maintained as required under the appropriate wage determination.

A major concern of any homework situation is how to avoid violating the child labor laws. Basically, anyone under age 14 is prohibited from working on goods in interstate commerce. There are also strict rules requiring special certificates for certain work by employees aged 14 to 16 and on employment involving the use of dangerous equipment for workers aged 16 to 18.

Child labor laws relate to electronic homework in two significant ways. First, it is the natural inclination of children to want to emulate their parents. The idea of helping out on the "computer" could be very difficult to resist. The principal feature of child labor exploitation in other kinds of homework is the involvement of the entire family to increase the income. This becomes very relevant in situations where the worker is employed on a piecework basis, e.g., batch type work with a significant amount of data entry. Second, exposure to some of the equipment may affect the child's health.

It is not just federal law that may apply in these situations. Many states have child labor laws as well as minimum wage and overtime laws that must be considered.

In addition to the problems that can develop in controlling the wages and hours of employees, there is also the need to consider the possible impact of EEO (equal employment opportunity) requirements. If a company creates home workstations or office clusters, how are they distributed? Are they made available to all eligible employees, or only to those in selected neighborhoods? Are they limited to employees of one sex, to younger or older employees? What provisions are made for employment of the disabled?

This litany of issues suggests that today's employment practices may become even more complicated when considering the

employment of workers in their homes in widely divergent economic and social areas. A company wishing to engage in such out-of-plant activities must be prepared to employ workers throughout their geographical area and in all kinds of housing situations as well as socioeconomic strata.

## LABOR RELATIONS AND COLLECTIVE BARGAINING

Some employers may consider the use of office workstations at home to avoid the problems associated with collective bargaining. Indeed, there is no question that the scattering of employees outside of the traditional office or plant environment could make union organizing more difficult.

However, any idea that homeworkers are exempt from the collective bargaining protections is incorrect. Such employees have the same rights as any other worker to organize. To the extent that such employment is under exploited conditions, it is likely that unions will make every effort to sign up these workers for their own protection. Many unions may have contracting-out provisions in their collective bargaining agreements. As pressure for expanding home workstations grows, so will the pressure to expand collective bargaining agreement protections to existing work forces.

Some employers may use home workstations as a device to eliminate or reduce the union's relationship to their business. I do not know of any situations where home workstations have been used to get rid of a union, but for firms with that goal in mind, it will not be easy.

Employers must also look at the downside of such activity and the vastly reduced control they will have over employees using home workstations.

## FRINGE BENEFITS AND INSURANCE

A major consideration for employers is the impact of fringe benefits, insurance, and related issues for the workers at home. In short, if employers believe this work can be done cheaply, they are mistaken.

Again, the issue of independent contractor versus employee has great relevance. These employees must pay social security and unemployment compensation. Employers may be obligated to

pay for medical insurance if regular employees have such a plan, and there is very certainly the obligation to include these employees in any bona fide pension plan. The latter is a very important consideration and the discrimination rules can be tough.

One very important matter is the question of insurance, particularly casualty and workers' compensation insurance. The possible costs should be carefully reviewed. If there is an accident in the home, what will be the employer's responsibility? What if someone else is injured by the equipment, if there is an electrical short, or someone trips over the power cord? The problem of properly supervising the workplace, as well as the worker, deserves serious consideration.

Material provided by many home workstations will have to be sent to and from the office. Who is insured for delivery and pickup? Even if an independent contractor relationship is established, there may be potential liability through third party actions or product liability claims, particularly if the equipment is provided by the company.

## SAFETY AND HEALTH

Matters of occupational health and safety inherent in the use of any equipment may be exacerbated in the home context. Is the machinery properly wired and installed? Is the ergonomics of the normal office replicated in the home? We have recently been exposed to numerous articles and at least one congressional hearing on the safety of the video display terminals that are at the heart of office workstation activity. These alleged hazards are as important in the home workplace as they are in an office setting. And the use of certain devices that are safe around adults may have to be reconsidered if they are used around children, the elderly, or pregnant women.

## ZONING

Those of us who place our Apples, etc., in the office at home or in the recreation room are probably not in danger of violating local zoning ordinances. But if home workstations increase, consideration of local zoning laws and whether such installations are permitted at all will become important. Moreover, if we develop the cluster idea, i.e., people coming to "out-stations," zoning may be

come much more relevant. Indeed, there may even be the questions of how far away from the residential area such a cluster office is located and whether it serves the purposes of the home environment.

Clearly, we may be at the frontier of new ways to work, particularly in the interaction of the home and the traditional workplace of office or factory. The potential pitfalls described here can be turned into a challenge—to examine home workstation projects for sound business reasons and not as a way of getting "cheap" employees.

Unfortunately, the cottage industry sweatshop that stained our industrial history has not vanished. Exploitation of homeworkers continues today. The task of high-technology business is to understand this and to avoid tarnishing its image. Otherwise, the public may reject the home workstation concept just as it has rejected virtually every situation in which exploitation of workers has been the basis for economic success.

# Effects of Work Location on Motivation

Arthur P. Brief

Advances in the technology of telecommunications and in the availability of personal computers have stimulated questions about the desirability of employees working at home rather than at conventional locations. One can readily envision, for example, a computer programmer working at home with a personal computer linked to the personal computers of other programmers, as well as to the centralized computing facilities of the programmer's organization. The question is whether this arrangement is more advantageous than one in which the programmers perform their duties at a centralized site.

The advantages and disadvantages of homework can be ascertained by using a number of different criteria. Here, only one criterion will be used—the potential impact on an employee's motivation.

Working is not an end in itself; rather, it is a means of acquiring a variety of satisfying results or outcomes. If it were not for the personal satisfaction derived from these outcomes, individuals would not seek to work.

According to V.H. Vroom (1964), working (1) requires the expenditure of energy, (2) contributes to the production of goods or

Arthur P. Brief is professor of management/organizational behavior at New York University.

services, (3) requires social interaction, (4) at least partially defines social status, and (5) provides wages.[1] These characteristics can be viewed as classes of outcomes associated with performing work.[2] In large part, an employee's motivation to work is a function of the degree to which he or she believes that the work will lead to certain levels of these outcomes. This view of work motivation is analogous to Vroom's approach to the topic; that is, people rationally choose work roles based on the expected utilities of those roles.

Motivation involves the choice to initiate effort, to expend a certain amount of effort, and to persist in expending that effort over a period of time.[3] Obviously, these choices not only influence the role an employee selects but also the level at which the work is performed. Thus, the interplay between work motivation and work location has implications for job choice and job performance. If working at home as contrasted with working in a more conventional location does not influence an employee's expectations, an employer could conclude that location does not influence motivation.

This analysis is based on several assumptions:

First, work performed at home is essentially the same as work performed at other locations. If the work varies, then the level of the outcomes might also vary. Outcome levels associated with financial analysis of a large corporation, for example, and preparation of an individual's income tax return are likely to be different. So, in comparing outcome levels of a financial analyst working at home with those of a tax accountant working at a more conventional location, the differences observed may be due to the nature of the work rather than to the locations.

Second, the personnel policies, practices, and procedures applied to employees working at home are like those applied to employees working in the office. In particular, it is assumed that an employer does not vary selection, training, and compensation according to work location. If different types of people are selected to work at home and they are trained and compensated differently from their conventionally located counterparts, then levels of outcome would vary with location.

Compensation policies are an obvious example. If a typist working at home is paid according to the number of pages typed and a conventionally located counterpart is paid according to the number of hours worked, then the wages of the two employees will

differ. Any differences in work-related results attributable to location per se would be confounded.

Differences in selection and training can also confound comparisons between outcome levels. If an employer selects more experienced individuals to work at home, then work experience contributes to an employee's attained status. Differences in the status outcomes acquired by the employees in this instance would be attributable to work experience even though they are also affected by location. As a final instance, training can help make a job easier and reduce the amount of energy expended. If such training varies by location, so would outcome levels.

The third and last assumption concerns the choice of prospective home-based employees. Individuals vary considerably in their preferences for work-related outcomes. Thus, people with certain preferences may choose to work at home because they expect different levels of various outcomes from those who prefer working at more conventional sites. Although this reasoning is plausible, it is assumed here not to be the case. The logic underlying the necessity for the assumption runs as follows: To a degree, employees performing a given role can influence the levels of outcomes available to them and, in fact, do so dependent on their preferences. Therefore, if the preferences of those working at home vary from those of their conventionally located counterparts, outcome levels also would vary. Thus, differences in outcome levels would be due to the types of employees working at home and not necessarily to their work location.

An example should help to clarify this argument. People vary in their need for affiliation with other people and, therefore, in their preference for work-related social interaction. A person with a relatively high need for affiliation can satisfy this need through more social interaction at work. This person would need more social interaction regardless of work site but he or she may also select to work in a conventional site, expecting it to provide higher levels of social contact than a homework site. This person would place more emphasis on social interaction than another person with less need for affiliation who gravitated toward work at home. The reported differences in outcome levels between these two persons would be attributable to both the actual levels of their respective work locations as well as to the levels actively anticipated by each individual. Attributing the impact of location per se on reported outcomes would be problematic.

Collectively, the three assumptions compare the influence of work at home on outcomes, holding constant across work locations (1) the nature of the work performed, (2) employer-applied personnel policies, practices, and procedures, and (3) the outcome preference of employees. It may be charged that these assumptions negate the exploration of many interesting questions raised about work at home. The assumptions, however, are required to allow an exploration of the impact of work location on work motivation.

## EFFECTS OF HOMEWORK ON OUTCOME LEVELS

### Expenditure of Energy

While not wanting to be overworked, people do enjoy being kept busy. Satisfaction derived from the expenditure of mental or physical energy has been attributed to a belief that hard work per se is morally correct.[4] Others attribute it to neuropsychological factors.[5] How might this level of energy expenditure vary according to work location? Does working at home adversely affect an employee's activity level?

Adverse effects would be expected only if less work is required from those working at home than from those at conventional sites. This could occur in one of two ways. First, the flow of work to homeworkers may be more difficult to manage than the flow to employees in a conventional site. Second, because of the lack of close supervision of employees working at home, employers may demand less output from their home-based employees. Both problems should be manageable, particularly with the use of available telecommunications technologies. Furthermore, homeworkers may find it easier to satisfy their need to expend energy than their conventionally located counterparts because of the opportunity to substitute domestic tasks when lulls in their work loads do occur.

Thus, if one assumes that employees working at home do not necessarily prefer to expend more or less energy than their conventionally located counterparts, it seems safe to conclude that they need not suffer the consequences of too little activity simply because of where they work. Indeed, if work flows and demands are equally managed across sites, the employee working at home may be in a more advantageous position.

## Production

For a variety of reasons, the goods or services an employee produces may serve as an outcome. J.R. Hackman and G.R. Oldham (1975)[6] have argued, for example, that tasks perceived to have a substantial impact on the lives or work of other people are satisfying. In this sense, the work of a farmer or physician can be seen as potentially more important than that of an elevator operator or gas station attendant. It has been assumed, however, that the work performed by the employee at home is equivalent to the work performed at a conventional site. This assumption addresses only the objective or physical attributes of the tasks performed and is not concerned with the psychological meaning an individual may attach to the goods and services produced. A large part of that meaning is derived from the objectively defined tasks performed, but two individuals performing the same tasks may attach different levels of meaning to the impact of those tasks on others. The clerk who transcribes medical records in a hospital's patient service area, for example, may more readily see the impact that work has on the quality of patient care than the clerk who transcribes the same type of records at a remote site.

Generally, the context in which a job is performed can influence the degree to which a good or service produced is seen as meaningful. In that regard, homeworkers may be relatively deprived of the satisfaction derived from producing goods or services that are perceived to have an impact on others. Employers might want to consider ways to show their homeworkers the likely impact of their work, and supervisors may need to be trained to communicate with homeworkers. Such communications all too frequently are ignored at conventional work sites—to ignore communications in the case of homework may have negative motivational consequences.

## Social Interaction

Work is a social activity with the potential for frequent contacts with subordinates, coworkers, superiors, and others. Such social interactions can satisfy a worker's needs for affiliation. These interactions are influenced considerably by work location. Compared with conventional work sites, the home is socially iso

lated, at least in terms of face-to-face contacts with coworkers. Telecommunications technologies can provide substitutes for face-to-face interactions, but the extent to which these substitutes provide satisfaction levels comparable to those supplied by face-to-face interactions remains largely unexplored. Substitutes for work-related interactions, however, can be found in the home. Interactions with family members and friends outside of work can satisfy affiliation needs. The efficacy of such substitution, however, is open to question. It probably is safe to conclude that the employee working at home is relatively deprived of satisfactory levels of social interactions. If this conclusion is correct, it is not only the employee's needs for affiliation that go unfulfilled. The opportunity to learn "appropriate" role behaviors, directly or indirectly, from others at work is hampered as well.

What can employers do to offset the negative consequences of the limited work-related social interaction encountered by homeworkers? Available alternatives involve encouraging face-to-face contact among employees. Whatever the form, these interactions are intended to help the home-based employee establish social ties at work that help fulfill affiliation needs and other useful functions. An employer of home-based workers might consider a mentor program, which would assign more senior colleagues to newly hired home-based employees to aid them in adjusting to their new jobs. The mentors would teach the home-based employees the organization's informal norms and provide social support. Like any alternative approach, such a program would have to be evaluated in terms of the benefits accrued versus the direct production time lost.

### Social Status

Status is the ranking of people in a social system. It influences two needs: the need for affiliation, and the need for personal growth and development. In the former case, an individual's status helps determine with whom he or she communicates and the direction of those communications. Persons with high status have a greater number of options in this regard and have more communications directed to them. In the latter case, a person's status at least partially reflects achievements and can be used by an individual to gauge the level of his or her personal growth and development.

One's job or occupation is a principal determinant of status. Some aspects of a job that contribute to status include (1) the skill or knowledge required to perform the job, (2) rank, (3) wages, (4) seniority, and (5) the status of one's associates.[7] Whether working at home contributes to status is an unanswered question. The answer probably varies with employers. In this respect, symbols perpetuated by employers are important because they denote status. The symbols used by employers include titles, offices, and furnishings, and perquisites such as a personal secretary, a car and driver, and access to executive dining rooms. Clearly, the availability and meaning of some of these symbols vary according to work location. Take the case of offices and their furnishings. Offices signal higher status if they have fewer occupants, are larger, have more windows, and are better furnished. But what do these features imply if they are supplied by the employee working at home and not the employer and are not as readily apparent to the employee's work associates as they would be if the employee were located at a conventional site? It can be concluded that the status implications of a home-based employee's office are less potent than those of conventionally located coworkers.

The same case can be made for other status symbols; thus, the home-based employee is handicapped to a degree by work location. This disadvantage might be overcome by supplying the home-based employee with nontraditional symbols of their attained status. These might include the number and type of employer-provided telecommunications devices and the people to whom those devices are linked. Regardless of the symbols used, it is important to recognize their motivational relevance and the effect of working at home on their availability and meaning.

## Wages

Wages are probably the most important form of motivation because of the role they play in satisfying the greatest array of human needs—economic support, job status, social affiliation, and personal growth and development.

This analysis is based, in part, on the assumption that employers do not vary their compensation policies as a function of work location. Given this assumption and the relative importance of wages, it can be concluded that the impact of working at home on the motivational bases of work is exceedingly limited. As long as

employers do not vary their compensation policies, this conclusion is sound; however, employers may choose to base a homeworker's compensation on criteria different from those used for conventionally located employees.

Should they do this? Clearly, the answer is no. Money motivates high performance levels if it is allocated in an equitable manner contingent on job performance.7 Compensation policies based on these findings will prove to be effective regardless of work location and thus should not vary by location. In a very general and limited sense, wages can vary legitimately because of homework; this variance is more attributable to employees than employers. For a presumably small group of individuals the opportunity to work at home is an opportunity to earn wages not otherwise available. Some people, for a variety of reasons including family responsibility and health status, cannot work at a conventional site. In such cases the motivation of homework wages would be quite powerful and might attract new individuals into the labor force. Further, for many individuals, homework may be less costly than working at a conventional site, and real income levels may be enhanced. Money saved by working at home could include dollars spent on a work wardrobe, commuting, and meals. On balance, it appears that working at home has no negative motivational implications and might, in a limited sense, have some positive ones in terms of the available wage levels.

## SUMMARY OF EFFECTS

In terms of motivation, working at home has some advantages and disadvantages. It appears to have a marginally positive impact on two motivational bases of work: expenditure of energy and wages, and a potentially negative impact on three others: the production of goods or services, social status, and social interactions. It appears that employers can act to mitigate the potentially negative consequences of the first two. Taking into consideration these potential actions and the motivational dominance of wages, this analysis suggests that while working at home will have some impact on the motivational bases of work, it will be minimal. People do differ in preferences, and these individual differences will influence the nature of the relationship between work location and the motivation.

## CONTINUITY, CHANGE, AND MOTIVATION

On balance, the effects of homework on motivation will not be profound. To some, this may be a welcome but unexpected and therefore questionable conclusion. It should be. The empirical data necessary to ascertain the impact of homework on the motivation to work are not available. Cooperative efforts among employees, employers, and social and behavioral scientists are required to produce that data. The thoughts presented here may serve to isolate some of the particular issues that need more research. It has been predicted that the results of such research will indicate some, but not considerable, influence of homework on the motivational bases of work, and that these findings will be questioned due to their unexpected nature.

People have come to expect change, not continuity. They also expect that technological advances necessarily produce significant and immediate social and psychological changes. In the current instance, attention has been focused on technology facilitating work at home and the effect of working at home on motivation. History, however, suggests considerable continuity rather than change as a result of a shift to work at home. The Industrial Revolution brought with it a movement from work at home to what are today considered conventional sites. Historians have hypothesized that this shift contributed to the demise of the so-called work ethic in America. Recent historical evidence, however, presents a more complex picture. D. T. Rodgers (1978)[8] has convincingly argued, "From the restless industrial workers of the nineteenth century to the hard hats and survey respondents of the twentieth, the tension between pride in one's job and estrangement from it has a long and enduring history" (p.180).

More generally, D. Yankelovich (1981)[9] has observed, "In American life, continuity and far-reaching change do coexist with each other" (p. XVII). Moreover, W.R. Nord (1982),[10] in discussing the future of the study of employee behavior, has asserted, "Many of the changes that will occur can be better anticipated and understood when a strong prevailing wind of continuity is assumed" (p.946). My analysis argues that continuity in the motivational bases of work will coexist with the shift toward work at home, and that the assumption that this continuity will occur will help in the adjustment to homework.

Thus, some anticipated changes in the motivational bases of work may occur with a shift to work at home; however, most of the negative consequences of these changes can be counteracted. Necessary strategies should be formulated now and then built upon the forthcoming empirical data required to ensure their success.

## NOTES

1. Vroom, V.H. Work and Motivation. New York: Wiley, 1964.

2. Aldag, R.J. and A.P. Brief. Task Design and Employee Motivation. Glenview, Ill.: Scott Foresman, 1979.

3. Campbell, J.P. and R.D. Pritchard. Motivation theory in industrial and organizational psychology. In M.D. Dunnette, ed. Handbook of Industrial and Organizational Psychology. Chicago: Rand McNally, 1976.

4. Weber, M. The Protestant Ethic and the Spirit of Capitalism. London: Allan and Unwin, 1930.

5. Scott, W.E. Activation theory and task design. Organizational Behavior and Human Performance, 1:3-30, 1966.

6. Hackman, J.R. and G.R. Oldham. Development of the job diagnostic survey. Journal of Applied Psychology, 60:159-170, 1975.

7. Aldag, R.J. and A.P. Brief. Managing Organizational Behavior. St. Paul: West, 1981.

8. Rodgers, D.T. The Work Ethic in Industrial America 1850-1920. Chicago: University of Chicago Press, 1978.

9. Yankelovich, D. New Rules: Searching for Self-Fullfillment in a World Turned Upside Down. New York: Random House, 1981.

10. Nord, W.R. Continuity and change in industrial/organizational psychology: Learning from previous mistakes. Professional Psychology, 13:942-953, 1982.

# Use and Misuse of Workstations at Home

Dennis Chamot and John L. Zalusky

Computer technology is central to work reorganization plans now being instituted throughout our economy, and in many other countries as well. Whether the focus is on robots and automatic materials transfer in factories, desktop computers and word processors in-offices, laser scanners and automatic warehouses in retailing, or customer-operated equipment in banks, the very nature of work is being redefined.

From the beginning of the first industrial revolution, manufacturing has been characterized by continuous technological change. Machinery can always be made more efficient, and production processes can be improved. The same has not been true of office work. There was a very long gap, for example, between the adoption of typewriters and telephones as standard office equipment and the invention of the photocopier. For many decades office work changed little and the tools available to office workers—whether clerical, professional, or managerial—changed hardly at all. An office worker of the 1950s or 1960s would not have been all that uncomfortable in an office of the 1920s.

Today, office equipment and office work are undergoing rapid

Dennis Chamot is associate director, Department for Professional Employees, AFL-CIO. John L. Zalusky is an economist, Department of Economic Research, AFL-CIO.

change. Many of these developments have not yet been fully digested, in a labor relations sense, but it is clear that office work is becoming more and more electronic. And an inherent characteristic of electronic work is that it becomes portable.

The requirement for office workers to have physical access to files and other support devices is disappearing. Some already use available technology to do part of their work away from their offices; some do essentially all of their work at home, connected to a central facility through telephone lines. So far, however, the number of people and firms so engaged is extremely small. It is also undoubtedly true that there is a strong element of predisposition and self-choice among today's electronic homeworkers. For these reasons, generalizations based upon this very limited experience should be approached with great caution. There is no justification for simple extrapolation to a future in which large numbers of people work at home because the employer insists upon that arrangement.

So, while the results of recent research may be of some interest, it may be more helpful at this point to examine historical precedents and current labor-management and economic considerations. Assuming there is a trend developing within the business community to think about electronic homework arrangements, we should search for problems that might arise now so that plans can be devised to avoid them.

Many of the potential benefits electronic homework offers to employing organizations, under current legal and economic conditions, are fairly obvious. They include reduced overhead costs resulting from a need for less office space; reduced capital costs, especially if homeworkers furnish their own terminals; the possibility for greater managerial control; and the expectation that individual productivity might increase. Clearly, businesses would have no interest in this concept unless they expected some real economic advantages.

Computer technology also offers significant benefits to employees, but the benefits may well be enjoyed by people other than those who suffer the problems. To properly assess these effects, it is necessary to divide the potential work force into two categories.

The first category includes entrepreneurs, executives, administrators and other managers, and some professional employees. Except for the small group of true entrepreneurs (many themselves involved in developing computer software), everyone in

this group works in a traditional office and does only part of his or her work at home. These people *choose* to do some work at home primarily for their own convenience. They are salaried and receive the same benefits customarily enjoyed by their coworkers. They would expect to receive normal salary advances and to be considered for promotions at appropriate times.

The second category is potentially much larger and includes clerical employees, other support personnel, and some professional employees. If electronic homework becomes widespread, this group will be characterized by the fact that they are *required* to work at home for the convenience of the employer. Indeed, once this form of work becomes entrenched in corporate planning, office space will be designed to accommodate only those workers whom management desires to have on the premises. All other work will be done elsewhere.

The history of past experiences with industrial homework in this country should make us very sensitive to the range of abuse within this second category. Since the social and economic conditions that led to previous abuses persist today, there is no reason to assume that computer homework will be immune. Primarily out of the desire that the repugnant practices of the past not be repeated, combined with a belief that protective standards would be impossible to enforce, the Fifteenth Constitutional Convention of the AFL-CIO, held in October 1983, passed a resolution titled "Computer Homework" (see Appendix C). It concludes:

> RESOLVED: That the AFL-CIO calls for an early ban on computer homework by the Department of Labor as a measure of protection for those workers entering the market for the fastest-growing occupation in the United States.

A ban on industrial homework done through computer terminals may be viewed by some as "arbitrarily depriving the homeworkers of the use of his property and personal liberty." In fact, this is the language of a New York State appeals court judge in 1885 when he set aside the first law limiting homework. That same argument has been repeated in every forum considering the abuses of homework, but it has not been persuasive. Many states and the federal government have placed limits on homework. The question is not whether there is evidence that computer homework is abusive (how many exploiters cooperate with academic researchers?), but whether we can guarantee that it will not follow

the pattern set by other forms of homework and lead to the abuse and exploitation of women, children, minorities, immigrants, and even men. It is better to learn from the past rather than await the appearance of new horror stories as the electronic homework system begins to exploit the weak.

Agitation against industrial homework began a half century before the founding of the American Federation of Labor, while slave labor was still widespread. It is hard to believe that this economy found the two systems economically competitive, yet it did and the conditions were appalling. In 1829, for example, Matthew Carey included in his "Free Trade Advocate" the plight of 20,000 homeworkers in the New York, Boston, Philadelphia, and Baltimore needle trades.

Among the earliest examples of industrial homeworkers were glove markers. They began using hides to make gloves for their own use. Jobbers found wider markets for the work and factories followed. This development left the tedious work to be performed in the home and shifted control away from the glove maker, who became dependent upon the industrial supplier for work. A variation of this process involved Parisian craftsmen who founded the artificial flower industry in New York shops in the late 1820s. Increased demand and competition resulted in a cheaper product being produced in homes. Movement of the handwork out of the craft shops gave the shopowners, as contractors, control over the labor and product markets. The same experience occurred somewhat later in the jewelry, doll, and similar industries.

At the turn of the century social reformers like Jane Addams and Lewis W. Hine called attention to child labor practices and the miserable conditions found in industrial workshops and sweatshops. Home workshops were considered particularly insidious because of the difficulty in devising and enforcing suitable legislative controls. Fundamental laws governing basic working conditions were being undermined. Individual homes became work centers for women, their children, their neighbors, the neighbor's children, and even unemployed husbands. The family owned one or two sewing machines, and work was distributed to them by "manufacturers." In fact, many of these homes became satellite factories.

Health and safety hazards and the misuse of child labor became issues of great concern to state and federal governments. It also became clear that laws designed to control minimum wages and

hours of work were easily subverted by unscrupulous manufacturers who sent work out of controlled factories to remote home sites. Other manufacturers were forced to follow suit to remain competitive. Jobbers and other middlemen affected the process of labor and work distribution. It became more difficult to obtain accurate records of hours worked, wages paid, and the safety and health condition of workplaces. As a result, basic standards of safe, fair employment became less enforceable.

What began as reasonable opportunities for those who preferred to work at home evolved into no other work opportunities for many. Poor working conditions and exploitation of the widely dispersed homeworkers became the norm for whole industries. The argument of personal freedom and liberty was meaningless for workers dependent on jobbers.

The price per bundle of work (piecework standards) sent to homes dropped with the arrival of each new group of immigrants or downturn in the economy. Farm families in Pennsylvania competed with tenement dwellers in New York for the same scarce work, keeping earnings down. A Department of Labor Women's Bureau study reported earnings of homeworkers in 1932 as low as $1.25 per 42-hour workweek. In 1983 dollars that would be less than 25 cents an hour.

Child labor, hours of work, minimum wage, and even consumer protection laws passed by various states were impossible to enforce as work moved back and forth between home and factory. Eventually, 19 states, the District of Columbia, and Puerto Rico passed laws limiting or prohibiting industrial homework. These became less important after the passage of the Fair Labor Standards Act (FLSA) of 1938, a law giving the Wage and Hour Administration the authority to regulate or limit homework by order as a condition of enforcing wage and hour regulations. Most of the limits were adopted in the early 1940s, and with the exception of knitted outerwear, remain intact. Even so, concern has increased in recent years as cases of abuse have surfaced again in New York and other urban centers, often involving undocumented foreign workers.

Many of the elements that in the past contained potential for exploitation of homeworkers exist today for electronic homework: availability of worker-owned equipment, a large labor force with the requisite typing skills, product and labor markets that can become very competitive, and an inability of homeworkers to organize or achieve control over their work.

The AFL-CIO observes that some current practices are already beginning to follow the historical pattern of abuse. Anecdotal evidence suggests that clerical workers and data processing clerks who do their work on terminals in their homes are paid less than comparable office workers and are given fewer or no benefits. A *Business Week* article (May 3, 1982, p. 66) contains the following statement:

> . . .Aetna plans to pay telecommuters by the project and to use them only for "peak work," leaving them without a regular salary. They will also be ineligible for health and pension benefits.

Another example (*The Nation*, April 2, 1983, p. 390):

> For the past five years, [Ann] Blackwell has been working at home . . . as a participant in what Blue Cross calls its "cottage keyers" program. Blackwell puts in an average of 50 hours a week at the terminal, mostly while her two children, aged 7 and 13, are at school; but when she is behind quota she works at night as well. She is paid 16 cents per claim, each of which requires about 90 seconds to process. By completing about 2,000 claims a week (the company requires a minimum of 1,200), she nets about $100—after deductions for taxes and equipment rental charges paid to Blue Cross. That is for a 50-hour week, with no paid vacation time, no paid sick leave and no fringe benefits.

We do not believe that these anecdotes necessarily prove that exploitation is widespread. Advocates of computer homework can provide their own anecdotes about cheerful and satisfied homeworkers, which, too, do not prove that it does *not* exist. But problems have arisen already, despite the small number of people studied by various researchers, and some general trends are being established.

Steven S. Kawakami reviewed the literature on electronic homework and surveyed 11 companies and several government agencies. One paragraph of his report* in particular neatly sums up the main issues:

> . . . (T)he traditional differentiation between clerical workers and managers/professionals in conventional offices is apparently being repeated in home-based teleworking projects. Managerial and professional homeworkers tend to be highly paid, possess high status, enjoy payment on a salaried basis and substantially all fringe benefits, are subjected to a low to moderate amount

* Electronic Homework: Problems and Prospects From a Human Resources Perspective (report for tutorial seminar LIR 494), Institute of Labor and Industrial Relations, University of Illinois at Urbana-Champaign, September 7, 1983.

> of supervision, and are usually provided with all necessary equipment and materials by employers. By comparison, the clerical homeworkers studied here receive considerably lower pay and less status, are paid on an hourly or incentive basis, sometimes lack certain insurance benefits, may be supervised much more closely (including through on-line computer monitoring), and sometimes are required to pay for some or all of their own equipment and work materials.

If electronic homework becomes widespread, it will occur only because current law gives employers a great economic advantage by allowing them to shift costs to the employee and to lower wage rates and benefits. For the simplest work—basic key boarding and data entry—the move has already begun to travel beyond our borders to low wage countries. The portability of electronic work allows the electronic cottage to be very far away indeed.

Competition in the marketplace should not result in a contest to see who can pay the lowest wages. That approach is basically unfair and, more importantly, you can't win at that game—there are always people in poor areas who are willing to work for less. Instead, a far healthier approach for all concerned is to compete on the basis of better products, more efficient operations, and better use of people.

Unfortunately, business decisions are not always made to provide the maximum social good. The 1983 AFL-CIO convention resolution calling for a ban on electronic homework, for example, followed a statement issued over a year earlier by the executive board of the Service Employees International Union (SEIU), which concludes:

> SEIU believes that leaving the [computer homework] industry unregulated will have a devastating impact on the well-being, wages, hours, and working conditions of home computer workers.
>
> Because enforcement of wage, hours, and safety standards in the home is absolutely impossible, we call for an early ban on computer homework by the Department of Labor as a measure of protection for those workers entering the market for the fastest-growing occupation in the United States.

Some might say that a ban is very improbable in light of potentially widespread support for homework from managers and professional employees who see many personal benefits in telecommuting. They also argue that the overall economic imperative is too strong to oppose with an outright ban. And finally, there is a strong division of opinion among members of one of the largest group potentially affected—women with children or other home

bound obligations—many of whom would be attracted to electronic homework even under clearly exploitive conditions.

Although there is a certain amount of persuasiveness in each of these arguments, the difficulty of the task is no excuse for abandoning the responsibility to protect the best interests of working people. If a complete ban is not implemented, what else can be done?

First, there is probably no realistic way to prevent managers from indulging in workaholic tendencies, if they so desire, by working additional hours at home. Many already do, and the presence of a computer terminal just adds a minor new wrinkle.

Professional employees, on the other hand, create a more complex situation. They are, by definition, employees and not managers. As time goes on, more professional employees will find themselves doing much of their work on computer terminals, and some may welcome the flexibility of occasional work at home. There should be no problem with those people who choose to work at home, completely voluntarily, simply as a convenience. However, how can we assure that the work done at home is not necessitated by an increased work load, making it impossible to perform the job routinely during a normal work schedule? If homework becomes an available option, the employer may create more work to fill more time.

As a first approach, electronic homework could be banned through use of the FLSA regulations. Currently, executive, administrative, and professional employees are exempt from coverage, so the ban would apply to clericals but not to managers or professional employees. The AFL-CIO's Department for Professional Employees favors the elimination of the professional exemption to the FLSA. That would still leave managers and executives exempt. This situation is still not entirely satisfactory because it does not deal adequately with the needs of professional employees.

To better serve the growing number of employed professionals, as well as the even larger number of clerical employees, new ways to minimize the negative effects of telecommuting on employees must be considered. A combination of legislative and collective bargaining approaches will be needed, covering such areas as:

1. Pay and benefit protections. Homeworkers must receive no less than office workers doing comparable work.
2. Union security measures. Automatic inclusion of telecom

muters with preexisting units at the employer's office facilities, or adequate inclusion of homeworkers in organizing campaigns.

3. Import restrictions on clerical work and data processing done overseas for domestic employers.

This is a minimal list, but those familiar with American history, as well as with the current state and federal labor laws, will recognize the enormous difficulty of enforcing such measures even if the legislative or collective bargaining framework could be put into place. How, then, can we prevent a repetition in electronic homework of the abuses that occurred so many times before in other industries using homeworkers?

Anything short of a ban would be difficult to enforce once abuses became common. The time to act is before the unscrupulous elements in our society force the rest of their industries to follow their direction. Business leaders must make a strong effort to satisfy the need for employee equity, even if that occasionally conflicts with the desire to maximize profits. If individual businesses shirk that responsibility, or claim they can't afford it, then the fears based upon historical analysis will be confirmed.

The AFL-CIO is on record for an outright ban of electronic homework. We will work toward that goal unless strong evidence is presented to us that the business community is ready to help develop other workable mechanisms to protect employee rights. In either case, we are unwilling to see history repeat itself.

# Discussion: Labor Issues

Chaired by John L. Zalusky (AFL-CIO). Other participants include Greg Geisler (G Geisler Group), Dennis Chamot (AFL-CIO), Arthur P. Brief (New York University), Donald Elisburg (Connerton, Bernstein & Katz), and members of the audience.

## HOURS AND WAGES

Q: What impact do wages have on employees who work at home?

Geisler: Let me cite the case of Ann Blackwell, a Blue Cross homeworker. She works an average of 34 hours a week, is paid 20 cents a claim, and her average hourly take-home after deducting her cost for the terminal is $12.18 an hour.* Her in-house counterpart works an average of 37.5 hours a week and has a take-home, after adding her additional benefits, of $7.59 an hour. Ann Blackwell, along with the other cottage keyers, is quite content with her situation. In fact, the average cottage keyer works 29 hours a week and makes a take-home wage of $11.20 an hour after the deduction for the terminal.

We were having difficulty analyzing why our keyers at home were more productive than those working in-house and why the homeworkers had a lower rate of error. Perhaps this higher pay is the motivator.

* These figures are valid for November 1983.

Zalusky: Mr. Geisler, most production or piecework standards are based on some concept of a "fair day's work"—normal performance. What performance level was used to establish the rate of 20 cents per claim? And, how does that compare to the standard used for in-house employees? Put another way, how many claims per hour do you expect of them?

Traditionally, the problem with piece-rate standards has been that production must be divided by hours worked to yield percent performance and earnings. Workers have too often been pushed to work themselves to death or cheat on the hours they report on standard to show an acceptable level of performance. Workers now fudge reported hours on production standards for income or job security reasons, and I believe it is virtually the rule rather than the exception at home. Hours worked are better controlled in an office or factory; the result is an apparent increased productivity for homeworkers relative to those in the more controlled environment. How is one to know that the homeworkers you described are not working many more hours than reported and that is what is causing the high productivity you have reported for them?

Geisler: At Blue Cross/Blue Shield, we have an easy way of measuring. A claim is either keyed or it is not. Keyers cannot falsify the number of claims they have processed per hour per day. We may have an advantage over the U.S. Army ALMSA program, since it is very easy for us to quantify work done. The standard is 65 claims per hour. We expected our cottage keyers to meet 85 percent of that standard because of the archaic equipment they have; the opposite occurred. They are producing at a much higher rate, although even at the 85 percent standard, they would still be well above our minimum-wage guideline.

Zalusky: But, at 65 claims per hour being 100 percent performance for those inside the office, and they earn $7 per hour, then to produce $12 per hour the homeworker must be working at a pace far beyond the normal range statistically expected. Is there a different production standard translated into a piece rate for homeworkers?

Geisler: We do not pay the piece rate to in-house employees—I do not think it is standard for any company to pay full-time employees on a piece rate. Our salaried employees make an average wage of $11,250 whether they do 50 claims a week or 5,000.

Zalusky: How do you measure hours of work? Is it the time on the terminal?

Geisler: We are not concerned about hours of work at the cottage level, although they are reported. We were concerned that keyers could be working 80 to 90 hours a week. The opposite is true. Homeworkers work less per workweek, and produce more than their in-house counterparts. This very satisfactory situation may change in time, but at the moment we are very optimistic.

Zalusky: When industrial engineering standards are set, they include an allowance for personal time, delays, coffee breaks, etc., which usually amounts to 9 to 15 percent. So the original expectation of 85 percent for keyers might be based on similar figures. If you measure based on the time actually on terminal and not the prep-time that goes into getting ready to go on terminal, that might make the difference.

## PROTECTING THE WORKER

Q: Mr. Zalusky, if the ban your union endorses is not a radical approach, since it may cut employment opportunities for some people, how do you see the future of homework? From the union's point of view.

Zalusky: The labor movement supports a ban on electronic homework because we see in place today all the economic conditions that led to the exploitation of homeworkers in the past. Homework has often evolved from an opportunity to work at home to no alternative but homework for many and an abusive situation for most workers.

By 1932 homework conditions were so poor that when the National Recovery Act was passed it prohibited homework in many industries. The Department of Labor surveyed 171 families that had worked at home. This study found that 86 percent of those that had lost their homework employment because of the ban were pleased and liked their factory jobs better than homework. The ban on homework caused jobs to open up in factories where there were none before.

Labor sees a potential for abuse of homeworkers and job losses in customary workplaces. With this country's history with homework the burden of proof lies with those who wish to encourage it for electronic office work. Employers who want to use it should be able to prove that workers and the public will not be injured—kind of an environmental impact statement. The burden of proof should not be on those who oppose it because evidence of worker injury will not be available until it is a massive

problem as it was in the past. We do not want to wait for the injustices to reappear.

Chamot: One of the problems in looking at electronic homework today and the historical evidence for abuse of industrial homework is that today we are dealing with more than one kind of worker. The abuses of the past were suffered primarily by people who were powerless, unorganized, with no bargaining power, and at the lower rungs of the economic ladder. You have people like that today and you also have today people at the very top of the economic ladder. There are professional employees and managers who have offices somewhere and who want to use a computer terminal at home out of convenience. This poses a very different situation from the cottage workers who were so abused a century ago.

The call for a ban on homework is based upon the historical background of abuse and the difficulty of enforcing standards in the home. If you do not have a ban, there must be some mechanism available for protecting against abuses.

Equity is an important concept, and involves the potential economic abuse of homeworkers. That's really the bottom line. Some unscrupulous employer will recognize, as some may have already, that they can pay lower wages and they don't have to pay benefits. Based upon American industrial history, one does not look with a great deal of confidence that this is going to be ignored.

Brief: We have a tremendous body of social legislation available to us today that we didn't have in the early part of the twentieth century, so I think we're comparing apples and oranges because of that social legislation.

I also question the argument that there is economic motivation to create inequity. Rather, I see an economic motivation to maintain equity between the two work forces—homeworkers and in-house workers. Over a period of time it is not sound management practice to treat those work forces differently. That is bad management, and bad economics. There may be a short-run gain in exploiting a work force, but in the long run, it is a poor way to tackle the problem.

Elisburg: There are clearly some groups of people who have no other employment alternatives, including the disabled, the elderly, and homebound parents. Homework does offer these people work opportunities that they simply could not consider before.

On the other hand, the past abuses of homework seem ready to

be repeated right now. We were all shocked to find a couple of years ago, when everybody thought homework had disappeared, enormous numbers of illegal aliens in urban areas who were in sweatshop situations. Everyone thought sweatshops had disappeared. The idea that a sewing machine is different from a terminal is false.

Q: What happens to office workers being displaced through office technology even at the office?

Chamot: The general thrust of a lot of modern technology, not just office technology, is affecting the paraprofessional level, the engineering assistants, the laboratory technicians, etc. The effect is to automate the jobs out of existence, or to shift the functions to professionals or managers. People have argued whether or not clerical jobs are being enhanced or diminished. Managers will use more of the advanced technology and they can do more clerical chores themselves: type their own reports, and draw their own graphics.

As optical character reader equipment comes into more widespread uses, the need for bulk typing will be reduced, affecting clericals and data entry people. We're really only at the beginning of these trends.

Q: Isn't the call for a ban on homework simply saying that the status quo is what we want to preserve? That anything else has a potential for exploitation?

Chamot: Calling for a ban is an expression of extreme concern, based upon 150 to 200 years of economic history, based upon reports of a few abusive situations today, and based upon a strong belief that you don't replace one form of exploitation with another.

The history of this country argues strongly that abuses will occur. If nothing is done to prevent them, abuses will occur as a result of the current regulatory climate, lack of sufficient enforcement personnel in the Department of Labor, and the lack of money on the part of the state and municipal authorities.

Zalusky: Calling for a ban is saying to management, "Come forward with some idea of what your protections are going to be." We know that some employers are not going to volunteer protections, and others in very competitive situations are not going to want any protections for workers. Professor Brief makes the good point that managers who want to manage well and keep their work force are going to treat people at home as they do those in the office.

The problem stems from the assumption that employers want

to keep their employees. This management philosophy runs on a continuum—some employers desire or are indifferent to high employee turnover while at the other extreme there are employers that promote from within, seek to provide employment for life homework, and try to retain employees through sound benefit plans. The recent growth in employee leasing by employers marks the one extreme on this continuum. Additionally, this point also assumes that the user of homework will be the employer. That has not generally been the case in the past—there have been brokers that locate homeworkers and users' products for them to work on. This occurs today in a small way in stuffing and addressing envelopes.

As the work is deskilled and workers can be replaced easily, wages and benefits will be pushed down to the lowest possible level.

Worker productivity is not really as important in this discussion as many would like to make it seem. The employer is concerned with cost per unit of production. That can be achieved either by improved productivity or lower wage and benefit costs. With homework the evidence to date is that the latter will be the case—even Blue Cross is not providing fringe benefits to its homeworkers.

Finally, there is the profit motive—there will be profit in finding the homeworkers willing to work for the least in wages and there will be agents and employers willing to do this just as there are now firms using and providing employee leasing, temporary help, and farm labor.

Then there's profit. And if there's profit, you're going to find employers who are ready to exploit it.

Q (*from the floor*): Over the past 30 years, the Federation of the Handicapped in New York City, with over 200 homebound, severely disabled people, working at home as its employees, has pioneered the homework concept. Some 15 years ago, legislation was approved by the President, and the Fair Labor Standards Act was amended so that an apartment, a residence, or a home was allowed as an extension of an organization like the federation. Five of the major unions responded at that time because the legislation had to appear in the *Federal Register* to become law. The unions were violently opposed. In the 15 years since then, the federation has been successfully monitored by the Department of Labor. Considering the union support of a ban on homework, has there been any change of view regarding the severely disabled who are home-based and homebound, working for closely

monitored organizations like the Federation of the Handicapped?

Zalusky: The employment of the handicapped in a home setting is not a mainstream issue. It has normally been exempted through sheltered workshops and there have been efforts to make employment opportunities available to them.

Q: In other words, you view this on a positive level?

Zalusky: I would see it as positive.

Q: What constitutes part-time work? At what point do the Fair Labor Standards Act's wage and hour rules apply?

Elisburg: Part-time work is a concept not contained in the Fair Labor Standards Act. There is no *de minimus* rule under that statute. If an employee works half an hour or a quarter of an hour, he or she better be paid at one-half or one-quarter of the minimum wage.

The concept of part-time has been built up in the industrial setting principally as a way of avoiding certain kinds of fringe benefits; for example, medical plans and, formerly, pension plans. In terms of the basic labor protections pertaining to Social Security, minimum wage, overtime, occupational safety, and health protection, there is no differentiation between a full-time worker and a part-time worker. The hour is just as valid wherever you are.

From the standpoint of the Fair Labor Standards Act, whether fulltime or part-time, you are required to be paid the same minimum wage, same overtime, have the same recordkeeping, same everything. The part-time concept appears to be a way of limiting things like fringe benefits that are not covered under the other labor protective statutes.

Q: Some experts here have made uncomplimentary comments about trying to do business cheaply. What is the future of business if it does not figure out ways to operate a little more cheaply?

For example, an American man may wear a suit made in Hong Kong, a shirt from Taiwan, shoes from Romania. These countries have learned how to make things cheaply. Clearly, somebody somewhere may be exploited so a company can save money. But somebody right here in this country is unemployed and on welfare.

Zalusky: Our nation's problem with employment and unemployment is such a broad political issue that whether people work at home at lower wages or not is not going to have much of an impact. For example, the balance of trade and overseas competition

problems are not going to be solved by such self-help solutions as wage cuts or homework. The value of the dollar against the currencies of our major trading partners has increased 45 percent over the last two years. Wage costs are about 50 percent of total costs, so to be back in the same competitive position we were in two years ago workers will have to increase productivity or reduce wages by more than 80 percent. Whether these workers are in-offices, factories, or at home makes little difference if one is trying to live on Hong Kong wages.

Overseas competition has been used in part as justification for doing away with or modifying many of this country's social standards, for example, the increased use of convict labor, more relaxed safety standards, environmental protections, minimum wage laws, and a variety of conditions that affect our quality of life.

This country has serious problems with overseas competition, but I don't see homework as even a small means of addressing the problem.

Chamot: There is more involved in international competition than the question of wages. Other factors help determine cost, including the abilities of management, sales people, product design, the cost of money, the cost of energy, or the cost of materials. These factors have little or nothing to do with the issue of electronic homework.

Elisburg: I think that there is a perception that American workers are pampered compared to workers elsewhere, and that we have got to do away with such treatment. No one argues about improving productivity, installing better business operations that can make people more competitive. But the issues we are talking about here concern sweatshops. If most of you who are wearing or using certain types of foreign goods from certain countries looked in the factories where those items are made you would never touch them. There is documentation in the International Labor Organization in Geneva every year showing abusive labor practices.

There is reason for concern, and I am not an advocate of banning homework. I can tell you from experience, as an administrator, of going into places in this country 3 and 4 years ago and finding 5 and 10 people to a room running a sewing machine in 1978—not 1888. That is the kind of exploitation that is occurring and that is why the unions and others are concerned. It's the company that may be grossing $10 million a year by paying workers effectively 50 cents an hour because they just arrived

from Colombia, can't speak English, and are afraid of immigration officials. That is the potential exploitation.

**Not identified:** We seem to be focused here for some reason or other on the very narrow aspect of salary. My personal experience with programmers working at home is that the salaries we are paying are approximately double what we pay the people working in-house. But that is beside the point. There is a whole level of cost control involved in not taking 8,000 people from the far ends of Long Island, Westchester County, New Jersey, and Connecticut, moving them 40 to 60 miles into the city of New York where space costs *x* dollars per cubic foot; where electricity costs are so high now that it is necessary to take out a mortgage to pay your bill.

The current work environment is an artificial one, created only because we did not have the communications capability to operate a large-scale company, with the exception of working with equipment, hardware, big machinery. That was the only reason to bring people together, other than the fact that we could not communicate over distance. Now that we can, we should eliminate that limiting environment.

Q: There seems to be a dichotomy of attitudes toward work in this country. If you are an employee, the unions try to protect you from working too hard. If you are a manager, you are lauded for being a workaholic. Work at home covers a wide spectrum of jobs, ranging from perhaps a sweatshop organization to the general manager who takes extra work home on the weekend. How are the unions approaching this? Are unions attacking the whole trend, or just isolating the group that they have traditionally defended? And if so, do unions plan to isolate them from this new, ill-defined emerging area, and then defend that particular group?

Chamot: In general, unions address the needs of nonmanagerial workers. This includes professional-level employees as well as clericals and production workers. Some professional employees have a great deal of negotiating ability and, in a sense, autonomy, some freedom of choice, which clerical employees lack. Many workers from each of these groups have joined unions to seek a greater measure of control over their work lives. We will continue to represent all of them. We favor a ban on homework because proper oversight to prevent abuse would be virtually impossible.

Q: In a very large number of cases, homework arrangements are voluntary arrangements and are to the benefit of the employee.

The unions themselves ought to take initiatives to look at opportunities to include these people and ensure that these workers

are not exploited rather than calling for an outright ban on homework.

Part-time work carries similar problems. Since part-time work is not just a matter of exploitation, but a great benefit to a great many people, would a ban really be in the best interest of labor? While there are certainly those employers who might use part-time work to exploit workers, perhaps the union ought to work for fair compensation, fair benefits, and everything else in all these cases, rather than a ban. There ought to be much more of an effort on the part of unions to explore more fully the kind of situations in which homework can be beneficial, and to work out ways to guard against disadvantages.

Zalusky: Unions strive to work out reasonable safeguards for workers against exploitation of any worker. If the issue comes down to some workers finding homework convenient or even cost-effective at the expense of others losing their jobs, working without health care, or without a living wage, then I expect unions to come to the aid of those not able to help themselves. In that context we are going to continue to pursue a ban on homework because we see it in its historical context—homework has not meant work freedom, but freedom to exploit. Market forces have driven the outcome in that direction in the past and are certain to do so again.

# Discussion: Lessons Learned

Chaired by Joanne H. Pratt, president, Allied Professionals Educational Consulting Services (APECS). Other participants included V. S. Shirley (F International), Ronald A. Manning (Control Data Corporation), Mary McDavid (U.S. Army), Greg Geisler (G Geisler Group), Nelson Phelps (Mountain Bell), Don Miller (IBM Corporation), and Nancy Shoji (American Express).

## PRODUCTIVITY

Q: How is productivity measured when analyzing the work of telecommuters?

Phelps: At Mountain Bell, we found a 48 percent productivity increase among telecommuters. Eight individuals were monitored in the trial. All had worked for a year or more in the training development arena. We began by looking at the length of time it previously took for these people to produce a quality-level course. Course quality stayed about the same, but they were able to do the course development work in 48 percent less time.

Q: How do you explain such an increase in productivity? Are the employees working longer hours? Are they working faster? Or is it a higher-quality product?

Geisler: At Blue Cross, we had some built-in bias in that we were paying our college people on a piecemeal basis and we had just

recently, say within the past year, installed standards per se on our in-house people. Although it is premature for Blue Cross to evaluate productivity at this time, it is evident that paying telecommuters on a piecemeal basis for the same work others do in-house and at a flat rate, has resulted in a significant increase in productivity.

Q: Is there a difference in the project profitability based on the number of employees on a project, such as those done by F International? Do you get a higher return if you have fewer people working on a project?

Shirley: Yes, because the shared overhead involved in setting up the project is lower for a few workers, and a smaller group is managed more easily. We find the productivity peaks with projects involving 10 or 12 people. The overhead on a very large project can be high. One of our projects, for example, involved 75 people. Project management consumed 30 percent of project costs.

Shoji: American Express worked out a monitoring system that included both automated and manual productivity measurements, giving us a fairly accurate estimate of what the work was, the volume handled, and how well it was done. Results showed the work-at-home production was actually better than in-house. Working on the basis of the type of work we give our homeworkers, the return time and the quality of work seems to make a difference.

Q: Can any of you say that the increases in productivity will be sustained?

Phelps: Our trial project lasted eight months. Toward the end of the project, we began to see a flattening and, in some cases, a dropping off in productivity increases from week to week. I wish that through the trial period we had done something that we are doing now and that is, to ask the employees to keep track of actual hours worked so we do not know if they were putting in more hours and that produced the 48 percent increase. We had decided initially not to be concerned about how many hours they worked. The output is what interested us. In asking the employees about the increase in productivity, we heard different answers. Some said they had not worked more hours in a day than they did at the office, but added that since they were not interrupted as often at home, they felt more productive. However, one individual put in (according to him) 14 to 15 hours a day and worked weekends. He had one of the highest productivity increases.

Q: How do you explain the homeworkers' willingness to work longer

hours? Did your 14-hour-a-day employee have any compensation other than the joy of work?

Phelps: Well, I think if Mike were here he would say, "Hey, I like what I'm doing," and once Mike got involved in a project like this, particularly since he was one of the first that really wanted to try a trial like this, he found it very comfortable and helpful. I don't think Mike was concerned about how much time he worked; it was the project.

Q: Most experiments used pre-selected employees. Have any empirical data been produced that show productivity gains from employees who were not already high producers, highly motivated individuals?

Geisler: Only about half the people selected to participate in the Blue Cross pilot were preselected because they were high achievers. Several of the employees were college students and coders with no prior telecommuting experience. Blue Cross trained them for the project. Their productivity was lower than those who were preselected as high achievers.

The issue of productivity may be overemphasized. As applied to clerical workers, productivity is easy to understand. But telecommuting by professionals and management people is not going to be measured by productivity gains. It is going to be measured by increased quality of work—a difficult quantity to measure.

Pratt: These comments support the finding of the APECS research, that the electronic age is turning the 5-day, 8-hour-per-day workweek into a 7-day, 24-hour-per-day work and personal week. This could make a striking change in the worker's household. What arrangements—and financial support—if any, are provided for the physical environment of the homework station? How are lighting, seating, proper storage, keyboard heights, wire management, power supplies, and static control managed?

Geisler: Blue Cross left it up to the employees to arrange the work environment.

Manning: Employees determined where in their residences they wanted to place their equipment. We did install the equipment and provide terminal cables and power interrupt switches. We did not measure correct heights.

Employees selected their own work areas. Although we did not survey the workers' families, employees indicated that their homework situation was a benefit to their family styles rather than a negative influence.

## CAREER ADVANCEMENT

Pratt: Professional and managerial employees are concerned about career advancement. Ronald A. Manning of Control Data Corporation (CDC) reports that a survey of people participating in a CDC pilot revealed that 9 employees felt that work at home would help their careers, 7 felt that work at home would hurt their careers, and 11 felt that work at home would have no effect on their careers. How can employers make sure that out-of-sight homeworking employees are being evaluated in a comparable way to on-site employees?

Manning: It is the responsibility of the managers to make sure that all workers are given equal recognition.

Shoji: In addition to equal recognition, the benefits of homeworkers should be equal to the ones of those who work in the office. Our workers are covered completely. When we decided to hire handicapped people on a permanent basis we brought in a benefits specialist who told them exactly what they would be getting. The candidate employees decided how these benefits compared with the government benefits they were receiving.

Pratt: Does the IRS permit the employee working at home to claim the expenses incurred by a home office if she or he does it voluntarily or occasionally?

McDavid: The IRS makes individual rulings about tax allowances for working in the home. Our homeworkers were told, in advance, that if they wanted to claim the extra deduction, it was up to them. They had the supporting documentation, written work agreements, and other background materials, but it was still an issue that would be decided by the IRS.

Pratt: What about security data problems in a work-at-home environment?

McDavid: Information security is not an issue unless workers are processing classified data.

However, penetration of security is always an issue. To solve the problem, remotely located employees can randomly change passwords to gain access to a system. This solution also provides automatic notification of abortive attempts to log on, so an audit can be conducted by the system itself. In general, it is not a good idea for remotely located employees to process classified data.

Phelps: There can be a concern for security when training uses sensitive, live data bases such as personnel or payroll records. Mountain Bell met that problem by using a process in which telecommuters took the data base material needed and put it in a second,

less sensitive working file. This allowed access to some live, older data, but it was on a separate file so that active files would not be damaged or violated. Also, there were serious discussions with the homeworkers to clarify their responsibility for the files and their use of passwords.

Geisler: Security is not the big problem that the media makes of it. Blue Cross works with 120 programmers; many of them work at home. The company has what we refer to as country club security. An employee flashes a card and is allowed in. There has been no concern about the need for passwords. As a result of programmers working at home using personal computers, Blue Cross managers are more security-conscious. The procedure now is to use a routinely changing password for external dial-up. This can cause problems. On Friday, for example, the password may be changed because one employee quit. Consequently, programmers trying to work at home on Monday may not know the new password and will get nothing accomplished. These wrinkles need to be worked out, but they do not make the security issue everything the press makes of it. By design, computers and programs contain enough security to keep most unauthorized people out.

Shirley: Another aspect of security, especially if you are running a commercial organization, is the need to protect files from emergency situations. What would happen to a client's business if a computer broke down or if there was a fire? Perhaps the best solution is to keep copies of homeworkers' disks somewhere else besides in the home. Duplicate records allow lost files to be recreated easily. Home-based project managers, for example, can have information that duplicates that held by regional offices.

## WHO TELECOMMUTES?

Pratt: If so many workers are so positive about work at home, why isn't there an increase in the number of employees telecommuting? Is there enough relevant work to occupy more homeworkers?

Phelps: Cost and technology are not the factors holding back the growth of telecommuting. On the other hand, management's view of the social issues can slow the trend. These issues include labor, management control, a general disbelief in the long-term potentials of the productivity gains seen so far, and disbelief in the ability to control and secure the homework environment. Changes will come slowly. Attitudes are involved, much the

same as they influenced the impact of office automation technology.

Management has a lot of work to do to catch up with technology. At Mountain Bell, work at home was common 50 years ago. The local telephone operator in many communities had a switch-board set up in the front room. Through the miracle of technology, we now put 300 operators in downtown Manhattan or Washington, D.C., at a cost of $60 a square foot.

Neither management nor the technological geniuses have made the connection with the personnel side of subsystem research, when large projects are put in place. Instead of designing with an emphasis on people, they try to do that at the end and make it work out. That is where the homework trend may fit in.

Pratt: How are personal computers (PCs) being used in business?

Geisler: A PC is quite valid as an extension of the office, especially if it is hooked into the office spreadsheets. Blue Cross has offered a personal computer acquisition program for its employees. The company has 70 IBM PCs (reclaimed from hospitals) to offer its workers. The company bought the computers at one-third off the retail price and is willing to sell them to employees at two-thirds of our costs; that means an employee can buy a $3,800 computer for about $1,500. As a result, there are a lot of people who will become computer-literate because of the Blue Cross purchase program.

Miller: In the latter part of 1979, IBM began to look at breaking away from the traditional setup involving a programmer-engineer working in the office, using a terminal accessing a large data base to develop his or her program, circuit, or chip. We were concerned that American industry would have difficulty acquiring sufficient numbers of programmers, electrical engineers, etc., in the 1980s. Studies relating to the United States showed a need for roughly 15 percent compounded growth in those disciplines during the late 1980s and early 1990s. Statistics from the U.S. Department of Labor showed the possibility of a 3 percent compound growth in the number of graduating computer scientists and electrical engineers.

IBM researchers asked, how do we make our existing electrical engineers and computer programmers more effective? Their answer was to give these workers the opportunity to have an electronic briefcase—they do not have to work at home and they do not have to work in the office all the time, but there should be a smooth continuum of their work.

IBM started with a pilot in the company's Santa Teresa Laboratory. The pilot involved 300 volunteers. That was before the advent of IBM PCs, so 18 intelligent little micros made by other companies were used in addition to 280 or so terminals with limited capabilities.

The pilot used existing security and password protection to ensure the protection of unannounced products which the participants were dealing with.

The people represented a cross section of exempt professional employees, not just superstars, with a reasonably good mix of all performance levels among the engineers and programmers. Participation was totally voluntary; IBM paid for the phone line and the equipment that was put in the home. The company did not buy furniture or rent space or reimburse employees for electrical current uses. They were surveyed before they received a home terminal to learn what they expected to gain from the pilot. The expectation of productivity gains was exorbitantly high. They were surveyed again, about six months into the pilot, and finally after about a year and one-half. In addition, we instituted an on-line query as they tried to log off in some 20 percent of all the cases. Questions were forced up on their screen, asking them how they liked that session, what were they doing, and how their family felt about their home computer work. So the pilot produced a lot of data.

All of the 300 in the pilot had workstations in the home; however, the work done in the home was not in lieu of work in the office except for about 35 individuals. These were allowed to work full-time at home, and were looked at very closely. They were marketing and systems engineering people in remote parts of the United States. They showed performance and productivity improvements of several hundred percent because they did not have to drive to the branch office.

The IBM pilot made a good, solid case for productivity improvements, more than enough to justify the cost of telephone, terminal, and associated equipment. In that pilot, IBM developed enough confidence in the security and its logistic management ability to expand the program to the rest of the company, now involving about 8,000 remote workstations.

# PART III

# THE FUTURE

# Technology Forecast

Frederic G. Withington

A number of recent technology forecasts are relevant to the cost, performance, and nature of the equipment likely to be used for teleworking.

Of prime importance is the forecasting of the price of microprocessors, which are the central components of workstations (see Figure 1). The forecast runs to 1997. That sounds far away, but the technology of semiconductors is by now so well known that, with some degree of certainty, it is possible to project quite far into the future. Figure 1 shows the cost of buying microprocessors of various sizes from their original manufacturers. The four-bit device is used in the pocket calculator; today it costs about $1.50, which is commensurate with the $4.88 cost for the sort of calculator you can buy at a drugstore. More significantly, the cost of the 16-bit microprocessor is now below the $10 level. It is the heart of the IBM PC and the Apple II and is quite powerful. The 32-bit microprocessor (with the computing power of a fairly large general purpose computer) is now entering the same scale. So far it still exists in limited quantities, but the quantities will rise and the cost will drop. Eventually, even more powerful 64-bit microprocessors will appear.

Frederic G. Withington is vice-president, Information Systems, Arthur D. Little, Inc.

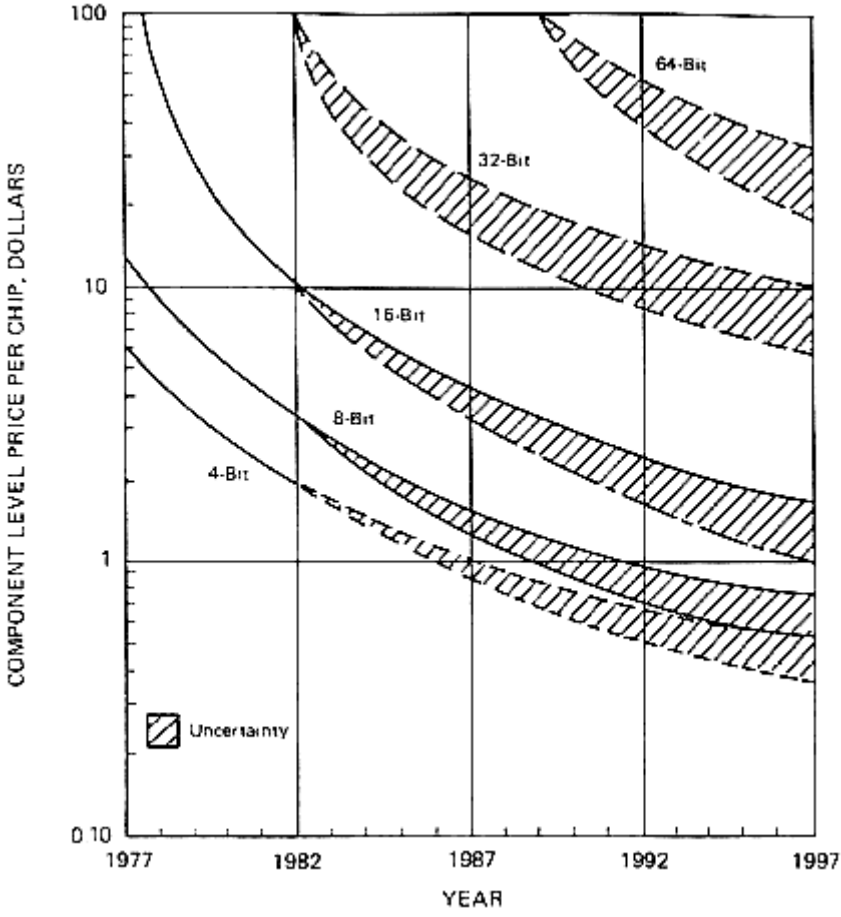


Figure 1
Median microprocessor price versus time (1,000 Unit purchase). Source: Arthur D. Little, Inc.

Figure 2 presents a corresponding forecast of the cost of file storage. An office worker will have to take home or have delivered electronically a considerable quantity of information to work with, perhaps hundreds of thousands or millions of characters. The figure shows the cost per character stored for IBM's large disk drives for the last 30 years. The points form a remarkably smooth curve that appears to taper off toward a limit. Just appearing on the scene, however, are brand new recording technologies: optical storage in the form of video disks with perhaps 100

times the recording density of existing magnetic storage, and vertical magnetic recording, which stands the little magnets up on their ends and looks at the cross section instead of laying them down flat and looking at the longitudinal section, offering 10 times today's recording density.

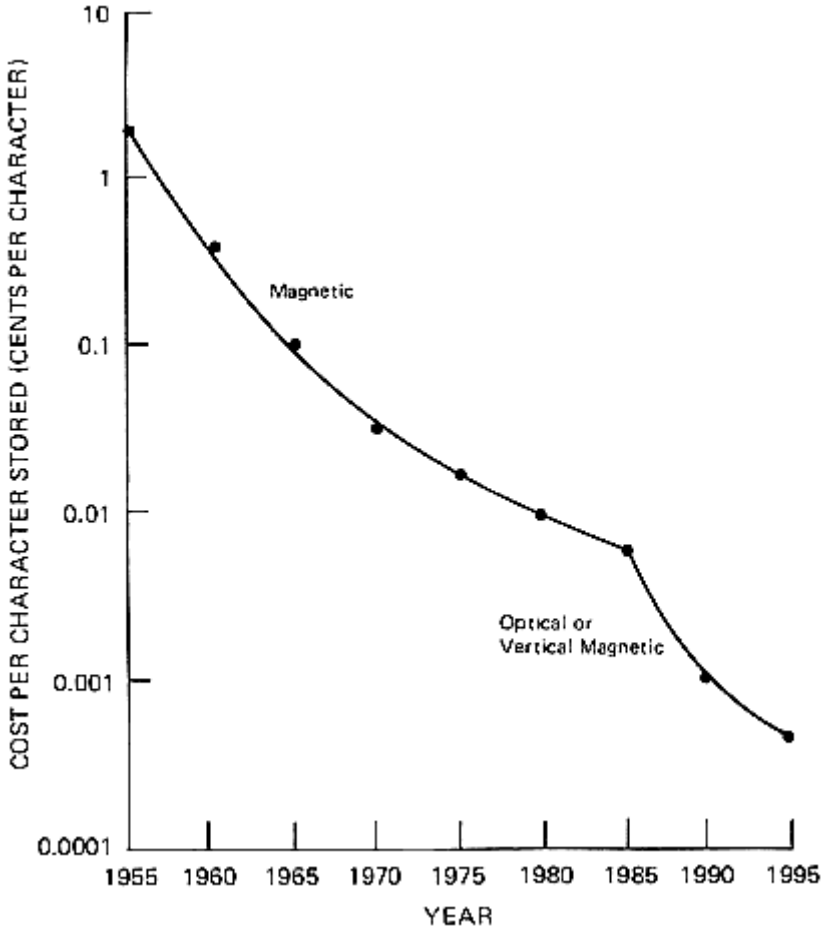


Figure 2
File storage evolution. Source: Arthur D. Little, Inc.

So, one technology or the other will keep the cost curve going down.

The home workstation of 1990 will employ these technologies along with a telephone handset and communicating capabilities.

It will not look very different from today's terminals or personal computers. The difference will be in the electronics inside; there will be great quantities of storage and computing power. These will support such services as a high-resolution display that can make any shape on a digital bit map, with perhaps 2000 × 2000 picture elements (about 20 times today's resolution) in full color.

Turning to communications technology, we find a different world. There are already mature new technologies for improved communications. Coaxial cable is used for cable television and for high-speed digital communications. The optical fiber, which is already widely used for telephone service, is also available. There is also microwave technology, low-cost transmitters and receivers that sit atop buildings or homes, and there is satellite technology. It is possible to buy for about $2,000 a home satellite receiver. (You cannot transmit with it, however; that will always be more costly.)

The problem is getting past financial and regulatory constraints to get these technologies into widespread use. The financial quandry lies in the cost of installation. If I rewire the telephone system to all your homes, I must use $26-per-hour workers to do it, and I must go into every manhole in every street, pull out the old equipment, and put in new. To rewire the entire nation's communications system, including every local loop and every connection, would be an astronomical job, costing, let us say, $100 billion, and probably much more. By the year 2050 or 2100 there will have been a universal conversion from copper wire to fiber optics for the nation's entire telephone network, so that every telephone will have television bandwidth. But that is so far away that it is not a concern to us now. In the meantime, we face the problem of affording the available new technology.

Since we will be using standard communicating microprocessors, we can put in software that enables the devices to do many different things, as we can with a personal computer today. Teleworkers will be provided with the appropriate software to do the company's business, but it will also be possible for them to buy game software, to do word processing, to figure the family finances, and to use expert system software to prepare the IRS Form 1040. Consumers as well as workers and employers will have many reasons to acquire this device.

A telephone handset will be on the workstation in order to have one less box on the desk and one less keyboard. We will not have

voice recognition, although there will be some slow and limited improvement in voice capability in these systems, which, perhaps, will be of some significance in terms of the increasing breadth of work that can be done remotely.

The device will probably cost not less than about $500 because manufacturing costs are limited by factors that are either subject to inflation or are not dropping. The manufacturer must provide a case to shield the device that fits the Federal Communication Commission's emission requirements. The keyboard must be convenient and pleasant to use. There has to be a display assembly, either a cathode ray tube with a high voltage supply or a flat panel, and that will remain fairly costly. Finally, a power supply is needed to drive the whole thing, and it contains heavy metal. Thus there is a certain minimum price for manufacturing the basics of the machine; the rest is electronics, the cost of which is declining toward zero. So the manufacturer may as well provide enough electronics to get to high levels of capability because leaving them out doesn't save much money anyway.

The workstation printing capability will be rather limited. Unfortunately, people want fast printers and high-quality since we are accustomed to the letter-quality print of the electric typewriter. That is a high standard; there is no cheap, high-speed, high-quality printer in the offing. People are likely to solve this problem by pooling their printing needs and equipment.

Another device that will be important to teleworking ought to be in widespread use by 1990. It looks like a convenience copier, but it is all-electronic and all-digital. The machine scans the piece of paper on its top and converts it to a digital bit stream. It then drives a laser beam to copy the image on the xerographic drum and to produce copies, though since it is digital it can alter the material by changing the font or suppressing some paragraphs, adding boilerplate, creating a form, or adding a logo. More to the point, this is a communicating device that can receive bit streams from such devices as our home workstations and produce paper images. Printing capability will therefore be available to teleworkers but may be remote.

In addition, the divestiture of AT&T has set into motion a radical experiment with this country's communications system. This is more important to the future of home workstations than any technology issue because of its effect on communications costs. Long distance, high-speed service is now very expensive but it

will become much cheaper. Such service is now unregulated, and the new technology is highly applicable to it; there will be many competitors utilizing optical fibers and satellites to provide wideband, long distance service at low-cost. In addition, regulators will no longer be taxing long distance service to subsidize local service, as they have done in the past. Thus, under intense competition, rates should drop sharply. At the local level, however, we have services controlled by the regulators who set the rates for consumer dial service. They will necessarily extract the maximum possible revenue from high-cost local business services to subsidize consumer telephone service, to make up for the lost long distance subsidy. Thus, even though a local leased line has the same technology and the same potential for price decline as the long distance one, it will in fact increase sharply in cost.

When I work at home at a terminal, I will probably hold a line for a period of perhaps hours. Dial service will be metered and the rates will be higher than now, so I will run up a considerable bill. Perhaps it would be more economical to lease a line full-time, but that cost will be higher too. In any case, we are talking about several hundred dollars per month for heavy home-communications use.

There are alternatives. One of the by-products of this rate change is that it encourages so-called bypass carriers to use new technology. Bypass carriers avoid the regulated telephone network. They provide a cable link or a microwave transmitter to transmit from the roof of a building to a satellite station or teleport. A teleport being built on Staten Island in New York City will have cables going to the World Trade Center and then fanning out through Manhattan. These wideband bypass carriers will come into existence, especially through the adaptation of TV cable companies that have trouble making the sort of money they would like to from consumer service alone, because of the artificial cost surge in local communications. However, it is not clear that these carriers will be offering low-cost service for working in the home. Not every home will be equipped with a roof-top microwave transceiver, even if there were spectrum space, nor will every home have a two-way cable at a cost of hundreds of dollars or more.

In sum, the outlook is for superb new devices and communications services to become available for home workstations in the coming years, but at high-cost. The price of hardware has a floor set by shielded cases, power supplies, and keyboards. And on the

presumption that most teleworking will involve communications much of the time, homeworkers and their employers may face problems created by sharp increases in the cost of local communications service to the home.

Will employers and employees pay the increasing costs of teleworking? Workaholic executives will. Or their employers will do it for them. Computer programmers will, or their companies will do it for them. Journalists already do, and traveling marketing representatives, aided by facilities offered by the local hotel or motel, undoubtedly will too. But how much further down the line than that is teleworking likely to go? I wonder. In any case, we should bear in mind that teleworking has a cost floor that is suddenly higher because of the AT&T divestiture.

# Clerical Workers and New Office Technologies

Judith Gregory

The American labor force today includes 19 million clerical workers. They are expected to number 22 to 23 million by the end of the decade, according to U.S. Department of Labor statistics. Nearly one in five American workers now works as a clerical, making it the largest single category of workers. Clericals are predominantly women—98.6 percent of all secretaries are women, for example.

New office computer technologies hold both promise and perils for these millions of office workers. Problems for today's clerical work force include low wages, insufficient benefits, inadequate retirement income, and a lack of organization that contributes to and perpetuates these economic realities; a lack of affordable, available, quality child care; and occupational health and safety problems.

My remarks focus on female workers, who comprise the overwhelming majority of clerical workers and are the special target for homework programs involving clerical level personnel.

Judith Gregory is a research associate of the Department for Professional Employees, AFL-CIO. Ms. Gregory was research director for 9 to 5, National Association of Working Women, from 1979 through April 1984. This paper is an edited version of the presentation.

## ECONOMIC REALITIES FOR WORKING WOMEN

The range of choices in the conditions and circumstances of work is severely limited for most women. To understand the constraints on choices that women make about office homework, it is necessary to understand the economic realities of women's lives in the 1980s.

In 1983 the median yearly income for women working full-time was $12,172 before taxes, compared with $20,682 for men working fulltime.[1] While women's real wages have been held relatively stagnant in the past decade, their economic responsibilities have increased. Less than one in five families conforms to the historical stereotype of a breadwinning father, full-time homemaking mother, and one or more children; 45 percent of mothers with children under the age of six are working. Two out of three working women are single, widowed, divorced, separated, or have husbands who earn less than $15,000 a year. The number of female-headed households increased by 97 percent between 1970 and 1980.[2]

Only 10 percent of private sector clerical women are represented by unions, compared with 25 percent representation in the work force as a whole. In the finance industries, where female clericals form the backbone of the work force, only 3 percent are unionized, according to the Bureau of Labor Statistics.

## CHILD CARE

The lack of affordable, quality child care contributes to the lowincome status of American women, according to the U.S. Commission on Civil Rights.[3] It is estimated that there is just one daycare position open for every 10 children who need placement. The average cost of day care for two children is $4,000 a year —nearly one-third of the average working woman's income. Employers have been reluctant to assist in providing child care, although analyses indicate that the benefits should outweigh the costs.

Office homework is often touted as an easy solution to the severe shortage of affordable, quality child care in the United States. An advertisement for Lanier "telestaffing" computer systems, for example, shows a working mother at her terminal with her baby standing in a crib nearby, quietly observing what

Mother is doing. The facts of life differ considerably. Caring for a child while working at a computer terminal means doing two demanding jobs at once. Homeworkers with primary family care responsibilities report that coping with both work and family demands is highly stressful, although given the choice between working or not they would invariably have to choose work.[4]

The idea that child care needs can be met simultaneously with working is based on false notions of the attention women want and need to give their children and the care that children require. In research conducted by Margrethe H. Olson, homeworkers who had primary care for young children described the combination of responsibilities as extremely stressful. Fifty percent retained babysitters for all or part of their working time.[5]

In a study of office automation and clericals, including homeworkers, employed by Wisconsin Physicians Service (WPS), Cynthia Costello found that the relationship between paid work and family responsibilities was "perhaps the most important difference between the homeworker and her WPS counterpart. . . . For the woman who worked at WPS, her family responsibilities—from sick children to housework—often interrupted and shaped her day. But unlike the homeworker, the clerical who worked at WPS did not juggle housework, child care, and claims processing at the same time. For the homeworker, no spatial or temporal distance separated her 'work' from her 'family' tasks."[6] One homeworker commented: "When I first started homework, I had energy to burn and thought I had wasted time before. I got everything done I had done before plus the homework. I could hardly wait to get at the work. That's worn off. I used to stay up late at night and do the work. Now, I can't do that—my energy is gone by 9 a.m."

Women clericals who work at home still desire and need daycare centers or babysitters for children while they work, and need the wages to afford such services. Office homework should not be seen as a substitute for quality child care for working mothers who cannot find or afford day care or babysitters.

## OCCUPATIONAL HEALTH

An estimated 12.5 million video display terminals (VDTs), computer terminals, personal computers, and word processors are in use. The number is expected to rise to 41 million by 1987, accord

ing to International Data Resources, a marketing research firm in Framingham, Massachusetts.[7] Home use represents a significant share of the personal computer market.

Numerous studies report higher levels of health problems among clerical VDT users.[8] Potential health risks associated with video display terminal work will affect users of workstations in-office and home settings alike. Measures to control and abate these hazards are within the power of informed, concerned employers. In 1983 a special panel of the Committee on Vision of the National Research Council concluded that there is currently no evidence of permanent damage to vision from video terminal viewing. The report also noted that in some of the studies reviewed over half the VDT operators responding to surveys complained of some degree of visual discomfort, mental distress, and other physical disorders.[9] In particular, the panel report notes that the body of knowledge on ergonomics is not being applied consistently in workplaces and is still either unknown or unheeded by all too many office managers.

Hazards associated with new office technologies are only tangentially addressed by current federal or state occupational safety and health laws and regulations. At the time of the symposium on which this book is based, legislation that would provide health and safety protection for VDT users had been introduced in 10 states since 1981; laws will be reintroduced in many and introduced in more states in the next few years. Even when such laws or regulations are passed, enforcement for individual workers in the home will be virtually impossible.

## LOOKING AHEAD

It is unclear how widespread a trend "telecommuting" could become in the future. Economist Elisabeth Allison of Data Resources, Inc., says there are now 15 million information-manipulation jobs—such as computer programming, financial analysis, and writing—that could be done at home. Jack Nilles of the University of Southern California predicts that within a decade 5 million white-collar workers could be working mainly at home. According to *Business Week*, the number of homeworker programs for white-collar workers grew from a handful in 1981 to 35 in 1982, involving perhaps 600 workers.[10] This was a rapid rate of growth, but still an extremely small number of people. Nilles and others

estimate that by 1983 there were 10,000 to 20,000 members of the telework force, mostly part-time workers, and predict explosive growth to 5 to 10 million full-time workers who will do at least part of their work at home or at satellite centers by 1990.[11]

Explosive expansion of what is today a very small trend is difficult to imagine. Institutionalizing office homework requires substantial cost, time, and organizational commitment. The likelihood of automated homework in the future of clerical workers and employers' interests in implementing such programs are discussed here in the context of broader trends affecting clericals in the present era of rapid computerization.

I believe the desire to cut costs underlies most managerial interests in implementing clerical office homework. These interests include:

- shifting overhead costs of office space, electricity, and lighting to individual workers. Employees may even rent machinery from their employer, thus the employee not only underwrites the overhead but the ability to have a job;
- experimenting with productivity measures and costs of transaction-and information-processing to develop benchmarks as leverage to increase pressures and intensify control over the main office work force;
- reducing hourly wages by setting lower rates outright and by switching to piece-rate methods of pay, which means workers are doing more for less;
- abdicating responsibility for long-term, much less lifetime, welfare of employees by shifting costs of health and life insurance benefits, Social Security, and retirement income to individual workers;[12]
- reducing the chance of union organization, and generally weakening the already limited power of women clericals;
- using homeworkers as a transitional work force for corporate flexibility —easy to hire and release during and after a transition period of technological change and industrial competition and consolidation. In this way, homeworkers may be similar to temporary workers as another part of the "casual" work force.

These cost-cutting motives will be realized through three major trends already emerging as companies make the transition to mature levels of computerization:

- an intensification of working conditions and productivity pressures, including centralized control over individual workers who may be spatially decentralized, including those working at home;
- shifts from full-time to part-time workers;
- relocations of office work from central urban sites to suburbs and nearby cities.

## Intensification

The experience of office homework, whether it is a perquisite or the only available means of juggling work and family roles, depends in part on how much influence workers exercise in relation to their employers. Differences in levels of skills, prestige, control over working conditions, methods of pay, whether there is a shortage or oversupply of particular types of workers—these factors will affect the leverage employees have over wage levels and conditions of employment. Contrasts between categories of employees are sharply defined: office homework involves different circumstances and employer-employee relations for a clerical woman than for an executive.

The 1984 *9 to 5 National Survey on Women and Stress* found that a number of working conditions that describe job demands are fairly "universal" among managerial, professional-technical, and clerical women, including: always having to work very fast; always having to meet deadlines; always having too much work to do; always having to pay close attention to detail. Other demands are "particular" by job level, more common among clericals doing automated work, and even more common among black clerical women: working under strict production quotas or averages; having one's work monitored, constantly watched, or controlled by computer systems; performing repetitious, monotonous work. In general, job *demands* are evenly distributed among women managers, professional/technical workers, and clerical workers. But degrees of *control* are distributed according to position in the occupational hierarchy, including: whether you can decide how to do your work; whether you can set the pace of your work; whether you have input into policy decisions that affect your work; whether you have a lot of pressure and responsibility without the clout or authority to make decisions; whether you can use your skills, previous education, experience, or training in your work.[13]

Office homework may widen this gulf between levels of workers. In a review of a variety of remote office work experiments in Europe and the United States, Scandinavian researchers Gitte Vedel and Ewa Gunnarsson explore the question, "who will achieve greater flexibility as the result of homework program—employers or employees?" Tentatively, they found different answers for men and women. Male homeworkers tend to achieve greater flexibility as individuals—often by maintaining two fully equipped workplaces, one in the office, another at home, sometimes using portable computers as well. For the average female worker, equivalent levels of technological support cannot be assumed (and are rare), nor can flexibility necessarily be achieved; pressures intensify instead, particularly for working mothers.[14]

Whereas professional and technical workers are typically paid on a per-project basis, clerical homeworkers are almost invariably paid per items processed, under piece-rate systems, which mean that the individual worker internalizes productivity pressures. Computerized monitoring further intensifies automated office work. It is used ever more often, not only to measure work but also to pressure clericals performing automated work. Methods of pay based on piece rates and systems of constant computerized monitoring represent steps backward from reasonable expectations of pace and production and reasonable and fair hourly rates of pay for all workers, not just the fastest or hardest pressed.

If productivity is measured only by time at the terminal, important aspects of work time are left out of the equation: setup time, time getting work between employer and employee, and time for lunch and other breaks. Frequent breaks and rotations of tasks are essential contributors to effective and healthy automated work environments.

Finally, computerized monitoring inevitably emphasizes quantity over quality, often removing incentives for employees to perform perfect work. A clerical homeworker for an insurance company in the Midwest commented, "They want a lot of work done and they also want quality. When you do quality work, they complain because you aren't doing enough. When I was hired, I told them you can't get both. . . . You have to settle for a happy medium."[15] A data entry operator explains, "The shift activity . . . measures the time, strokes for the day, average strokes per hour, and total errors for the day. Depending on what the supervisor is looking for, strokes, errors, minutes, this report generates a

lot of tension. If one adjusts their strokes to lessen errors, then there are complaints one is going too slow."[16]

For these reasons 9 to 5 calls for an end to continuous computer monitoring of individual work performance wherever possible. In Sweden, for example, the aggregate flow of work for a department may be tracked by computer, but it is illegal to monitor an individual worker. Swedish management and labor representatives point out that measuring the work of a single individual does not reveal whether or not there is enough staff for the volume of work.[17] Monitoring the individual mainly serves as a means of enforcing pressures for an ever-faster pace.

## Part-Time Workers

From 1940 to 1980 the number of women working part-time increased fourfold to 15 million. Today, the part-time work force numbers about 18 million; the vast majority are women. From 1970 to 1982 part-time employment increased by 58 percent, while the U.S. labor force overall increased by 26 percent. Twenty-five percent of all clericals worked part-time.

More striking is the difference in the rate of increase in voluntary part-time work, 32.6 percent, in contrast to the increase in involuntary part-time work, an extraordinary 166 percent from 2.19 million to 5.8 million workers, also predominantly women.[18]

Most part-time workers work less than full-time because of family responsibilities, health problems, or other constraints. Part-timers earn an average of 20 percent less than their full-time counterparts. They seldom receive health insurance, fringe benefits, or paid vacations. They are unlikely to be covered by pension plans or unemployment insurance.[19]

Homework programs documented to date involve the elimination of benefits to clerical homeworkers (but see Raney, in this volume—ed.). Medical Services of Washington, D.C., has 10 "off-site keyers" in claims processing positions, all of whom converted from full-time to part-time status, from a regularly hourly rate of pay to pay per output, and from employees with employment benefits to individual contractors without coverage.[20] *Business Week* reports that homeworkers for Blue Cross of South Carolina, who are considered part-timers, are excluded from $2,000 to $3,000 worth of benefits annually. They also pay $2,400 annual rent for the computer terminals they use. While the company

maintains that the homeworkers earn up to $3,000 more than salaried office workers, the net gains or losses remain unclear.[21]

There is nothing inherent in homework, nor anything technologically determined, about the employer practice of eliminating benefits to homeworkers. While part-time status is the rationale given for the lack of benefits for homeworkers, some "part-timers" typically work 34 hours a week, comparable to average workweeks for full-time clericals, particularly when paid lunch breaks are subtracted from mainstream clericals' working time.

## Relocation

Office homework represents a point along the spectrum of spatial decentralization of office work—from central cities to suburbs; from older traditional office centers to new areas including suburbs, Sunbelt cities, and outlying secondary cities; to "offshore offices"; to "self-service" home-banking and home-retailing programs directed toward the growing market of home personal computer owners. Neither suburbanization nor offshore bulk data-processing are entirely new, but each is accelerated and extended by the increased mobility of office work achieved by the combination of office and telecommunications technologies.

Employers' interests in clerical homework programs echo the motivations underlying trends in-office relocations. Suburban women are the favored work force. Women who only need or are only able to work part-time are often selected. Working wives who are noncritical income earners are favored over sole supporters or working women who are heads of households. The dispersion of clerical homeworkers makes communications between homeworkers difficult and collective activity extremely unlikely.

Employers are increasingly selecting and rejecting particular pools of workers for specific types of work according to changes in the labor process and enhanced abilities to choose new sites based on labor supply demographics.[22] In a recent study of the movement of automated office work from San Francisco into Contra Costa County, Kristin Nelson of the University of California-Berkeley reports that the type of clerical labor available was a decisive factor in relocations of "low-contact-need" back-office work. In 1981 the San Francisco Chamber of Commerce described a "quiet exodus" of 9,000 jobs in 22 firms out of San Francisco. An estimated 32,000 new jobs are at stake, including job creation after the relocations. The jobs involve computerized information

processing at the upper tier of skilled clerical work, although wages remain very low.

Nelson found that the type of clerical labor available at a new site was a decisive factor in the office relocations she analyzed. Other factors traditionally considered in location decisions include availability and cost of land, access to good transportation, supply of managerial and technical personnel, and local zoning policies favorable to business expansion. These factors were all available in nearby Oakland and Richmond. In fact, rents in Oakland and in some sections of San Francisco were equal to those in Contra Costa County; reducing rental costs does not explain the relocations. The companies apparently hoped to find women willing to perform skilled work at low wages, a contradiction made worse by computerization. Employers also hoped to avoid or move away from central city women, particularly minority women, who are most likely to need full-time work, more likely to be heads of households, and more likely eventually to insist on their rights and full wages and possibly to organize. Nelson writes:

> Back offices require local clerical labor that will be productive, stable, and non-militant in jobs with low rewards . . . In order to find educated female workers that will remain in "factory office" jobs, modern employers look to middle-income neighborhoods characterized by young families, where they expect to find well-educated, white women whose position in the domestic economy limits their career mobility. . . . The transfer of jobs from central city, low-income, predominantly minority female work forces is not an unfortunate side effect of back office relocation necessitated by land cost considerations—it is one of the major reasons for back office relocation.[23]

Office suburbanization involves efforts by some employers to break up conditions that might facilitate self-organization by clericals by moving work away from women for whom employment is absolutely critical to the support of themselves and their families. To the extent that companies select participants in homework programs with similar criteria in mind, office homework may contribute to the powerlessness and economic vulnerability of women in the overall work force.

## SUMMARY

Clerical homework programs today are few in number and experimental. Small as such experiments are, their greatest effect may prove to be the more widespread introduction of monitoring,

piece rates, and productivity pressures into mainstream office employment in ways that undermine pay levels, job security, the quality of work, and the ability of female clericals to organize in their own behalf.

The solutions to the problems of the current clerical work force include the development of stable part-time employment in addition to full-time employment, provision of affordable, quality child care and flexibility in working hours, universal coverage in benefits plans, occupational health and safety standards for automated office work, and enforcement of workers' rights to organize collectively.

Taking the current perils of office computerization into consideration, 9 to 5 does not believe that the problems of the office work force will be solved by placing office workstations in the home. If adequate protections and fairness on-site are not always possible, it makes it less likely that adequate worker protection can be enforced off-site. The potential for abuses by employers is great, creating the possibility that we will step backward to a twentieth century equivalent of nineteenth century cottage industry.

For these reasons, 9 to 5 supports the call for an early ban on electronic home workstations, as introduced by the Service Employees International Union and adopted by the AFL-CIO, to achieve adequate protection and fairness for female clericals and for all employees at electronic workstations—at home or in the office.

## NOTES

1. Less than 1 percent of women who work full-time earn $25,000 or more per year, compared to 12 percent of men. More than 50 percent of all fully employed Hispanic women, 43 percent of black women, and 37 percent of white women earn less than $10,000 a year.

2. Data from the Women's Bureau and Bureau of Labor Statistics, U.S. Department of Labor, cited in: National Commission on the Future of Women in the Workplace. The Invisible Worker in a Troubled Economy, Business and Professional Women's Foundation: Washington, D.C., January 1984.

3. U.S. Commission on Civil Rights. Disadvantaged women and their children. Washington, D.C., May 1983.

4. Olson, Margrethe H. Remote office work: Implications for individuals and organizations. Graduate School of Business and Administration: New York University, New York. CAIS No. 81-56 (CR).

5. Olson, Margrethe H. et al. Workshop on problems and potentials of office homework. International Conference on Office Work and New Technology, sponsored

by 9 to 5, National Association of Working Women. Boston, Mass., October 1982.

6. Costello, Cynthia. "On the Front": Class, Gender and Conflict in the Insurance Workplace. PH.D. dissertation, Department of Sociology, University of Wisconsin, Madison, 1984.

7. Serrin, William. Electronic office conjuring wonders, loneliness, and tedium. New York Times, March 28, 1984.

8. See, for example: Cakir, A., D.K. Hart, and T.F.M. Stewart. The VDT Manual. New York: John Wiley and Sons, 1979; Grandjean, E. and E. Vigliani. Ergonomic aspects of visual display terminals. DHHS-NIOSH Publication No. 81-129. Washington, D.C.: U. S. Department of Health and Human Services, 1981; National Research Council, Committee on Vision, Panel on Impact of Video Viewing on Vision of Workers. Video Displays, Work, and Vision. National Academy Press: Washington D.C., 1983 (See particularly *Dissent* by Lawrence W. Stark, pp. 235-236); Technical memorandum on video display terminals and low level radiation, by Diana Roose. Cleveland: Working Women Education Fund, 1983.

9. National Research Council, Committee on Vision, Panel on Impact of Video Viewing on Vision of Workers. Video Displays, Work, and Vision. National Academy Press, Washington, D.C., 1983.

10. "If home is where the worker is." Business Week, May 3, 1982.

11. Wiegner, Kathleen K., and Ellen Parris. "It's 8:45--Do you know where your employees are?" Forbes, September 12, 1983, 143-150.

12. Women workers suffer from inadequate retirement income due to years of low pay, patterns of alternating paid work and nonpaid work in the home, lack of coverage by pension plans and low rates of vesting in such plans due to high tenure requirements and the high turnover in women's clerical and service jobs. The average working women retired with less than $1,000 in savings in 1979. Only 1 in 10 women who retired from private industry before 1980 received any pension money. See: Working Women Education Fund, *Office Work in America*. Cleveland, 1983; and Citizens Commission on Pension Policy, Pension Facts, Washington, D.C., 1980.

13. 9 to 5 National Survey on Women and Stress, and Office Automation Addendum. Working Women Education Fund: Cleveland, 1984.

14. Gunnarsson, Ewa and Gitte Vedel. Flexibility in women's remote office work. Arbeitslivcentrum: Stockholm, Sweden, 1984.

15. Costello, Cynthia. Op. cit.

16. Report on data from the VDT hotline and questionnaire. 9 to 5, National Association of Working Women: Cleveland, 1983.

17. See: Marschall, D. and J. Gregory. Office Automation: Jekyll or Hyde? Highlights of the International Conference on Office Work and New Technology. Working Women Education Fund: Cleveland, 1983.

18. Serrin, William. Up to a fifth of U.S. workers now rely on part-time jobs. New York Times, August 14, 1983.

19. Leon, Carol and R. Bednarzik. Profile of women on part-time schedules. Monthly Labor Review, June 1978.

20. Gailord, Susan B. Telecommuting allows employees to mix business with homework. Newhouse News Service, Spring 1983.

21. Business Week. Op. cit.

22. See the work of Michael Storper and Richard Walker, University of California at Los Angeles and Berkeley respectively, on the importance of local labor supply in industrial location. For example: Storper, Michael and Walker, Richard. The spatial division of labor: Labor and location of industries, in Sunbelt/Snowbelt, Urban Development and Regional Restructuring. L. Sawers and W. K. Tabb (eds.), Oxford University Press, New York, 1984.

23. Nelson, Kristin Louise. Back Offices and Female Labor Markets: Office Suburbanization in the San Francisco Bay Area. Ph.D. dissertation, Department of Geography, University of California, Berkeley, 1984.

# The Potential of Remote Work for Professionals

Margrethe H. Olson

*Webster's New Collegiate Dictionary* defines a *profession* as "a calling requiring specialized knowledge and often long and intense academic preparation." It does not necessarily imply a formal licensing or certification, and does not prohibit membership in a formal organization as a full-time employee. My focus here will be primarily on professionals as organizational members, loosely defined to include those with a high level of specialized knowledge that is applicable across different organizations.

Anyone who works in an organization has some common sense notion of the difference between professionals and nonprofessionals or nonexempt employees. First, the professionals' skills are generally in demand; this gives them bargaining power and privileges within the organizational hierarchy that are unavailable to others. It also, of course, brings them higher monetary rewards. This may not be true, however, in the so-called glamour professions, such as medical research (non-M.D.) and civil rights legal defense, where a job carries prestige, autonomy, and other perquisites of professional status without high monetary rewards.

The job of a professional also may be characterized by long-term deadlines and variety as opposed to minute specialization of

Margrethe H. Olson is associate professor of computer applications and information systems, Graduate School of Business Administration, New York University.

labor. It tends to be low on specification of rules and procedures and high on flexibility and autonomy.

As a consequence, the professional employee may face a high degree of ambiguity in his or her relationship to the organization. Criteria for performance tend to be unclearly specified. The professional may have a strong sense of autonomy and a strong commitment to his or her profession, particularly in those professions where barriers to entry are well defined. One consequence of both autonomy and commitment to profession is low organizational commitment. Professionals, therefore, tend not to be unionized.

Given these characteristics, the work-at-home option is relatively easy to implement for professionals. If their skills are in scarce supply, their organizations are more likely to respond to their demands for flexible work options. Performance evaluation takes place on the basis of long-term deliverables based on generally ambiguous performance criteria. Remote supervision, then, is relatively easy to accommodate. Professional employees typically may work at home two or three days a week and increase their productivity substantially because of the ability to concentrate in the home environment. Usually they continue with full salary and benefits and are evaluated on the same, relatively ambiguous performance criteria as before.

Does this make work at home an ideal option for professionals? Or do similar problems exist as those Judith Gregory outlines (see pages 112–124) for clerical workers? The answer is, of course, "it all depends."

Given the potential of technology to alter traditional work patterns, how might an organization take advantage of its increased flexibility?

On the assumption that the professionals have skills that are in demand and therefore have the flexibility to choose from multiple work options, I see three alternative scenarios for organizational structures emerging: the location-independent organization, the contract organization, and the human resources organization. Work at home is a part of each scenario, and each can be analyzed in terms of its responsiveness to organizational and individual needs and pressures.

## THE LOCATION-INDEPENDENT ORGANIZATION

The physical relocation of organizations tends to be guided by economic constraints of building costs, taxes, and the availability

of labor. The existence of telecommunications technology permits a wider set of choices. Work groups can be formed temporarily, bringing persons of particular skills together through the use of electronic equipment, without incurring employee relocation or travel expenses. This greatly facilitates the low-cost reorganization of divisions and authority structures.

At the individual level, location independence is achieved through communications systems that permit employers and employees to keep in touch regardless of location. Electronic store-and-forward message systems and "beepers" are familiar examples. Many organizations utilize centralized message centers to reduce the administrative cost of handling communications. One significant result is the location independence of those whose messages are handled. Cellular mobile telephones will help increase this capacity.

Where will people work when their location is not critical? Most will continue to work in traditional offices. Those offices, however, may be physically separate from their immediate work group or subordinates, resulting in remote supervision. Certainly they will have a computer terminal or personal computer at home, but this will be used primarily after regular work hours and will either replace longer hours in the office or reduce the amount of work lugged home in a briefcase. As now, there will be informal arrangements or work at home in special cases such as maternity leaves and long-term disabilities. Others will work at home occasionally—as many do now on an informal basis—such as once a month or when facing an imminent deadline. The total amount of office space required to accommodate managers and professionals will not be reduced significantly, although as previously noted, it may be allocated more efficiently.

## THE CONTRACT ORGANIZATION

One response to economic uncertainty is to reduce the number of full-time salaried employees and purchase particular, specialized skills as needed on a contract basis. An ideal contract organization brings together significant numbers of personnel who would previously have been full-time employees but now contract out their specialized skills to different organizations. The employee benefits through increased autonomy; if the skill is in short supply, the arrangement can be significantly more lucrative. The

employee loses the protective benefits and job security of the organization, however, and income levels may be uncertain.

Retirement takes on a whole different meaning. Although the organization may benefit from its lean staffing, it loses employee commitment. Those motivational bases of work that depend on organizational membership—contribution to production of goods and services, social interaction, and status—are lacking or significantly reduced (see Brief, pages 66–75).

Technology permits a significant degree of location independence for those providing valued needs and services. Public data services, such as the Source, can be envisioned providing advertising to match individuals with an organization's requirements for specialists. This scenario assumes the requisite skills offered by the specialist and needed by the organization can be provided through computer and communications technology, or at least that the results of production can be transmitted electronically.

## THE HUMAN RESOURCES ORGANIZATION

In another very different scenario, companies take innovative approaches to invest in human resources on a long-term basis. Organizations that are committed to long-term employment seek out methods of accommodating employees' nonwork needs through various work options. Work at home, either occasional or long-term, is one option. Others are extended leaves of absence, job sharing, and flexible hours. Technology plays a significant part by facilitating that increased flexibility. Location independence, too, helps increase flexibility; employees might work at a regional office closer to home to reduce commuting time or choose work hours to allow time for nonwork responsibilities such as child care.

How do each of these scenarios respond to individual and organizational needs and pressures?

## ORGANIZATIONAL NEEDS AND PRESSURES

In these times of economic uncertainty, we hear that businesses are continually seeking ways to increase their flexibility in employee selection, retention, and termination. Employees with unique skills are especially susceptible to employment shifts if

organizational demand for those skills is not consistent. At the same time, significant shortages of certain specialized skills, particularly computer skills, continue to plague management. Many experiments with work at home are motivated by a need to attract and build a labor supply that would otherwise be unavailable. Pilot programs are thus targeted to those skills. Finally, as the costs of facilities continue to rise, companies seek ways to provide space while minimizing fixed capital costs and maximizing flexibility.

Aspects of each of the three scenarios provide positive responses to these organizational needs and pressures. Certainly the contract organization appears to be an efficient method for acquiring skills on an as-needed basis, thus improving organizational flexibility. Facility costs are lower since they are borne by the individual. The human resources scenario, however, banks on the improved contributions of existing long-term employees when organizational commitment to their security is guaranteed. The location-independent scenario provides significant, organization wide flexibility, regardless of geographical location, for the utilization of employee skills and facilities.

## INDIVIDUAL NEEDS AND PRESSURES

The United States is a nation in which the majority of two-parent households have both parents working outside the home, where women have entered the work force permanently in large numbers, and the number of single-parent families is steadily rising. In today's work environment, employees need to accommodate the demands of their nonwork lives as well as the demands of their work.

In this volume Judith Gregory writes of the female clerical workers who are trapped within a limited set of less-than-ideal choices. By way of comparison, do individual professional women suffer a similar fate? Or do they face a different, also less than ideal, set of options?

A recent study showed that in the software development profession, women are significantly underrepresented at middle management levels and dramatically nonexistent at higher levels of management.[1] This is particularly significant when one recalls that the software industry has always been touted for its lack of

barriers to entry for women. Other minority groups have more severe underrepresentation. According to the author of the study report, "Blacks need not apply."

Another recent study indicates that for professional couples who both work full-time outside of the home, women continue to bear most of the responsibilities for child care and other aspects of household maintenance.[2] At the same time, equality is expected in the office—women must work as hard as men to get ahead. Is it any surprise that women are underrepresented at middle and upper management levels, when the most important years for career development (i.e., ages 25 to 35) coincide with the most important years of childbearing?

What does this have to do with work at home? Clearly, professionals, especially women with family responsibilities, need greater flexibility in their work lives. Is work at home a good solution to this need for flexibility? Is it better than other solutions such as high-quality affordable day care?

In my own interviews with professionals working at home, I found that those who chose the arrangement strictly out of personal preference were almost exclusively men. They often reported improved relationships with their children, but there was always someone else (usually a spouse) there full-time to "keep the kids out of Daddy's hair while he's working." All of the women professionals I interviewed considered work at home a trade-off, reporting that although it is difficult and stressful to hold two jobs at the same time, it helps them keep their skills up-to-date and is "better than not working at all." In many cases the money is not as important as the intellectual stimulation. These women often live in suburban communities where the commute time, added to an 8-hour workday, would be prohibitive. To ensure the concentration they need to perform their work at home, most have full-time babysitters, even live-in help. But the stress from role overload, role conflict, and social isolation is readily apparent.

Many professional women choose the work-at-home option or leave their jobs for a more flexible alternative such as independent contract work at the point in their careers when they might otherwise achieve a higher level of management. In an organization where work at home might be institutionalized (as opposed to, for instance, corporate day-care facilities) another barrier to

higher levels of management is created since visibility is still key to promotability.

What about mixing work and nonwork? Is it healthy for or detrimental to families? This is still an empirical question. Today, however, with the imbalance in the division of responsibilities in a typical home, integration of work and nonwork activities can be highly stressful.

I prefer to think of a more positive approach to the problems of work versus nonwork for professionals, embedded in the philosophy of the human resources organization. In this view, a cafeteria of flexible work options are put in place for both men and women; work at home is only one option and can be combined with others. Since this sort of organization demonstrates a high level of commitment and trust in the individual, his or her response is to produce high-quality work without being "policed."

Long-term employment also can facilitate flexibility in career paths since employees do not have to endure the pressures of a short-term test of their career potential during critical years for family growth. Furthermore, true equality between men and women in our society will not be achieved until it is achieved in the workplace, and the combined scenarios of the location-independent and human resources organization can facilitate workplace equality by providing and encouraging greater flexibility for both men and women.

## CONCLUSIONS

The alternative scenarios presented here are not mutually exclusive. I believe that we will see the implementation of moderate aspects of at least the first two scenarios in most large business firms.

The degree to which any scenario changes an organization's structure is of course dependent on many factors besides technology—primarily economics. The real point of these scenarios is to demonstrate that remote work at home has a broad interpretation when applied to professionals as members of an organization.

With integrated computer and communications technology, it is possible to reduce the intellectual challenge of many jobs, both clerical and professional, through division of labor, routinization, and systematic de-skilling. It is also possible to monitor that

work without the employee's knowledge. In such a work environment, work at home can be an unhealthy extension of management tactics that discourage employee motivation and commitment in the office.

On the other hand, new technology makes it possible to effectively decentralize control over work, shifting control to the individual or work group. Individuals working on contract enjoy this autonomy.

In an organizational context, jobs can be designed to provide variety, enhance skills and knowledge of results and their effect on the organization, and increase individual autonomy over work sequencing and scheduling. Many professional jobs already have these characteristics. When nurtured in a management climate of openness and trust, work at home can be implemented as a simple extension of a high-quality work life. Thus, from the point of view of accomplishment, many potential problems posed by work-at-home programs are really problems of poorly designed jobs in an unhealthy management climate.

In an environment where jobs are well designed and there is a management climate of trust and openness, implementing work at home in a positive way is easy. The concerns that I have expressed here also can be alleviated if the positive quality of work life is embedded in the long-term commitment to employee welfare in the human resources type of organization. Ideally, this high-quality of work life and long-term commitment to employees, in which work at home is a straightforward and positive option, should be available to all employees: clerical, professional, and managerial.

## NOTES

1. Kraft, Philip and Steven Dubnoff. Software workers survey. Computerworld, November 14, 1983, p. ID/3.

2. Blumstein, P., and P. Schwartz. American Couples: Money/Work/Sex. New York: William Morrow, 1983.

# Commentary

Jack M. Nilles

Many people see the recent advances in microelectronics, telecommunications and computer technologies, and their applications to working at home as the coming of a new, bright age, the age of the electronic cottage. Others see these technological advances as forerunners of the return of old forms of repression, exploitation, and losses of individual freedom in a new variation, the age of the electronic sweatshop. Which will it be?

The underlying technological change is rapid and intense. Since the late 1960s the cost of raw computing power has been dropping at an annual rate of 25 to 40 percent. This trend is likely to continue at least into the mid-1990s before its rapid pace diminishes. Personal computers, which first appeared as commercial products in 1975, now outnumber other general purpose computers of all types by 8 to 1. The turn of the century could see general purpose computers of significant capability in at least 80 percent of U.S. households and almost all U.S. businesses, regardless of size. A "significant" computer has the ability to perform most routine and many specialized information processing tasks of importance to a business or a family. Unlike today, most of those future computers will be connected, or connectable, to digital telecommuni

Jack M. Nilles is director of the Information Technology Program, Center for Futures Research, Graduate School of Business Administration, University of Southern California, Los Angeles.

cations networks dominated by the telephone system. The accelerating development of this computer and telecommunications infrastructure provides the basis for several changes.

One such change is working at home, generally with the aid of computer or telecommunications technologies, telecommuting. The basic technologies are largely available; the systems technologies need further development for many applications. But a variety of other factors continue to affect the growth and acceptance of workstations in the home.

## DEMOGRAPHY

Specific figures vary, but experts generally agree that nearly half of the U.S. labor force comprises information workers, those whose income derives primarily from creating, assembling, manipulating, storing, and disseminating information, or operating information processing machines. There is less agreement on the future growth of this sector, particularly as the influence of microcomputers is felt. In the past, the net effect of the introduction of computers has been a substantial increase in the number of information jobs and a smaller decrease in the number of manufacturing jobs.[1]

It is not at all clear that this growth relationship will continue, particularly since business uses of microcomputers are likely to cause shifts in the types of jobs available, emphasizing cognitive skills and deemphasizing dexterity. In short, managerial and professional jobs are likely to become more complex, analytical, and diverse. Secretarial and clerical jobs as we now know them will diminish in number and become more routine. Text processing and other traditionally secretarial tasks already are being performed by microcomputer-equipped managers and professionals. Data entry clerical tasks are being performed directly by customers as electronic funds transfer and other network information services proliferate. If these trends hold, they will have important consequences for telecommuting and, especially, for women in the work force.

Almost all secretarial and clerical positions, one-third of the total jobs, are held by women. These generally low-paying information jobs appear to be most threatened by computer technologies. On the other hand, a large and growing fraction of the new computer programmer work force is comprised of women. Computer

programmers constitute a large proportion of contemporary telecommuters, but they are still a small proportion of the total work force. Also, most part-time workers are women. Many of these women work part-time because there are not sufficient day-care facilities for their young children.

According to U.S. Census data, there is a long-term population trend away from the cities and into rural areas.[2] Skilled information workers, managers, professionals, and technicians constitute a disproportionate share of those people choosing to leave the cities. Most of the managers, professionals, and technicians are men. The nature of managerial and professional jobs, i.e., the need for periods of solitary thought and analysis, is often conducive to remote working. Men seem to enjoy working at home, according to the evidence presented in this volume. Women may be less enthusiastic, looking to office situations to escape from their traditional distaff roles.

Ambiguity characterizes most statements about computer work in the home. We simply do not know the details of what is happening to information jobs, nor does anyone seem to be systematically collecting the information. It is clear, however, that change is occurring at an accelerating pace.

What does this have to do with telecommuting? All of the technological and demographic trends, insufficiently documented as some may be, point to an increasing predisposition of workers, particularly managers and professionals, toward working at or near home. This predisposition, together with the technological trends, provides necessary but not sufficient conditions for widespread home telecommuting. A further requirement is that telecommuting be attractive to employers. Evidence presented in this volume indicates that this is so.

To some extent there is bias in the evidence presented here by organizations experimenting with telecommuting. In all of the cases studied, the home telecommuters were volunteers; all had personal reasons for preferring to work at home at least part-time. None were forced or otherwise pressured to telecommute. Most were managers or professionals. Nevertheless, for the reasons just stated, this group may be entirely representative of the majority of telecommuters in the coming decade. The only group not represented here is the set of independent telecommuters—those who have initiated telecommuting as individual entrepreneurs or as employees of organizations that have no formal telecommuting

experiments or operations in process. This latter group, consisting of a mix of full-and (mostly) part-time telecommuters, now numbers from 20,000 to 30,000 individuals.

When I first began studying telecommuting in 1971, before coming to the University of Southern California, and during the next few years of research on the topic, I believed that there were a number of possible barriers to the acceptance of telecommuting. These included employees' fears of change, computers, personal isolation, career arrest, threatened job security, and exploitation; and employer's fears of lowered productivity, increased turnover rates, decreased ability to react to change, and warnings of exploitation by organized labor. While these fears still exist, the realities are much less forbidding than the apprehensions on both sides. Nevertheless, the fears and expectations may be much more important than the realities in affecting the growth of telecommuting.

## PRODUCTIVITY

The dominant fear expressed by managers, upon first hearing about telecommuting, is that their employees will slack off and become less productive, given the least opportunity.

In a more sanguine frame of mind, in 1971 I anticipated that productivity would increase for information workers using computers in environments more isolated than the average office. Experiments in 1973 in the insurance industry supported my assumption; productivity of clerical workers and underwriters increased 15 percent in a remote office situation.[3]

Evidence presented in this volume indicates productivity improvements for home telecommuters of at least 20 percent in all cases, with several claims of 50 percent or more for some workers, managers, professionals, and clericals. Even though universally acceptable definitions of productivity are as rare as unicorns, the evidence is distinctly positive. For the skeptics, many reasons can be found for these improvements: more actual work time per day due to fewer interruptions; longer hours in compensation for eliminated commutes; increased quality due to fewer distractions, greater concentration, and work hours modified to suit individual metabolisms; and stronger work incentives due to a greater sense of "being in control" or to piecework payment systems. All but

the last of these items seem unthreatening to the remote employee.

The durability of these productivity estimates is evidenced by F International, with its 20-year history of growth based on the competitive advantage of part-time telecommuters, even without sophisticated home terminals, in the United Kingdom and Europe.

Our initial expectations were that turnover rates would be reduced mildly. The 1973 insurance company experiments showed a drop in turnover rate from 33 percent to zero. The experiences of other authors in this volume lead to the conclusion that turnover is substantially reduced, almost to zero; however, no program has been running long enough for any long-term statistical conclusions to be reached. (The longest trial reported ran about eight months.) As with the productivity issue, the "Hawthorn Effect" may be a factor in these studies.*

The fear of "out of sight, out of mind" can be strong for employees and employers. Employees fear that the boss won't remember them at promotion time, and the boss has nightmares about key telecommuting employees running off to, or becoming, competitors. No evidence of either phenomenon has turned up in the cases presented to date. On the contrary, anecdotal evidence gathered at the University of Southern California indicates that organizations with good internal communications systems that include the remote employees, through electronic messaging for example, induce stronger feelings of identification with organizational goals.[4] Of course, the evidence also shows the greater importance of good communications between an employer and an employee working in a remote situation.

## ATTRACTIVENESS

Our initial opinion, in the early 1970s, was that home telecommuting would not be attractive to many people, primarily for social reasons. People would want to remain in the office environment for its social contacts. Yet a primary motivation for

* The Hawthorn Effect was first noted in a series of experiments at Western Electric. Production increased when illumination either increased *or* decreased. The workers were responding to management's interest, per se, in their welfare—ed.

corporate home telecommuting experiments is the ability, by means of telecommuting programs, to attract or retain key talent. The ability to work at home is seen as an inducement that is more powerful than salary considerations. The telecommuting environment allows flexible hours, casual dress, decreased stress, and economic benefits. These factors can act as powerful motivators. Social contacts can be maintained by frequent, but not daily, trips to the office.

## COSTS

When we first evaluated telecommuting in 1973, before the advent of microcomputers, we concentrated on the capital, real property, and operations costs. At that time telecommuting looked attractive to employers on the cost basis alone. As central city property costs have escalated over the last decade, and as information technology costs have plummeted, the advantages have become even more striking. As V. S. Shirley of F International puts it, indirect costs of telecommuting consist primarily of management and communications, not facilities. Added to this are the reductions in training costs produced by lower turnover, in travel where telecommuting or teleconferencing is used, and in staff requirements (or greatly increased income) resulting from productivity improvements. Some cost increases may result from the necessity to train managers, employees, and coworkers in the finer points of telecommuting. These are expected to be more than offset by the benefits.

Cost benefits on the employees' side include reduction in clothing, food, and transportation expenses, the latter possibly offset if the employee buys the necessary equipment and services, such as extra telephone lines, answering machines, and copying equipment. Drawbacks are largely related to the need to usurp part of the home for a workplace, or add to the size of the home. If fears of exploitation are realized in the future, then the costs of decreased job mobility and reduced income may well offset any gains for the affected employees.

## MANAGEMENT ISSUES

One general conclusion emerges in this volume: **There is no substitute for good management**. Telecommuting provides some ad

ditional challenges in this respect. An underlying issue is the adversary relationship between managers and employees that seems to be characteristic of organizations in the United States and Europe. When present in a telecommuting situation, this relationship can be particularly counterproductive. A typical fear expressed by managers who are first exposed to the concept of home workstations is that their subordinates will take advantage of their invisibility and productivity will plummet. Experiences related here indicate the opposite. Still, the fears remain. Positive experiences are all the result of the development of a high level of trust between manager and employee, augmented by a carefully thought-out system of performance measures to bolster that trust. Good managers should do well in telecommuting situations. Bad managers will founder more quickly than in a traditional office.

As further indication of the need for active management, almost all of the corporate experiments discussed here were the efforts of individual managers. Where the experiments have stagnated or simply stabilized, it is because the responsible individual has left the scene. It is important that the spirit of the experiment be sustained, particularly in situations where there are changes in corporate structure.

Employee selection also plays a vital role. The most important attribute of a prospective telecommuter seems to be inner-directedness, the ability to start and complete a task under one's own steam. High achievers probably would make good telecommuters. According to the authors here, prior familiarity with computers does not seem to be a major consideration, nor does prior familiarity with company practices and procedures, provided good communications between managers and telecommuters are maintained. Handicapped individuals with limited mobility may also be exceptionally motivated candidates for telecommuting, since it gives them a special employment opportunity.

Three groups might benefit from training specifically oriented to telecommuting: managers, telecommuting employees, and the office staffers who work with the telecommuters.

Managers need to develop project status reviews, message-based communication techniques, and methods for coping with the unusual working hours of some telecommuters. Managers also need to develop methods for appraising employee performance, compensation and benefit plans, career development tech

niques, and termination criteria to match the new environment. One of the most sensitive issues may be appraising performance without the use of surveillance.

Employees need to develop self-reliance and an awareness of the increased need for quality communications with their supervisors and each other.

Office workers who interact with telecommuters need to develop a better understanding of the changes in working patterns. This latter group is the most often overlooked in many company test programs.

In designing telecommuters' work, the characteristics of the telecommuting environment and of the ideal telecommuter indicate the need for task flexibility and employees' control rather than the rigid systems imposed in some work environments. Tasks should be well specified to minimize the loss of time due to misunderstandings.

Managers also may be concerned about computer misuse and crime. Clearly, there is greater risk of equipment loss and information leakage when the information system is physically distributed over a wide area rather than concentrated at a single work site with access control.

## EMPLOYEE ISSUES

Issues of fair employment practices, led by concerns about various forms of exploitation of workers, are a major component of this volume. Particular attention was directed to nonexempt workers as the most likely to be exploited; the evolution of exploitative situations in the nineteenth century in manufacturing, particularly in the garment industry, and the potential for repetition of these scenarios in information work, particularly secretarial and clerical jobs; and the effects of those developments on women in the work force. The AFL-CIO is sufficiently concerned about these issues that it has issued a provisional ban against working at home.

The AFL-CIO position typifies the adversarial relationship between labor and management that is common in many U.S. organizations. The AFL-CIO has taken a preemptive stance: although there is no known exploitation of telecommuters, the best way to prevent exploitation is to avoid future situations in which exploitation could occur. In my opinion this is utterly unrealistic. Infor

mation workers will on their own begin insisting on telecommuting arrangements. Managers impressed by the benefits of telecommuting will accommodate these desires. Managers with long-term views of their own success will not engage in exploitation. Others will. It is to these "others" that labor groups should direct their attention.

Is piecework inherently exploitative? Margrethe H. Olson points out that exploitation tends to occur with piecework, or contract work, in a condition of oversupply of labor. The greatest near-term possibility for oversupply of information workers is in clerical and secretarial work, for just these reasons. At present, the demand for managers and professionals with computer competence is far in excess of the supply. Whether this will be the case 10 years from now is less certain.

One interesting result of a ban on home telecommuting for clerical workers is that telecommuting may produce "telescabs." Jobs may be exported to the Caribbean islands, India, and Korea, for example, via telecommunications satellite, resulting in an absolute job loss for U.S. workers.

Exploitation in piecework most often takes the form of demand for excessive rates of production in a situation that is not easily monitored, such as the home. Computers can effectively monitor work rates and performance. They can serve as watchdogs as well as tools, provided that the work records are available to groups suspecting exploitation.

Thus far, computers cannot distinguish between an adult worker performing a job and a child using the same equipment as an aid to parents. It is not difficult to imagine children as information workers in situations that violate child labor laws. But is the situation really the same as those against which the laws were written? New, innovative laws may be required to guide employers and parents and to protect children.

## OTHER LEGAL AND SOCIAL ISSUES

Overlaid on the problems of unequal pay and unequal upward mobility for women are the social customs that still require women to be full-time housekeepers and child-rearers even though they also have careers outside the home. Can telecommuting have any effect on this situation? Picture the dilemma of the woman telecommuter: At last she can have a career and care for

her small child! Realistically, however, she cannot do this without day care or by shifting her work schedule to hours when the children are asleep. It is not possible to use a microcomputer that lacks voice input while holding a small child in your lap. The day-care help may be an older member of the family, such as a grandparent, creating other consequences for the nuclear family. The shift in work schedule may mean that the telecommuter can only work part-time. Many contemporary telecommuter mothers are part-time workers who would be unable to work at all without telecommuting. In short, woman's lot is *still* not perfect in today's work force, but women telecommuters seem to have more options than nontelecommuters.

Other issues, including discrimination in compensation, insurance, fringe benefits, and occupational safety and health, are largely unresolved for telecommuters. Some companies treat their telecommuters as independent contractors, others as part-time employees or as employees without the full complement of fringe benefits given to in-office workers. Other companies do not distinguish between the two in terms of compensation and fringe benefits.

A philosophy of fairness would dictate that if telecommuters are as valuable to a company as other workers they should receive equal compensation and benefits. The value judgment can include the marginal costs to the employer of providing telecommuting capability, provided that it also includes the benefits to the employer of increased productivity. There is considerable variation, however, in existing corporate policies. To a large extent these differences may be resolved in the market. Organizations with the best telecommuting policies will get the best employees.

Occupational safety and health issues are more problematical. It is not possible for an organization to control the working environments of its home telecommuters. Nor is it clear what the responsibility of an organization is for the health and safety of telecommuters' children who happen to be in the work area. The only definite statement that can be made at this point is that most of these issues have yet to come to light in actual cases.

One issue with great local variability is that of zoning restrictions on home telecommuting. For many families with a sole, part-time telecommuter the issue may be moot since detection of violations of work-at-home zoning restrictions would be quite difficult.

However, one variant of home telecommuting could be the neighborhood telecommuting node (a local family room or garage) in which a few workers might congregate daily. Here the traffic might present a clear zoning violation. This raises a broader issue: If telecommuting is seen to be good or bad for the general public, how should zoning laws be altered to reflect this judgment?

## THE FUTURE

There are now more than two dozen companies and government agencies that now have, or have had, telecommuting experiments in operation. In 1973 there was one company experimenting with telecommuting; most of the two dozen are relatively recent. Public and corporate interest in telecommuting is steadily increasing, as is made evident by articles in the media and by the existence of this book. The growth in the number of personal computer owners is astonishing. These patterns are precursors to a steady growth in telecommuting. As large organizations gain more experience with telecommuting, the number of home telecommuting employees will increase. Single-company satellite centers and multicompany facilities operations will develop. Possibly equally important will be the grass roots advances in telecommuting produced by individual employees and by small firms utilizing telecommuting technologies. In the near term most of these small firms will likely be high-technology companies. As the systems technology develops, and as computer literacy grows, the trend will spread to other organizations.

A broad spectrum of telecommuting modes will be present a decade from now. Some telecommuters (probably less than 10 percent) will work full-time at home. Most will work part-time at home or in local or satellite centers close to home. Some will rotate their telecommuting, spending a few months or years at it between tours at the traditional central office.

All of these statements about the future are conjecture, of course, although based upon our studies at the Center for Futures Research. For them to come to fruition on a grand scale, many of the benefits of telecommuting must prevail and many of the drawbacks must prove to be minor or illusory. Much needs to be done to improve our understanding of the factors involved before we definitely will know the value and potential of telecommuting.

## NOTES

1. Porat, Marc Uri. The Information Economy. Ph.D. dissertation, 1976. Stanford University, Stanford, Calif.

2. Long, Larry and Diane De Are. The slowing of urbanization in the U.S. Scientific American, Vol. 249, No. 1, pp. 33-41, July 1983.

3. Nilles, Jack M., F. Roy Carlson, Jr., Paul Gray, and Garhard J. Hanneman. Development of Policy on the Telecommunications-Transportation Trade-off, Final Report. Los Angeles: University of Southern California and the National Science Foundation, 1974. Report No. NSF-RA-5-64-020.

4. Steinfield, Charles W. Social aspects of electronic mail systems. Annenberg School of Communications, University of Southern California. Personal communication, June 1983.

# Appendix A

# Control Data AWS Employee Survey

1. Job title_____
2. Organization_____
3. How long have you been in your present job?_____
4. How long have you been employed at Control Data?_____
5. Briefly describe the major tasks and responsibilities of your job.
   _____
   _____
   _____
6. How long have you been involved in an AWS?_____
7. How many days a week do you spend at your AWS?_____
8. In a typical week, how many hours do you spend working at:
   Alternate work site_____
   Central office_____
9. Have you checked your insurance coverage at your AWS?
   Yes No
10. Have you checked local zoning laws regarding your AWS?
    Yes No

11. What support equipment is available at your AWS? (Please circle each piece that has been provided by CDC.)

_____

_____

_____

12. What tools, if any, that you do not have now do you need for working at your AWS?

_____

_____

_____

13. How much commuting time and distance do you save when you are working at your AWS?

_____

_____

14. How do you generally spend the time you save on commuting?

_____

_____

15. Compared to the traditional work arrangement, how much more or less productive overall do you think you are when are at your AWS location?

More Less _____%

Please list specific examples of why you feel this way.

_____

_____

_____

16. Compared to the traditional work arrangement, how much more or less productive overall do you think you are when you are at your central office location?

More Less _____%

Please list specific examples of why you feel this way.

_____

_____

_____

17. What impact do you perceive time spent at an AWS has on your performance?

1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

18. What impact does involvement in an AWS have on your career development?

1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

19. What impact has AWS had on your contact with coworkers?
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

20. What impact has AWS had on your contact with your manager?
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

21. What impact has AWS had on your contact with family or other individuals living at home?
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

22. Please note the impact of working at the AWS on the following:

Communication and information access
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

Administrative activities (time accounting, payrolls, illness)
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

Utilization of computer and other resources
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

Office support (e.g., secretarial/clerical, phone messages)
1. Very positive 2. Positive 3. Neither 4. Negative 5. Very negative

23. To what extent do you support the AWS concept?
1. Completely 2. To a great extent 3. To some extent 4. To a little extent 5. Not at all

24. How have people in your department who work exclusively at the central office reacted toward your not being there one or more days a week?
1. Very well 2. Fairly well 3. Neither 4. Fairly poorly 5. Very poorly

25. To what extent does your manager support AWS?
1. Completely 2. To a great extent 3. To some extent 4. To a little extent 5. Not at all

26. How accessible are central office resources to the performance of your duties?
1. Very accessible 2. Usually 3. Sometimes 4. Rarely 5. Never

27. What do you see as the advantages of the AWS program for yourself and for Control Data?

28. How has the AWS program saved or cost you money? Please specify?

| *Savings* | | *Expense* | |
|---|---|---|---|
| _____ | $_____ | _____ | $_____ |
| _____ | $_____ | _____ | $_____ |
| _____ | $_____ | _____ | $_____ |
| _____ | $_____ | _____ | $_____ |

29. Any other comments?

# Appendix B

# Control Data AWS Manager Interview Protocol

## Evaluation Worksheet

(Complete one worksheet for each AWS employee)

Employee's name:_____
Job title and function:_____
_____
Grade level:_____
Length of participation in AWS:_____months.
AWS location: Satellite office_____ home_____
Average time spent in AWS:_____days per week.

*AWS costs*: (Include only the incremental costs incurred due to participation in AWS)

Telephone:
Business or private line?_____
Installation charge $_____ paid by employee or CDC?
Monthly charge $_____ paid by employee or CDC?

Terminal/computer: (Including printer, drives, etc.)

| Please list equipment | Monthly cost |
|---|---|
| _____ | $_____ |
| _____ | $_____ |
| _____ | $_____ |
| _____ | $_____ |

Other equipment:
- Typewriter $_____
- Calculator $_____
- Other $_____

Furniture in the AWS supplied by CDC:

| Please list equipment | Monthly cost |
|---|---|
| _____ | $_____ |
| _____ | $_____ |
| _____ | $_____ |

Supplies: $_____

Support and communication:

Additional cost incurred due to AWS for:
- Administrative/clerical support _____
- Mail services _____
- Long-distance calls (off net) _____
- TWX/Telememo _____
- Messages _____
- Call forwarding _____
- Answering machine _____
- Other (please list) _____
  - _____ _____
  - _____ _____

Insurance: (Added insurance incurred due to AWS)
- Homeowners_____ Paid by: Employee___ or CDC___
- Equipment_____ Paid by: Employee___ or CDC___

## BENEFITS

Impact on productivity:

How has productivity changed? _____%

Is this productivity change in overall performance or only while the employee is at the AWS?

_____
_____
_____
_____
_____

Do you have actual demonstrated dollar savings or can you assign a dollar value to any increase in productivity? $_____

Is the AWS participant able to share office space, furniture, equipment, and telephone at the central location? If yes, what are the dollar *savings* with this arrangement?

| | |
|---|---|
| Space | $_____ |
| Telephone | $_____ |
| Furniture | $_____ |
| Equipment | $_____ |

Change in CDC travel costs incurred due to AWS?

# Appendix C

# AFL-CIO Resolution on Computer Homework

WHEREAS, There is a growing trend among companies, especially in the insurance and financial industries, to have employees with computer terminals work at home instead of the office. By 1990, the Bureau of Labor Statistics predicts that computer occupations will increase nearly three times as fast as the expected rate of growth for all occupations in the economy. Computer employment will grow by 70 percent in manufacturing, 70 percent in wholesale and retail trade, and more than 100 percent in hospital, educational, and computer services fields. While most of the growth will be in the office computer occupations, many of these positions could be transferred into the home.

WHEREAS, Homework has historically led to worker exploitation. In the early part of this century, jewelry manufacturers were abusing homeworkers to such an extent that state and federal governments began to regulate them and banned homework in seven industries, including the jewelry industry. Unsafe working conditions and flagrant violations of minimum wage and overtime standards and child labor laws were prevalent in these industries, and the potential for the same problems to arise in computer homework is tremendous.

WHEREAS, The piecework nature of computer work increases the risk of employee exploitation. The worker is under constant surveillance by supervisors through the terminal, and it is a short step from evaluating workers by output to paying them by output. Workers will undoubtedly be ineligible for health and pension plans, and they will be isolated in their homes, making union organizing and other concerted activity difficult.

WHEREAS, Leaving the home computer industry unregulated will have a devastating impact on the well-being, wages, hours, and working conditions of homeworkers. Moreover, enforcement of wage, hour, and safety standards in the home is absolutely impossible; therefore, be it

RESOLVED, That the AFL-CIO calls for an early ban on computer homework by the Department of Labor as a measure of protection for those workers entering the market for the fastest-growing occupation in the United States.

Adopted by the 15th Constitutional Convention of the AFL-CIO, Hollywood, Florida, October 3–6, 1983.

# INDEX

**A**

Abuse, risk of, 32
Acceptance of new ideas, 7
Addams, Jane, 79
Affiliation, need for, 68
AFL-CIO, 140
AFL-CIO Resolution on Computer Homework, 78, 152-153
Allied Professionals Educational Consulting Services (APECS)95, 97
Allison, Elisabeth, 115
ALMSA (Automated Logistics Management Systems Activity), 24-32
Alternate work sites (AWS), 38-50
American Express Company case study, 8-15
American labor force, 112
APECS (Allied Professionals Educational Consulting Services), 95, 97
AT&T divestiture, 109, 111
Attitudes toward technology, 17-18
Attractiveness of homework, 137-138
Audit, external, 31-32
Automated Logistics Management Systems Activity (ALMSA), 24-32
AWS (alternate work sites), 38-50;
*see also* Control Data Corporation

**B**

Balance of trade, 91-92
Blackwell, Ann, 81, 85
Blue Cross/Blue Shield of South Carolina case study, 16-23
Brief, Arthur P., 66-75, 85, 88
Bypass carriers, 110
Byrne, Dr. Richard, 17
,

**C**

Career advancement, 98-99
Career development, 48
Carey, Matthew, 79
Case studies, 3-56
American Express Company, 8-15
Blue Cross/Blue Shield of South Carolina, 16-23

Control Data Corporation, 38-50
F International, 51-56
Mountain Bell, 33-37
overview, 5-7
U.S. Army, 24-32
CDC (Control Data Corporation), 98; *see also* Control Data Corporation *entries*
Center for Futures Research, 9
Centralized message centers, 127
CETA (Comprehensive Employment and Training Act), 14
Chamot, Dennis, 76-84, 85, 88, 89, 92, 93
Change
accelerating, 6
continuity versus, 74
technological, 133
Child care, 113-114
Child labor, 79-80
laws, 62
Choice, 68, 78
freedom of, 21
Clerical positions, 134
Clerical workers, female, 112-124
Clustered work force, 16
Coaxial cable, 108
Collective bargaining, 63
Communications, 40, 54-55
costs, 109-110
devices, 27
difficulty of, 36-37
procedures for, 50
technology, 108
Competition, overseas, 91-92
Comprehensive Employment and Training Act (CETA), 14
Computer connect time, 29-30
"Computer Homework" resolution, 78, 152-153
Computerized monitoring, 118-119
Computers, personal (PCs), 7, 100-101, 133
Connect time, computer, 29-30
Connell, James, 17
Continuity versus change, 74
Contract organizations, 127-128
Contractors, independent, 60-61
Control Data Corporation (CDC), 98
AWS Employee Survey, 145-148
AWS Manager Interview Protocol, 149-151
case study, 38-50
Homework program, 41-42
Copiers
laser beam, 109
telecopiers, 10-11
Cost/benefit analysis, 41
Cost curves, 105-107
Costello, Cynthia, 114
Costs
communications, 109-110
telecommuting, 138
Cottage keyer project, 18-20
Couples, professional, 130
CPU efficiency rate, 28, 29

**D**

DARCOM (Development and Readiness Command Material), 25, 28, 31
Decentralization of office work, 120
Delivery, work, 43
Demography, 134-136
Development and Readiness Command Material (DARCOM), 25, 28, 31
Dictation system, 8
Display, high-resolution, 108
"Dominetics," 1
Duplicate records, 99

**E**

Earnings comparison, 22; *see also* Wages
Education system, PLATO, 42-43, 48
EEO (equal employment opportunity), 60, 62
Efficiency rate, CPU, 28, 29
Electronic cottage concept, 14
Electronic homework, *see* Homework
Elisburg, Donald, 59-65, 85, 88-89 91-93
Emergency situations, 99
Employee morale, 30, 31
Employee Survey, Control Data AWS, 145-148

Employees
defined, 60
professional, *see* Professional employees
selection of, 139
Employment practices, fair, 140-141
Energy expenditure, 69
Environment, work, 93
Equal employment opportunity (EEO), 60, 62
Equitable Life Assurance Society, 14
Equity concept, 88
Error rate statistics, 22
External audit, 31-32
Exxon SQIP-2150 telecopier unit, 10-11

**F**

F International (FI) case study, 51-56
Fair Labor Standards Act (FLSA), 60, 80
Fairness, philosophy of, 142
Family interaction, 34
Federation of the Handicapped, 90-91
Female clerical workers, 112-124
Female economic realities, 113
Female telecommuting, 141-142
FI (F International) case study, 51-56
File storage evolution, 106-107
Flexibility, work, 118
"Flexiplace,"; 1
FLSA (Fair Labor Standards Act), 60, 80
Forecast, technology, 105-111
Fraud, risk of, 32
Freedom of choice, 21
Fringe benefits, 63-64

**G**

Geisler, Greg, 16-23, 85-87, 95-97, 99, 100
Goddard, Robert, 6
Gregory, Judith, 112-124, 126, 129
Gunnarsson, Ewa, 118

**H**

Hackman, J. R., 70
Handicapped, Federation of the, 90-91
Handicapped population, 9-10
Handsets, telephone, 108-109
Hawthorn Effect, 137*n*
Health, occupational, 64, 114-115, 142
Health insurance benefits, 20
High-resolution display, 108
Hine, Lewis W., 79
"Hold harmless" agreements, 27, 31
Home-based work, *see* Homework
Home workstations
law and, 13-14
printing capability of, 109
use and misuse of, 76-84
word processing, 8-15
Homebound, Project, 8-15
Homework
abuses of, 88-89
attractiveness of, 137-138
ban on, 88-90
"Computer Homework" resolution, 78, 152-153
electronic concept of, 7
future of, 87-88, 103-144
limits on, 78-79
strengths of, 55-56
weaknesses of, 55
Homework program, Control Data Corporation's, 41-42
Hours and wages, 85-87
Human resources organizations, 128

**I**

IBM, 100-101
IBM PC, 20
Ideas, new, acceptance of, 7
Independent contractors, 60-61
Individual needs and pressures, 129-131
Industrial Revolution, 5, 16
Information processing technology, 6
Information security, 98-99

Installation, communications system, 108
Insurance, medical, 63-64
Insurance claims, "paperless,"; 18
Interaction, social, 70-71
Interactive systems, 24
International competition, 91-92
IRS, 98

**K**

Kawakami, Steven S., 81
Kiron, Alan, 1

**L**

Labor
  movement, 87
  relations, 63
  standards, 60-63
  unions, 63, 94, 116
Labor force, 134-136
  American, 112
Lanier "Telestaff" central dictation system, 10
Laser beam copiers, 109
Laws, 39, 59-65
  child labor, 62
  home workstations and, 13-14
  zoning, 13, 64-65, 142-143
Lefcourt, Herbert, 21
Legalities, *see* Laws
Location-independent organizations, 126-127
Logistics, 40

**M**

Magnetic recording, vertical, 107
Management, 2, 17, 40-41, 48, 100, 138-140
Manager Interview Protocol, Control Data AWS, 149-151
Manning, Ronald A., 38-50, 95, 97, 98
McDavid, Mary, 24-32, 95, 98
Medical insurance, 63-64
Message centers, centralized, 127
Micronet, 53
Microprocessors, price of, 105-106
Microwave technology, 108
Miller, Don, 5-7, 95, 100-101
Minimum wage, 62, 79-80
Monitoring system, 11-12
  computerized, 118-119
Morale, employee, 30, 31
Motivation, 67
  work location and, 66-75
Mountain Bell case study, 33-37

**N**

Naisbitt, John, 1
Nelson, Kristin, 120-121
New York City, 9
Nilles, Jack M., 1, 115, 133-144
Nord, W. R., 74

**O**

Occupational health, 64, 114-115, 142
Occupational safety, 64, 142
Occupational Safety and Health Administration (OSHA), 13
Office acculturation, 15
Office relocations, 120-121
Oldham, G. R., 70
Olson, Margrethe, H., 1-2, 114 125-132, 141
Optical character reader, 89
Optical fiber, 108
Optical storage, 106-107
Organizational needs and pressures, 128-129
Organizational phenomenon, 2
Organizations
  contract, 127-128
  human resources, 128
  location-independent, 126-127
OSHA (Occupational Safety and and Health Administration), 13
Overhead costs, 77, 116
Overseas competition, 91-92

**P**

"Paperless" insurance claims, 18
Participation, level of, 49
Part-time work, 91, 94
Part-time workers, 119-120

PCs (personal computers), 7, 100-101, 133
Personal interaction, reduction in, 44-45
Personal needs and pressures, 129-131
Personnel, 41
Phelps, Nelson, 33-37, 95-100
Phones, *see* Telephone *entries*
Physically disabled homebound people, 10
PIC (Private Industry Council), 14
Pickup work, 43
Piecework standards, 80, 86, 118
PLATO education system, 42-43, 48
Pratt, Joanne H., 95, 97-100
Printing capability, workstation, 109
Private Industry Council (PIC), 14
Production log, 12
Productivity, 18, 40, 45-46, 70, 90, 95-97, 136-137
  initial drop in, 36
  intensification of pressures for, 117-119
  measurements of, 50
  statistics on, 21
Professional couples, 130
Professional employees, 83, 125-126,
  remote work for, 125-132
Profit motive, 90
Profitability, project, 96
Programming, 51
  development of, 7
Project Homebound, 8-15
Psychological phenomenon, 2

**R**

Raney, James G., Jr., 8-15
Reagan, President Ronald, 9
Records, duplicate, 99
Relocations, office, 120-121
Remote work for professionals, 125-132
Reporting, 40
Retirement, 128
Rodgers, D. T., 74
Roosevelt, President Franklin D., 5

**S**

Safety, occupational, 64, 142
Satellite technology, 108
Schiff, Frank, 1
Secretarial positions, 134
Security data problems, 98-99
SEIU (Service Employees International Union), 82
Selection, employee, 139
Semiconductors, 105
Service Employees International Union (SEIU), 82
Shirley, V. S., 51-56, 95, 96, 99, 138
Shoji, Nancy, 95, 96, 98
Social interaction, 70-71
Social progress, 6-7
Social status, 71-72
Software, system, 108
Suburbanization, office, 120-121
Supervision console, 10-12
Support structures, 7
Sweatshops, 92

**T**

Technological change, 133
Technology
  attitudes toward, 17-18
  communications, 108
  female clerical workers and, 112-124
Technology forecast, 105-111
Technology push, 1-2
Telecommuting, 1, 135-136
  advent of, 6
  costs of, 138
  female, 141-142
  future of, 2, 143
  growth of, 99-100
  origin of, 1
Telecopiers, 10-11
"Telemanaging,"; 14
Telephone handsets, 108-109
Telephone installation costs, 47
Telephone lines, 12
"Telework,"; 1
Terminal costs, 47
Terminals, video display (VDT), 59, 114-115

Texas Instruments Silent 700s, 21
Timekeeping form, 12
Toffler, Alvin, 9
Trade, balance of, 91-92
Travel costs, 47

**U**

Unemployment compensation, 63-64
Unions, labor, 63, 94, 116
U.S. Army case study, 24-32

**V**

VDT (video display terminal), 59, 114-115
Vedel, Gitte, 118
Vertical magnetic recording, 107
Video display terminal (VDT), 59, 114-115
Vision and video terminal viewing, 115
Vroom, V. H., 66

**W**

Wages, 67-68, 72-73, 82, 85-87, 116
  comparison of, 22
  minimum, 62, 79-80
Wang WP-5, 10
Wideband bypass carriers, 110
Wisconsin Physicians Service (WPS), 114
Withington, Frederic G., 105-111
Women, *see* Female *entries*
Word processing workstations, 8-15
Work
  characteristics of, 66-67
  new forms of, 1
  office, decentralization of, 120
  part-time, 91, 94
  remote, for professionals, 125-132
Work environment, 93
Work flexibility, 118
Work force
  categories of, 77-78
  clustered, 16
  productivity of, *see* Productivity
  reorganization of, 16-17
Work location and motivation, 66-75
Work pickup and delivery, 43
Work productivity, *see* Productivity
Work schedule, 53
Work selection criteria, 40
Work sites, alternate (AWS), 38-50
Working, *see* Work
Workmen's compensation, 27-28
Workstations, home, *see* Home workstations
WPS (Wisconsin Physicians Service), 114

**Y**

Yankelovich, D., 74

**Z**

Zalusky, John L., 76-84, 85-92, 94
Zoning laws, 13, 64-65, 142-143