

COMPUTERIZED CONFERENCING & COMMUNICATIONS CENTER

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NEW JERSEY INSTITUTE OF TECHNOLOGY

INTEGRATING WORKING AT HOME
WITH INFORMATION SYSTEMS
MANAGEMENT

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INTRODUCTION

The history of computerization has its origin in the automation of manual processes - searching out the segments that could be put on a computer. The intended result was that the entire job would be done faster and cheaper. Thus, current computer-based information systems tend to make more efficient use of computers than people. The management function, on the other hand, often seems to focus on competitive skills and salesmanship rather than on the ability to attract and hold talented people. But, such impersonal factors that have driven management practices are changing. There has been a complete reversal in the relative costs of one computer versus one employee. The cost of a computer is now a fraction of that of an information worker. Another change to be reckoned with is the emergence of computers as facilitators of human communications (Turoff, 1985).

Since there are other costs besides salary that must be considered in maintaining the office workforce, some corporate managers are looking for alternatives to the traditional locational and temporal aspects of office work. Recognizing that technology for personal computing has progressed in just a few short years from video games to some very sophisticated applications, management may even consider if it would be beneficial to encourage employees to buy personal computers for use at home. One way to do this is a computer purchase program subsidized by the employer.

There are many different views of what "working at home" really is; there is much conjecture as to the success or

failure of such programs. This paper attempts to review the current literature associated with the subject of remote work and to provide a framework for further understanding.

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EVOLUTION OF REMOTE WORK WITH COMPUTERS

Over ten years ago, Claude A. R. Kagan and Lawrence Shear made some rather prophetic statements about the home use of computers (Kagan and Shear, 1973). At that time, computers had not yet achieved much recognition for use other than as "mainframe" units located in the centralized domain of the corporate information systems department. Service bureaus selling computing services on a time sharing basis were just becoming popular, but Kagan and Shear predicted that home computers would be available that could be used either on a stand alone basis or tied into a central computer using a communications system. Furthermore, they boldly forecast that such home computers would be moderately priced - they claimed a \$2,000 computer would be available in just a few years. They felt home computers would be considered status symbols which, in turn, would increase consumer demand thus making it worthwhile for manufacturers to sell them at lower prices. They went so far as to predict the immense popularity of video games as an offshoot of the acceptance of computers by youth. They also believed personal computing would become so widespread that user groups and magazines devoted to the technology would be established. Although unsubstantiated at the time, their foresight can certainly be verified by examining more current literature (Anderson, 1980; Carroll, 1982; Dutton, Kovaric, and Steinfeld, 1984; Keen and Woodman, 1984; Vitalari, Venkatesh, and Gronhaug, 1985). As of 1983, nearly one of every ten households had some kind of personal computer, of which as many as 20 percent had a modem for applications involving telecommunications (Dutton, Kovaric, and Steinfeld, 1984). According to Link Resources, the New York based market research and

consulting firm, a subsidiary of International Data Corporation, there were 11,356,000 personal computers and 2,271,000 modems installed in American homes by the end of 1984. Given the current popularity of personal computers, the issue at hand is whether or not such devices may be effectively used for remote work.

Remote work is usually referred to as organizational work performed externally from the normal confines of business, both in space and time (Olson, 1983). Add a computer linked to the office and you have "telecommuting" (McClintock, 1981; Nilles, 1982; Plotzke, 1982).

Remote work with computers is not a new idea - it first appeared about 1970 - and is not limited to working at home (Pratt, 1984). Olson describes other arrangements such as satellite work centers where a self-contained department of an organization is physically located to provide convenient commuting distance for the greatest number of employees and neighborhood work centers where employees of various companies share common facilities located conveniently in their neighborhood. Those concepts were first suggested in 1972 when energy shortages forced many companies to consider remote work to conserve gasoline use by not having workers commute (Pratt, 1984). However, the idea didn't seem to catch on then and it was not until the next major energy shortage in 1979 that remote work again became a topic of interest. It was then that remote work appeared to become more synonymous with working at home. Perhaps the reason for this was that the first remote workers were women, apparently trying to raise children while still pursuing their careers (Pratt, 1984).

Others have suggested that work at home may be a natural evolution from video game playing (Anderson, 1980; Carroll, 1982; Dutton, Kovaric, and Steinfeld, 1984). For example, one might start by playing video games and gradually progress to programming (Dutton, Kovaric, and Steinfeld, 1984). Anderson also suggested that the home is not unlike a small business, so that there is a home equivalent to business data processing (Anderson, 1980). Carroll went so far as to identify common problems faced by users of a text editor and those playing the computer game "Adventure" (Carroll, 1982). He found those problems to be:

1. Disorientation - the user/player does not know what to do in the system environment
2. Elusiveness - what the user/player wants to do is deflected to other, perhaps undesired goals
3. Emptiness - the screen is effectively vacant of what to do or what went wrong
4. Mystery Messages - the system provides feedback that is useless and/or misleading
5. Slipperiness - doing the same thing in different situations has unexpectedly different consequences
6. Side Effects - taking an action has consequences that are unintended and invisible but cause trouble later on
7. Paradox - the system tells the user/player to do something that is clearly inappropriate
8. Laissez-faire - the system provides no support or guidance for overall goals, e.g., winning the game or typing a letter

Carroll postulated that both users and players were trying to cope with an unfamiliar environment and experienced learning difficulties. This was not necessarily bad

because his research revealed that the game has a conceptual, maze-like learning approach that he termed an exploratory environment, which motivates the player to overcome problems. On the other hand, the text editor under study created an environment that seemed to frustrate more than help (Carroll, 1982). Thus, environmental as well as personal factors affected the user's confidence and ultimate success.

A sample consisting of 282 members of active computer clubs in Orange County, California, indicated that 26 percent primarily use their computer for business. If word processing use is included, then work at home is probably a primary use for 45 percent of the respondents. If this is a trend, the home of the future may be the site of more task-oriented behaviors. Work at home has strong normative support, at least in technical and professional/managerial households (Vitalari, Venkatesh, and Gronhaug, 1985).

FACTORS INFLUENCING COMPUTER USE IN THE HOME

Carroll concluded that if the learner's motivation is task oriented and the learner feels in control of the situation, then obstacles can become challenges (Carroll, 1982). Cognition - the act or process of knowing - is felt to be an important factor in human interaction with computers (Allen, 1982). Cognitive factors in the computing scenario affect user confidence. User confidence is extremely important, especially if one is a casual user, i.e., one who uses a terminal only occasionally and spends most of the day doing something else (Cuff, 1980).

More recently, Dutton et. al. presented a research agenda that stressed the integration of four factors - social background, technical features, social milieu, and personal attributes - into a predictive model of patterns of home computer use (Dutton, Kovaric, and Steinfeld, 1984).

Social background refers to level of education, income, occupation, and age - variables which clearly support the likelihood of predicting entry into the world of home computing (Dutton, Kovaric, and Steinfeld, 1984).

Technical features too are somewhat obvious. The man-machine interface must be designed to appear as natural as possible or else the user will quickly reject the system (Cuff, 1980). Hardware limitations surely influence use, but so do software differences. As the user progresses from software performing the most elementary tasks to that using a command language, the more the user will enjoy and persist in using the software (Dutton, Kovaric, and Steinfeld, 1984). That supports Carroll's earlier findings (Carroll, 1982). However, the

key development is not in either hardware or applications software but in the addition of a communications capability to the microcomputer (Keen and Woodman, 1984). That marriage may produce exponential growth (Hiltz and Turoff, 1983).

The social milieu or environment encompasses a network of individuals linked through some common denominator, such as magazines, personal friendships, or electronic mail, for example. As one becomes more integrated into the network, whatever it is, use will increase (Dutton, Kovaric, and Steinfeld, 1984). Hiltz and Turoff confirm that once individuals get caught up in the excitement of these efforts and in the self satisfaction inherent in such accomplishments, it is almost an addictive working environment (Hiltz and Turoff, 1983).

Personal attributes consist of a user's preexisting experience and expertise and instrumental reasons or motives (Dutton, Kovaric, and Steinfeld, 1984). The home computer is still a rather complex product requiring some special skills and, possibly, some training. For well-educated, technically-oriented individuals, that complexity is manageable. They will need to invest less time in learning to use the computer and integrate it productively into the household task environment (Vitalari, Venkatesh, and Gronhaug, 1985). There will always be a place for the application of programming and other specialized skill to do sophisticated things, but most people wanting quick access to information don't really care how a program obtains it. They probably won't use a system much unless they can do so without specialized skill and knowledge (Cuff, 1980).

SOME MISCONCEPTIONS ABOUT WORKING AT HOME

There are several misconceptions associated with working at home (Hiltz and Turoff, 1983). The first is that the person who works at home will never commute to an office. Most telecommuters visit the office periodically to attend meetings, review projects, and so on (Gordon, 1984). McClintock found that time spent telecommuting varied greatly, from one to thirty hours per week (McClintock, 1981). Hiltz and Turoff, workers-at-home themselves, do commute about half of the time. Their own experiences were reinforced by a survey which showed only about 28 percent of the respondents spent more than half the time working from a home office which included a terminal or personal computer (Hiltz and Turoff, 1983).

Lift, Inc. is a not-for-profit corporation devoted to helping severely disabled people find employment in computer programming. A telephone interview with Charles W. Schmidt, Chairman, revealed that Lift employees make a commitment to come into the office at least once a week. This is to protect the handicapped person from being considered a nonentity. Most disabled individuals are not loners by choice and often must be with others in order to realize their potential. It is also important for the nonhandicapped to be exposed to the handicapped in the workplace to appreciate their capabilities and accept them as contributors rather than as a burden to society.

The second fallacy identified by Hiltz and Turoff is the "electronic hermit" image ascribed to those that work at home (Hiltz and Turoff, 1983). One envisages no face-to-face contact with other human beings. However, McClintock believes that, while it results in more time

working alone, telecommuting can increase employee interdependence and face-to-face interaction (McClintock, 1981).

Working at home may even provide the other extreme - too much contact. Family, friends, visitors may all wander into the workplace. Interruptions may reach a point where rather drastic action must be taken to prohibit them, e.g., putting metal bars through doors to prevent children from entering. One soon discovers that it is necessary to hire a sitter or to provide for some kind of day care for small children (Hiltz and Turoff, 1983). When working parents care for children at home, the result is that little work gets done or the parents expect the children to behave beyond their abilities. This often leads to conflict and could result in emotional or behavior problems in the children (Edwards and Edwards, 1985). If the home was specifically designed to accommodate an office (like some doctors, dentists, and lawyers) it would have a separate business entrance. The reaction of people entering would be much different, much more reserved (Hiltz and Turoff, 1983).

While there may be reduced face-to-face interaction, the technology makes it relatively easy to initiate dialogues and form coalitions with people in other parts of the organization (Zuboff, 1982). Contact with other human beings may be enhanced by the addition of a communications medium. Hiltz and Turoff claim that a dense network of social relationships develop and are sustained. Although different in kind, those social contacts are just as real as relationships with coworkers in a traditional office (Hiltz and Turoff, 1983).

A third misconception may be that extensive equipment is needed for remote work. However, Anderson puts home computers in the same category as domestic "hardware" like dishwashers and stereos (Anderson, 1980). That was based on the assumption that programming in the home of the future would become a widespread activity - not unlike washing the dishes or playing the stereo! Anderson felt that was a "must" for the effective use of resources, i.e., for users to attain fluency (Anderson, 1980). In a survey of pilot work-at-home programs, Olson described the physical requirements as minimal - only a terminal and a telephone (Olson, 1983). Hiltz and Turoff describe their "electronic cottages" as having a large study, a computer terminal, and two telephone lines - one for the computer terminal and the other for incoming and outgoing calls (Hiltz and Turoff, 1983).

PERSONAL CONSIDERATIONS

Individual Characteristics of Home Workers

Dutton et. al. feel that before trying to predict the impacts of the personal computer on society researchers should focus on how people will use it (Dutton, Kovaric, and Steinfeld, 1984). In the study of computer club members conducted by Vitalari, et. al., rank data was collected for five kinds of computer activities:

1. Entertainment/games
2. Finance
3. Word processing
4. Business use
5. Hobby/education

A sociodemographic profile showed 63 percent were engaged in technical professions, were well-educated, and had above average income. Business use was high for engineers, self-employed people, and professionals. Hobby use was high for engineers, programmer/system analysts, students, and retired persons. Word processing use was high for professionals, sales persons, and blue collar respondents. Entertainment use was high for programmer/system analysts and students (Vitalari, Venkatesh, and Gronhaug, 1985).

Control Data Corporation began a work-at-home program about six years ago during the last energy crisis. Ralph S. McCrae, Manager - Homework Programs stated in an interview that between 50 and 100 people have been involved over the years and many are disabled. In another interview, John L. Johnsen, now Senior Vice President of Integrated Resources Life Companies, described the program

at the Equitable Life Assurance Society during his employment there. Again, physical condition was the motivating factor for working at home.

Pratt and Olson studied work-at-home pilot programs. Pratt gathered potential interviewees for her work-at-home study from media articles. The study consisted of telephone interviews with both employers and employees. Most interviews took forty-five minutes to one hour to complete. There were fourteen professionals and twelve managers in the male group. For females, the breakdown was: ten professionals, six managers, and four clerks. Pratt's research revealed these employees to be self-disciplined people who considered the opportunity to work at home a privilege. They had leverageable skills allowing them to successfully initiate home office work. They did not need the office for socialization. The limited time they spent there afforded them just about the correct amount of contact with people they wanted (Pratt, 1984).

Olson participated in the exploratory study sponsored by the Diebold Automated Office Program (Olson, 1983). Firms experimenting with pilot work-at-home programs were contacted. They were asked to furnish names of employees participating in their programs. Telephone interviews lasting approximately half an hour were conducted with thirty-two employees - twenty women and twelve men. They all performed work normally done in offices and regularly worked at home. The managers of those employees interviewed were also contacted. They were also interviewed by telephone but for a longer period of time - about one hour. The thirty-two employee group consisted of the following:

1.	Clerical	
a)	Data Entry clerks	4
2.	Professional	
a)	Software Engineers/Programmers	7
b)	Course Development Analysts	5
c)	Loss Control Consultants	6
d)	Staff Interviewers	2
3.	Managerial	
a)	Technical Managers	2
b)	Staff Managers	2
c)	Project Managers	4

(Olson, 1983)

Some individual characteristics common to the entire sample of home workers were determined. Olson proposed that all home workers should possess those characteristics:

1. Self-motivation, self-discipline
2. Skills provide bargaining power
3. Family requirements
4. Few social contacts beyond work and family

(Olson, 1983)

Self-motivation and Self-discipline

Cowan found that the best at-home workers were those who liked doing independent studies in college. They tend to be self-motivated, be able to determine what has to be done, and have a sense of purpose needed to do the job. They don't need to continually consult with their managers (Cowan, 1983).

Professional employees such as those participating in the Diebold study would be expected to be both self-motivated and self-disciplined. The participants confirmed this

statement. They also tended to work in a very rigid routine and in the same place and during the same hours every day (Olson, 1983). Pratt's findings provide reinforcement. Even though only 40 percent of her sample started work early in the morning, people in all categories took advantage of the twenty-four-hour day, seven day week to schedule their work (Pratt, 1984). Renfro suggests all details of an office routine, even dress and working hours, must be brought into the work-at-home scenario (Renfro, 1982).

John L. Johnsen, Senior Vice President, Integrated Resources Life Companies, described his experiences managing word processing telecommuters at Equitable Life Assurance Society to Kroll and in a personal interview (Kroll, 1984). Simply stated, the problem was not motivating the telecommuters; indeed, it was motivating those in the office to send them work. Turnaround time was slowed down because work had to be delivered to the employee's home.

Specialized Skills

Olson's interviews revealed that most of the home workers in the Diebold study felt they had some bargaining power with their employers, either because of their specialized skills or their proven loyalty to the company (Olson, 1983). This could be an advantage to the company if it desires to retain the services of a valuable employee. Employers can also recruit from a wider geographic area and more diverse population, including handicapped and retired people (Kroll, 1984). Also, with changing worker attitudes, such as refusing to relocate, telecommuting may be a welcome option (Plotzke, 1982). The January 26, 1981 issue of Business Week cited by Pratt described the case

of John A. Vlcek, a veteran software specialist (Pratt, 1984). He had left the California-based Computer Sciences Corporation, but the firm hired him back, agreeing that he could work at a computer terminal in his Brooklyn, New York home.

Family Requirements

Many workers-at-home cite family situations as the main reason for choosing that type of employment arrangement (Olson, 1983; Pratt, 1984). The ability to have flexible work hours, integrate work and family life, and remain at home with young children were all cited as important factors (Pratt, 1984). A generalized model of the typical home worker would be one who likes to move in and out of either full- or part-time work while staying at home (Pratt, 1984).

Hiltz and Turoff feel it is much easier to physically transform the home into an office than it is to develop the social routines necessary for the same premises to effectively serve as both home and office (Hiltz and Turoff, 1983). Home is no longer a place to get away from work. Work - the computer - is always there. That may tempt the user to try "just one more" variation or to excessively "polish" the information product, polishing that previously was inconvenient or even impossible (Nilles, 1982). Hiltz and Turoff describe it as "a workaholic's dream/nightmare." Their "electronic cottages" never close. They often work until 4 or 5 A.M. and on weekends and holidays (Hiltz and Turoff, 1983). An individual working at home is likely to routinely spend sixteen or more hours a day in the house (Salomon and Salomon, 1984).

The combination of the technology and working at home seem perfectly suited for those who tend to be workaholics. The result is that one can easily become overloaded, i.e., active in too many things and committed to much more than one can comfortably handle. Nevertheless, the opportunity to stagger work hours allows the home worker to spend more of the children's waking hours with them. One thus needs to adopt a lifestyle that balances work and play. Hiltz and Turoff suggest that to escape the holding power of the computer, those who work at home may seek intensive forms of recreation as an outlet (Hiltz and Turoff, 1983).

Salomon and Salomon state that changing the physical location of work to the home, where the day-to-day instantaneous responsibilities occur, will require major family adjustments (Salomon and Salomon, 1984). Role conflicts with coworkers in the office are reduced, but conflicts at home among family members may be created (McClintock, 1981). In the Diebold study, many of those interviewed felt that relations with their family were a problem. Both family and individual discipline were seen as critical factors affecting the success of working at home (Olson, 1983). The research by Hiltz and Turoff confirms this. They postulate that working at home can exacerbate existing problems between spouses. Submerged hostilities may be brought to the surface. They also feel the spread of the work-at-home concept will tend to produce more equality and less stereotyping of work roles between the sexes. There will be difficulties for many males and females alike. Nevertheless, Hiltz and Turoff concluded that working at home seems to improve family relationships somewhat, but, in a minority of cases, the increased family contact and the attempt to institute routines for separating time spent on work from time spent on family

may lead to a deterioration in relationships (Hiltz and Turoff, 1983). The most frequent reason for not telecommuting stated by nonuser respondents in McClintock's study was a desire to keep home and work separate (McClintock, 1981).

Social Contacts

Cowan indicates that working at home may require somewhat of a "loner" type of personality. It is not the kind of work situation for highly social or gregarious individuals (Cowan, 1983). The computer terminal itself can become the employee's primary focus of interaction. That can lead people to feel isolated in an impersonal situation (Zuboff, 1982).

Olson found that some of those interviewed in the Diebold study participated only in family or solitary activities beyond work. They also had fewer problems with social isolation or concentration than others. Olson concluded that an individual who likes to be alone could work at home effectively with only minor changes in lifestyle (Olson, 1983). On the other hand, Hiltz and Turoff emphasized the social contacts that are made when a computer is joined with a communications network. They can exchange messages, engage in conferences to discuss plans and ideas, and use a common "electronic notebook" where articles, reports, and even entire books may be drafted and edited (Hiltz and Turoff, 1983). Apparently, the degree of social contact depends on the particular situation. Pratt's findings showed that about the same number of home workers felt that they were loners as thought of themselves as outgoing. Working at home enhanced social contact for handicapped persons, for example, while pro-

fessional women with young children felt somewhat alienated from their peers (Pratt, 1984).

Hiltz and Turoff feel that it is possible to form friendships "online" with the right kind of communication system. In fact, they believe that working at home is feasible only with a communication system to establish a network of individuals that must be viewed in the context of a social group, not single employees interacting with a computer through a terminal (Hiltz and Turoff, 1983).

Considerable research has been conducted which has established the importance of social communities in the workplace and the extremes people will go to in order to maintain them. Many will not easily give up that pleasure and, hence, see themselves at odds with a new technology that changes the quality of their work life (Zuboff, 1982). Those who need the face-to-face contact of the office are likely to reject working at home. That is particularly true of those with repetitive simple tasks who miss the social presence of coworkers and the opportunity to socialize with them on the job. Hiltz and Turoff suggest that such individuals not engaged in intellectual activities are far more likely to become a part of the machine in the minds of others - something you send orders to and get results back from (Hiltz and Turoff, 1983). Nilles recommends the local work center concept, as opposed to working at home, because it is unreasonable to expect the average information worker to forego all on-the-job social contact. However, he also feels that an attractive compromise may be for the worker to spend several days per week at home and a day or more at the office to reaffirm collegial ties (Nilles, 1982).

In fact, a recent survey of Datamation readers by Olson revealed that those who were telecommuters overwhelmingly preferred such a compromise work arrangement (Olson, 1985). The social role of the workplace is less important to professionals and managers (Salomon and Salomon, 1984).

Promotability

Interaction at the workplace is also important to the employee for growth and promotion (Salomon and Salomon, 1984). Workers whose productivity could not be measured by supervisors were uncomfortable with working at home (Pratt, 1984). Olson and Lucas found remote workers to be concerned about promotability. Many professionals can work in relative isolation from the organizational environment for at least some period of time, but working at home could affect their feelings of identity with organizational goals and criteria for promotability (Olson and Lucas, 1982). Renfro confirms this by postulating that if the boss cannot see how well you are doing and how hard you are working, you may be forgotten and passed over at promotion time (Renfro, 1982). Cowan concludes that working at home could mean out of sight, out of mind (Cowan, 1983).

Control Data Corporation's Ralph McCrae stressed the importance of career development activities to Kroll and in a telephone interview (Kroll, 1984). He sees the biggest single problem with employees who work at home as their fear that career progress will be slowed down because they are not visible to management in the office every day. One implication may be that the telecommuter is content to be apart from the "team." The "loner" is not building the skills necessary to manage people, an ability that so many positions demand (Cowan, 1983).

ORGANIZATIONAL CONSIDERATIONS

Job Characteristics

Most people are familiar with the term "cottage industry." Perhaps it conveys a mental image of a Scottish weaver producing tweed cloth. Certainly, an organization known as the "Institute for Liberty and Community" would not provoke the same image. The "Institute for Liberty and Community" was John McClaughry, one of President Reagan's top advisers on domestic affairs. Many of Ronald Reagan's radio scripts, in the years before he became president, were written in McClaughry's log house, a "cottage" he built himself in Concord, Vermont (Applegath, 1982).

With the advent of the microcomputer, the contemporary "cottage" industry exemplified by John McClaughry became electronic. Much of it now has to do with moving information around as he did (Applegath, 1982). But, in an office environment, who moves information around? Do the "information movers" use computers? If not, should they? If so, have computers had a positive impact of them? These are some crucial questions that must be answered in order to find the tasks most suited for telecommuting.

The Diebold Research Program surveyed office workers using computers in some 500 large organizations in the United States and Canada (Diebold, 1984). Some of the key findings were:

1. Office employees have reacted positively to computer-mediated work and are increasingly demanding computer-based technologies

2. By the end of 1985, access to computer terminals is expected to increase to over 50 percent of the office workforce in those organizations surveyed
3. Managers are substituting computer-based technology, such as teleconferencing and electronic text systems, for written communications, telephone use, and travel.
4. Few organizations are taking full advantage of the opportunities offered by the technology; only one-fourth of the companies surveyed used it to promote work flexibility through work-at-home or flextime programs

(Diebold, 1984)

The Diebold study looked at four kinds of office employees: support staff, professionals, managers, and executives. Support staff and professionals make up three-quarters of the office workforce and are the most avid users of computers in the workplace. At present, managers make very little use of computers. Less than one-fourth of the managers in the organizations studied had either their own or shared access to terminals. Computer use by executives follows a pattern similar to that for managers (Diebold, 1984).

Office tasks have been characterized by the amount of "structure" they have or, conversely, by the degree of problem solving involved. At one end of the spectrum are highly structured tasks, such as producing payroll checks. At the other end are unstructured tasks, such as deciding whether or not to consummate a corporate merger. Successful performance of a "task" like that depends mainly on the problem-solving abilities of the decision maker (Croft and Lefkowitz, 1984).

As the result of a study to determine the communication tools needed in thirty-eight individual offices, Panko developed a typology of office work (Panko, 1984). He identified two basic types of offices:

1. Type I departments handle routine information processing - examples are accounting, payroll, billing, word processing, and reproduction departments. Procedures abound and their automation is central to improved performance
2. Type II departments handle nonroutine information processing - examples are line managers, legal departments, corporate planning, marketing, and engineering. Procedures are relatively few and their support is not central to improved performance

(Panko, 1984)

In Type I offices, careful attention is given to developing procedural tools and control systems. For example, Xerox Corporation carefully defined outputs of its Type I departments and calculated a "cost of information" measure for each output which could be tracked over time (Panko, 1984). On the other hand, Type II offices are likely to be professionally complex and nonprocedural. Too strong a procedural focus could be a deterrent to satisfying the real needs of the office. However, the work of the Type II department can be supported with nonprocedural tools, such as electronic mail, decision-support systems, and access to databases (Panko, 1984).

For the present, most telecommuters engaged in office work perform print-oriented tasks that may be done as a solitary effort, such as writing, word processing, and computer programming (Plotzke, 1982; Gordon, 1984). Panko undoubtedly would have classified such work as "Type I." However, Kroll interviewed managers of remote workers at firms engaged in such diverse activities as insurance, retailing, software development, and computer hardware. The managers' departments included personnel, marketing, programming, customer service, data entry, and word processing (Kroll, 1984). Both Type I and Type II offices appear to be represented by those managers Kroll interviewed as well as in the employee group surveyed by Olson to determine personal characteristics of home workers. That latter group consisted of data entry clerks, software engineers/programmers, course development analysts, loss control consultants, staff interviewers, and technical, staff, and project managers (Olson, 1983).

McClintock conducted ongoing, indepth interviews over a one-year period with twenty professional level telecommuters at a large research university. They were records managers, computer programmers, information systems operators, and administrative assistants. Six members of the group had tried telecommuting and abandoned it, so McClintock's research included both "users" and "nonusers" of the technology (McClintock, 1981).

McClintock examined the effects of telecommuting on both routine and nonroutine tasks. Routine tasks were defined as exchanging or assigning data sets, information dissemination by memo or other correspondence, and information seeking through reports and simple problem

solving. Respondents reported accomplishing more routine work in less time when telecommuting. For nonroutine work, telecommuting resulted in an increase in the time available for more complex tasks. Thus, there was an increase in the efficiency of routine task performance and an increase in the effectiveness of nonroutine task performance. McClintock, however, stresses that the use of an electronic mail and message system seemed to be critical to the success of telecommuting (McClintock, 1981).

Most office work has both routine and nonroutine, structured and unstructured aspects. Very structured tasks can be carried out with algorithms unspecified in application programs, but loosely structured tasks usually have few characteristics that can be specified algorithmically (Croft and Lefkowitz, 1984). Croft and Lefkowitz give an example showing how a standard procedure can still provide assistance to office workers in solving problems even if that procedure is not appropriate for a particular task. The problem is the fairly unstructured task of hiring new graduate students for a research project. How many people can be hired and who should they be? Although it would be very hard to write an algorithm to solve this problem, a list of things that should be done can be compiled:

1. Check salary budget for the project
 2. Check current salary for graduate students
 3. Check space available
 4. Get a list of unfunded students and their details
 5. Advertise the positions available
 6. Hire graduate students
- (Croft and Lefkowitz, 1984)

Using POISE, a system designed to support structured and some kinds of unstructured tasks, Croft and Lefkowitz specify these steps in a procedure. First, the project manager could make a database query to get the budget information. The next step would probably involve only a call to the department head, but POISE would be able to remind the manager to get that information. For the third step, some standard method for checking space could be specified. Accessing a student database could be the fourth step. Then the final steps, advertisement and hiring, could commence.

Job Selection Criteria

Gordon foresees financial analysts working at home on electronic spreadsheets and market research analysts retrieving information from a database to prepare reports at home (Gordon, 1984). McClintock is more enthusiastic. He believes all typical business activities, including marketing, production, sales, the delivery of goods and services, and supervision and management could be facilitated or accomplished electronically and not necessarily in "the" office (McClintock, 1981). His enthusiasm for telecommuting is not shared by the management at Stanley Works, the famous manufacturer of home workshop tools. Interaction between programmers and data processing systems' users is deemed so important there that chances of implementing a work-at-home program is minimal (Cowan, 1983). Telecommuting may just not be compatible with a corporate culture. It does fit in at Control Data. The initial project started there in 1979 trained and employed business application and computer-based course programmers, according to Ralph McCrae. The work-at-home job family now includes some

engineers and technical writers. Individuals are presently being trained for telemarketing, word processing, and data entry home-based employment. However, it is important to note that Control Data is not currently encouraging the work-at-home alternative except for those employees who have a significant disability - one that would make working at a traditional site unrealistic.

Olson and Lucas propose that jobs whose controls are determined by process rather than output may not be suitable for remote work (Olson and Lucas, 1982). Olson identified the following job characteristics for remote office work which were independent from the technology employed or the job level:

1. Minimum physical requirements - a terminal and telephone hookup at most
2. Individual control over work pace - job not driven externally by short-term deadlines
3. Defined deliverables - job controlled by output, e.g., data entry clerks paid per transaction, programmers paid on fixed price contracts for a delivered system or per completed program
4. Need for concentration - most jobs require some degree of concentration for at least some period of time
5. Defined milestones - easily measurable intermediate deadlines
6. Relatively low need for communications - the significant characteristic is that the need for communications can be partitioned

(Olson, 1983)

Kroll's criteria are similar. Jobs must require a minimum of physical activity, have easily definable and measurable goals, have long term deadlines, not be dependent on location, and not require constant communication with supervisors in the office (Kroll, 1984). Electronic Services Unlimited, a New York firm specializing in consulting, research, and training in the field of telecommuting, found that the following questions must almost always be answered positively if a job selected for telecommuting is to have a reasonable chance of being accomplished successfully:

1. Does the job involve routine information handling?
2. Is there high use of the telephone?
3. Is there relatively little face-to-face contact? If high, could it be scheduled so the other, cognitive tasks can be handled from a remote location?
4. Are terminals necessary or can they be used effectively to accomplish much of the required work?
5. Do the tasks have a structured flow of information in a defined time frame?
6. Are there defined milestones or deliverables at specified times?
7. Is the job self-contained enough so it can be done independently of others and, if necessary, be integrated into the whole later?
8. Is there minimal need for complex support, either people or equipment?
9. Is there minimal need for working space associated with the job?

Information-based organizations such as banking, insurance, marketing, utility, employment agency, and

computer service, and information-oriented jobs, like word processing, data entry, programming, accounting, and customer services, for example, seem to be the best candidates for work-at-home programs (Kroll, 1984).

Telecommuting Managers

Diebold's 500-office survey found that executives and managers make little use of computers (Diebold, 1984). Managers are sometimes reluctant to be seen actually touching a computer keyboard - an act they see as damaging to their professional image (Nilles, 1982). Panko studied eighty-five managers and found they could be divided into three user groups: sophisticated, simple, and indirect (Panko, 1981). Sophisticated users tend to maintain relatively complex online files, edit messages before sending, and demand more from the programmers who design the systems. Simple users work at the terminal themselves, but using only a few commands and not bothering to learn how to use the system's full power. Panko's sample consisted of sixteen sophisticated and eleven simple users. That means the vast majority of managers (58) were indirect users. Indirect users delegate most or all of the terminal work to subordinates (Panko, 1981). People are not easily sold on anything that may change cognitive processes and organizational social structures (Hiltz and Turoff, 1985).

Daspin reported on a recent interview with futurist Alvin Toffler (Daspin, 1985). Routine work, Toffler says, is nicely programmable. Workers who do routine work are in danger of being replaced - so are managers who make routine decisions. With the introduction of new technologies, whole levels of management will disappear.

Skills will be broken down into "programmable" and "nonprogrammable." Those with "programmable" skills may lose their jobs (Daspin, 1985). With that thought in mind, it isn't too difficult to figure out why a manager would want to keep his or her job "nonprogrammable."

How can managers be encouraged to become more active in computing so as to better understand the technology and ramifications like telecommuting? Perhaps the answer lies in computer-mediated communication systems. An executive may devote almost 95 percent of a workday to face-to-face, telephone, and written communications (Plotzke, 1982). A manager typically spends somewhat less time on such communications-related activities, but it still adds up to about 80 percent (Plotzke, 1982, Panko, 1984). Besides the attributes of interactive terminals, e.g., the quick feedback, computer conferencing (or teleconferencing, as it is sometimes called) allows the transmission of much additional information. Such things as statistics, graphics, and interactive database development can also be sent (Penrose, 1984).

Hiltz and Turoff find computer conferencing systems permit informal communication that is semistructured and highly adaptive. By increasing the number of people involved in informal information flows, they have more opportunity to pool talents and expertise and facilitate the lateral movement of information in the organization (Hiltz and Turoff, 1985).

The range of interaction among professionals and managers is greatly extended with computer conferencing (Zuboff, 1982). Turoff and Hiltz conducted experiments to study

the differences between face-to-face group problem solving and computer conference group problem solving. Although face-to-face groups tended to reach a consensus faster, they didn't produce better solutions. More options were discussed in the computer conference (Turoff and Hiltz, 1982).

Stahr relates how a group of Bechtel International employees went to Papua, New Guinea to build a gold mine. They took along an unusual tool: a computer conferencing system. Rather than communicate via telephone or Telex, which was deemed too depended on time and too expensive, the teams relied on personal computers to exchange messages and reports with associates at corporate headquarters in San Francisco. The gold mine was finished both more quickly and economically than anticipated (Stahr, 1985).

Project managers cited the efficient communications as a key to the job's success. If the Bechtel employees in New Guinea faced a problem that only experts in San Francisco could remedy, without the computer conferencing system they would have had two choices: fly the experts to the site or arrange for a conference call to New Guinea (sending supporting documents via express mail). Either option would have been more costly (Stahr, 1985).

Penrose warns, however, that computer conferencing in a business setting - particularly involving executives - assumes the users have some computing skills, as well as the desire to participate (Penrose, 1984). Perhaps as more voice features are added to computers, teleconferencing, as well as telecommuting, may become

reality for a host of industry professionals (Plotzke, 1982). With two-way video conferencing, parties can see and hear each other as events take place. The late night news program, Nightline, with Ted Koppel, exemplifies this form of teleconferencing (Penrose, 1984). The face-to-face contact between people, deemed so necessary by Stone and Luchetti for organizational success, is maintained if this communications medium is utilized (Stone and Luchetti, 1985).

Remote Supervision

If information technology is to live up to its promise of greater productivity, management needs to consider the consequences for human beings. That goes deeper than the need for a "friendly interface" or "user involvement" (Zuboff, 1982). Managing human assets means viewing employees and their relationship with management as important "social capital" (Beer and Spector, 1985). The old human resource model treated employees as a cost to be contained and had as its goal the containment of conflict. The objective was to hire employees, assign them to a job, and prevent problems from arising. The new human resource model treats employees as a human asset, an investment (Beer and Spector, 1985).

Changes in the physical and temporal nature of work can affect methods for monitoring and controlling work. A significant problem is the adjustment in managerial style that would be necessary to manage remote work. The typical manager sees subordinates routinely and can ask and answer questions about the work. With remote work, the manager must better define job expectations, including nature of the tasks, time limits, and quality concerns.

(Gordon, 1984). Olson and Lucas state that managers are uncomfortable supervising those they cannot see (Olson and Lucas, 1982). Hiltz and Turoff state the problem a little differently. Managers do not believe employees are working unless they can see them bent over a desk or talking on the telephone. The person must be there for eight hours, just in case they need to get an immediate answer to some question (Hiltz and Turoff, 1983). For the supervisor who would ask, "How can I tell whether my employees are working if I can't even see them?" Nilles would reply, "How can you tell they're working when you can see them?" (Nilles, 1982). Zuboff feels the interpersonal relationship can become less important to management than access to information on the quality and quantity of employee output (Zuboff, 1982). Supervision in most cases depends more on appearance than substance until the product appears (Nilles, 1982).

The managers interviewed in the Diebold study relied heavily on mutual trust and respect in their employee relations (Olson, 1983). A management style that demands blind obedience to orders is not the kind of leadership that works well in this situation. Hiltz and Turoff say it may come down whether a manager embraces a "Theory X" (employees are lazy) or a "Theory Y" (employees take pride in their work) viewpoint (Hiltz and Turoff, 1983). One stresses performance, the other stresses the maintenance of the organization and its human resources. The former relies on the "hard" aspects of management: structure, strategy, and systems. The latter emphasizes "soft" aspects: skills, staff, superordinate goals, and style. Remote supervision is much more likely to be perceived as a problem by performance, hard-aspect-oriented managers

than those that are maintenance or soft-aspect-oriented (Morf, 1984).

Olson found that managers had certain criteria that they felt were critical to the success of remote work. One was that it should be voluntary (Olson, 1983). Gordon disagrees, stating that those companies who relied on self-selection for remote work generally had poor results (Gordon, 1984). He feels employees often underestimate the impact of relative isolation and need to be one's own manager. The employer must carefully select the remote workers, based on information from the employee's manager about work habits and planning skills, checking that with personality inventories that help indicate the individual's need for social interaction and ability for self-direction (Gordon, 1984). Another criterion was that there must be open communication between supervisor and subordinate at all times (Olson, 1983). Telecommuters need feedback and directions just like those in the office (Gordon, 1984). Those who work at home need to be easy to reach within a reasonable amount of time. The value of electronic mail or a telephone message recording system could make management control easier. Olson found that those employees who had access to electronic mail had contact with and monitoring by supervisors daily (Olson, 1983). McClintock and Gordon both confirmed the importance of electronic mail to successful telecommuting (McClintock, 1981; Gordon, 1984).

Productivity Measurement

The economics of office work are dominated by labor cost (Strassmann, 1985). Olson and Lucas proposed that the

long-term effects of the changing nature of communications may be that individuals can productively contribute to organizational functioning regardless of their physical location (Olson and Lucas, 1982). Olson found that the managers interviewed in the Diebold study stressed that employees must always know that they were being treated fairly and that their work was being recognized (Olson, 1983). Hiltz and Turoff emphasize that managers of remote workers have to learn to measure employees not by their physical presence for a given number of hours a day but by the quality and quantity of work during a specified time period. That may be a relatively simple task with programming, as an example, but a much more difficult one with some of the cognitive activities of other employees (Hiltz and Turoff, 1983). Methods of measuring work-at-home productivity are, at best, inexact (Cowan, 1983). Nilles' research indicates that working at home is associated with significant (15 percent or more) increases in productivity of typists and data entry clerks (Nilles, 1982). Electronic Services Unlimited of New York reports a "norm" of about 20 percent improved productivity where direct measurement is possible. Gordon estimates productivity increases of 15-80 percent with an average of 25-35 percent (Gordon, 1984). For management and professional employees, work is less easily quantified and, until very recently, many of the telecommuter's tools were not suited for higher level work environments (Nilles, 1982). Strassmann claims that the first year's organizational and technology costs of bringing a typical administrator or professional into the electronic environment exceeds 30 percent of the individual's wages. The 30 percent productivity improvement just needed to break even is hard to measure and, therefore, hard to find (Strassmann, 1985).

The manager seems to have more confidence in a report if a professional spends three days in an office working on it rather than doing it at home. Not being able to see the person working on the document raises doubts in the manager's mind. Were the facts and figures double checked or was the report carelessly whipped out in an hour when it should have taken three full days to be carefully prepared? Managers must learn to overcome this type of bias in order to view the quality of a product objectively (Hiltz and Turoff, 1983). Kroll's survey found that managers must shape their styles, skill, and activities to the special needs of telecommuters. The extra efforts of the managers in that survey, however, were rewarded with increased productivity ranging from 10 to 100 percent and improved work quality and worker satisfaction (Kroll, 1984). In the survey by Pratt, about two-thirds of the employers and employees felt productivity increased with remote work (Pratt, 1984).

Browne feels that productivity is tied to compensation. With the usual compensation systems, an employee often uses most of his or her initiative figuring out how to work less without losing his or her job. Most people have no real incentive to use their intelligence in their jobs. So they save their mental energy for hobbies and other things outside the office. The key to productivity is for employer and employee to have the same incentive so the latter's mental energy can be unleashed on the former's behalf (Browne, 1973). Unfortunately, Browne stops short of providing the magic formula.

McClintock's pilot study was conducted to explore the effects of telecommuting on productivity and to develop a

conceptual model of these effects for future research. Improvements in efficiency on routine tasks and effectiveness on nonroutine tasks could be dampened by conflicts at home and off-the-job problems of fatigue and social isolation. The conceptual model shown in the appendix consists of nine causal loops (ADA, ADGA, ACDA, ACDGA, ACFG, ABCDA, ABCDGA, ABCFGA, ABEGA) with plus signs indicating positive correlations between variables and minus signs, negative correlations. Loops with an odd number of minus signs are self-correcting; those with an even number of minus signs will amplify increases in any variable (McClintock, 1981).

Costs and Savings

The microcomputer is the analog of the automobile; the telephone line and the communications satellite serve as the highways; information is transported instead of workers (Nilles, 1982). A daily commute today averages about eighteen miles per round trip (Nilles, 1982). If that commuting time could be converted to work time, more hours would be worked (for more money) or available for leisure activities.

Savings to employees may be measured in terms of both time and money. Reduced traveling to and from work results in time savings, but associated with that are monetary savings in gasoline, tolls, parking, and insurance expenses. Less money would also be spent on food and clothing (Pratt, 1984).

There is an opportunity for tax savings by taking deductions for the home office (Pratt, 1984). That could

include house or apartment rental, maintenance, and telephone expenses (Nilles, 1982). Plotzke cites the case of a telecommuting California stockbroker who saves three hours of commuting time daily and \$500 a month on commuting, parking, and meal costs, besides the tax write-offs for his office at home (Plotzke, 1982).

The increasing number of dual career households has resulted in not only travel but also child care pressures that can be relieved by one or both parents working at home (McClintock, 1981). Pratt states some parents saved money on babysitting and day-care fees, but Hiltz and Turoff pointed out that this could be an added cost to limit distraction while working (Hiltz and Turoff, 1983).

Telecommuting may reduce some costs but require expensive changes in the size or design of the home to accommodate new equipment and work patterns (McClintock, 1981). If the company did not provide equipment, the employee would need to spend additional money for the home system. That would be a personal computer (or terminal) and perhaps a second phone. Such costs could be prohibitive to lower level workers and retirees attempting to supplement their limited income (Pratt, 1984). However, the employee's cost of equipment and associated insurance costs and computer programs may be tax deductible (Nilles, 1982).

For the employer, rent or building ownership and other associated costs can constitute a substantial portion of corporate overhead - an expense telecommuting can reduce (Nilles, 1982). Less office space is required with fewer office workers actually in the office, saving some of the cost of rent, utilities, heating, and services (Kroll,

1984). Companies that own their buildings and have enough or a slight excess of office space to satisfy their needs could lease to outside tenants (Gordon, 1984). Likewise, companies experiencing rapid growth or short-term staffing needs might consider telecommuting as at least an interim solution to costly expansion via building or leasing (Gordon, 1984).

There would also be a decrease in the cost of installing and maintaining office work stations (Pratt, 1984). Even if workers spent only part of the time at home, office schedules could be staggered to reduce the required office space size (McClintock, 1981). For those who work part time, there would be no cost for fringe benefits (Olson, 1983; Pratt, 1984). Pratt's study also found remote work resulted in a decrease in disability payments (Pratt, 1984). There would be higher retention of employees (Gordon, 1984; Kroll, 1984; Pratt, 1984). In attracting new employees, the employer is freed from geographical restrictions (Nilles, 1982; Kroll, 1984).

For most offices, mainframe computer work load is heaviest during the traditional workday, approximately 8 A.M. to 5 P.M. It drops dramatically during off-peak hours; only large batch processing is generally done in those hours. Thus, costly computer capacity needed during peak hours can be underused and unproductive at other times (Gordon, 1984). That "overhead" cost may drop to the extent computer use is spread over a longer daily period and telecommunication facilities are used off-peak when they are considerably cheaper (Morf, 1984). Olson and Lucas propose that increasing the efficiency of communications and other office functions should result in greater free

time for managers. If that can be translated into increasing span of control, savings can be quantified in terms of a reduction in the total number of managers required to run the business (Olson and Lucas, 1982).

If workers do not need to commute, expensive energy resources will be conserved (Plotzke, 1982). Transportation is energy intensive, accounting for one-fourth of total national energy consumption. About one-ninth of this is due to the automobile, which uses about three kilowatthours of energy for each passenger-mile traveled. On the other hand, a microcomputer with a relatively massive memory might consume just one-tenth that amount of energy for each hour of use. For only one percent replacement of worker commuting with telecommuting, the national gasoline bill would go down by about 5.4 million barrels annually (Nilles, 1982).

IMPLEMENTING A WORK-AT-HOME PROGRAM

A Computer Purchase Program for Employees

Naibitt found that the cost (in 1982) to install a terminal in a worker's home was \$1,700. If costs continue to decline, they will be less of a consideration (Naibitt, 1982). Working at home could be integrated with an employee purchase program encompassing computer hardware, accessories, software, service, and maintenance. In return for the opportunity to work at home, a qualified employee must possess or agree to purchase an approved home computing system. The cost of the employee's investment, either existing or new, could be subsidized by the company to the extent that it can be quantified in terms of cost savings to the company or increased productivity. Keen and Woodman cited a Honeywell study where a 10-20 percent productivity improvement justified investing 60 percent of an employee's salary in a computer (Keen and Woodman, 1984).

In attempting to ascertain to which areas of the company such a program might be applicable, Hammersley provides some guidance. In an organization with a mature information systems function, the personal computer is used as a supplement to the mainframe. It becomes a part of the information services system, not a replacement for it. It may be used as a tool for new functions or, depending on the capability of the mainframe, a cheaper way to perform some specific tasks (Hammersley, 1981).

In a computer purchase program, codes of good practice should be followed whether applicable to the office or home. Keen and Woodman suggest a recommended vendor list for both hardware and software. Care must be exercised in the purchase of software so that it is compatible with the

array of hardware offered. Databases that create their own distinctive format that may not be easily transferred to mainframe files should be avoided. Users' data files must meet the same legal and audit requirements as the mainframe with regard to the integrity of database. Only users that have knowledge of proper testing and evaluation techniques should be allowed to program. Allowing everyone to jump on the bandwagon can only result in ineffective computing with people performing tasks inefficiently and unsuitable applications (Keen and Woodman, 1984).

Planning a Pilot Program

In investigating the feasibility of a work-at-home program, most researchers and interviewees emphasized tasks such as programming, word processing, and data entry. Hiltz and Turoff feel this is a very limited view of what the technology makes possible. They hypothesize that a wide variety of professional and managerial tasks can be carried out from a home office if the right form of computer and systems support are available. They suggest that those companies who limit the scope of working at home to only routine tasks will find that they are probably employing teenagers and grandmothers using someone else's name (Hiltz and Turoff, 1983).

Electronic Services Unlimited feels it is a prudent, smart management decision to invest some time and money in a telecommuting pilot program. It should address a business problem, e.g., overcrowding, absenteeism, turnover, exodus in the face of relocation, and so on. After first determining what departments should be represented in the planning process, e.g., human resources, information systems, as well as user departments, Electronic Services Unlimited recommends six steps:

1. Select the jobs
2. Select the people
3. Train the managers and emphasize the difference between good supervision and close supervision - supporting remote workers' efforts as much as checking on their productivity
4. Train the remote workers - those who are actually going to be telecommuting
5. Link the workers to the office - office visits, staff support, and technical assistance for equipment
6. Take care of technical details - equipment and services, such as telephone lines, set up well in advance of start-up date

Most companies would find these steps manageable and that there are few barriers to getting a pilot program started. Small scale pilot programs can be very effective for gaining experience with little risk (Gordon, 1984).

Independent Contractors

The Federal Social Security Act is a source of wide ranging provisions relevant to telecommuting. Under the act, employers and employees make contributions to fund disability, old-age, and survivors' insurance. The rules governing who must pay for social security coverage and how to determine the various payroll taxes assessed to employers require that a home worker be identifiable as an employee or an "entrepreneur." This often may not be so easy, but the Fair Labor Standards Act provides some guidance - if workers supply their own equipment, they may be independent contractors (Morf, 1984).

Employers like to treat home workers as independent contractors. This permits them to reduce record keeping, avoid costs of fringe benefits, and overtime payments. The Fair Labor Standards Act explicitly states that employees must be paid time and a half after forty hours have been worked in a week (Morf, 1984).

Browne relates his own business experience in California (Browne, 1973). His small firm had been losing money and was about to fail. He was burdened with payroll taxes, bookkeeping requirements, and other regulations imposed by the government which were expensive and time consuming to administer. Taxes - social security, income, unemployment insurance, disability insurance - had to be paid or withheld, reducing employees' take-home pay.

Browne fired all his employees including himself! He then made contracts with each person for the services he required. Because there were no more employees, no more taxes had to be paid or withheld. The employees were now independent contractors, selling their services, with their homes as their offices, and coming to the "old" office to perform services. Now they had many more income tax deductions: part of household expenses, telephone bills, utility bills, car expenses, and other costs normally considered to be personal. Besides the benefits realized by the employees as independent contractors, the business became profitable. Nothing really changed but the method of compensation (Browne, 1973).

Nilles, however, raises the issue of employee loyalty and feeling of corporate identity. If employees report to a central location, they may be more able to identify their own personal goals with those of the company. If

telecommuters are independent contractors, selling their services to the highest bidder, they may be less enthusiastic in support of corporate goals, and consequently less productive (Nilles, 1982).

Browne would disagree. He believes the contractor should be paid for information, not time - which might include coffee breaks, trips to the restroom, and flirting with the receptionist. Since only results are compensated, the worker, not the employer, must determine how much time is needed to do the job. Browne sees three important benefits to the employer from this scheme:

1. An accurate understanding of what each thing costs - alternatives can be easily compared
2. Relief from the burden of supervising an individual's time - only results have to be checked
3. Each contractor has the same incentive as the employer with respect to the service provided - profiting most by doing what is most valuable to the employer

(Browne, 1973)

A case history reported by Electronic Services Unlimited on the use of employees as independent contractors by New York Life Insurance Company is included in the appendix.

Some see the local work center as a surrogate for the central office in developing company spirit (Nilles, 1982; Daspin, 1985). In the telephone interview with Charles Schmidt of Lift, Inc., he felt very strongly that (severely disabled) workers must have a presence in the office so that the employer may see that those workers are fully as productive as any others and often more dependable and highly motivated. His experience has shown

that employers are willing to accept the minimal risk of a contract for a disabled programmer's services under Lift supervision where they would be reluctant to recruit that person as a direct employee. Nevertheless, Lift's corporate clients are urged to hire the individual as a direct employee after one year. The contract therefore provides a trial period for performance appraisal, on-the-job training, and client exposure to the special problems of managing remote disabled programmers, all under the supervision and responsibility of Lift. If the only accomplishment of a telecommuting program in the near term was the employment of those who previously were unemployable due to disability, how great a contribution to society that would be!

Labor and Other Opposition

If the company is unionized, nothing in the work-at-home program should violate the collective bargaining agreement. Salomon and Salomon suggest the physical separation of workers may dilute the power of labor unions causing them to intervene in the telecommuting process (Salomon and Salomon, 1984). Pratt states unions may oppose remote work because it is impossible to check on the safety of the employees (Pratt, 1984). Edwards and Edwards claim that the AFL-CIO, citing unfair labor practices, has called for a federal prohibition on telecommuting (Edwards and Edwards, 1985). Morf confirms that the Service Employees International Union of the AFL-CIO has asked the Department of Labor to ban computer work at home entirely (Morf, 1984).

Labor leaders are concerned about "telescabbing" and "electronic sweatshops" (Morf, 1984). Their position is

that working at home with a computer would encourage piecework, depress wages, reduce fringe benefits, and risk employee exploitation and unsafe working conditions. They also fear violation of "industrial homework" laws. Such laws were passed in the 1930s to protect women and children from abusive labor practices (Edwards and Edwards, 1985). Cowan states there may be opposition from some government agencies as well as labor unions. IRS and OSHA may also be interested in a company's telecommuting program (Cowan, 1983).

The issue of pay for piecework done at home has been a thorny issue for the Department of Labor and the courts for a long time. The (Hackensack, New Jersey) Record recently reported that, as the result of a worker's complaint, the Labor Department brought suit against a Teaneck, New Jersey, telemarketing firm, DialAmerica Marketing, Inc., for failure to pay minimum wage rates. The company's position, which was upheld by the district court, was that the workers were not employees because the company did not exercise direct supervision over their hours and work. However, the Third United States Circuit Court of Appeals overruled that decision and, on October 21, 1985, the United States Supreme Court refused to hear DialAmerica's appeal. Thus, the lower court's finding that the workers were employees subject to the Fair Labor Standards Act was upheld. (Recall the earlier discussion of independent contractors).

Industrial homework laws are in force in many states. Among these are California, New York, Texas, Illinois, Pennsylvania, New Jersey, Massachusetts, Washington, and Hawaii. Those laws are mostly concerned with workers employed to manufacture products; they generally don't

affect telecommuters. That's not to say that computer work performed in the home hasn't attracted attention. For example, New York specifically excludes tasks like typing, transcribing, and bookkeeping from the requirements of its law (Edwards and Edwards, 1985). Computer work is also not included under that law, but the area is being watched closely, a state Department of Labor spokesperson said in a recent interview with The (Middletown, New York) Times Herald Record.

Zoning ordinances may also prohibit using the home for certain business purposes, but they may vary widely from one locality to another. For example, in California, home businesses are allowed in Sierra Madre if you obtain the proper license; but you must apply for a home occupation permit before you can get such a license in Pasadena. In nearby Bradbury, home businesses are not permitted at all (Edwards and Edwards, 1985).

Olson expressed another concern: the company's public image. Several companies experimenting with work-at-home programs were particularly sensitive to the impressions of the worker's neighbors. What do they think when they know that the employee commands a regular salary but stays at home to work? (Recall the remote supervisor's suspicions mentioned earlier.) Olson states the exploratory study in which she participated raised more questions about such critical issues than it answered and that further investigation is required (Olson, 1983).

Edwards and Edwards reinforce Olson's concern about the effect of working at home on one's neighbors, but for a different reason. They state that most questions on compliance with zoning ordinances are raised by the

worker's neighbors who may be annoyed by noise, traffic, or just cars parked in front of their houses. Yet, some neighbors may welcome a business in a home nearby. They feel safer knowing someone will be in the neighborhood during the day. When neighbors are supportive, they can be valuable allies if some special permit or variance to work at home is needed (Edwards and Edwards, 1985). Obviously, establishing and maintaining good relations with the neighbors is important to any business but may be particularly critical to the success of a work-at-home venture.

CONCLUSION

Diebold says more than half the American workforce today could be called "information workers" and that percentage will increase to 90 by the year 2000 (Diebold, 1984). Kroll claims seven million people use terminals in offices today. That will increase to forty million in only about five years (Kroll, 1984). Keen and Woodman state currently that one out of twenty workers interface with a computer and that will be reduced to one out of three (Keen and Woodman, 1984).

Several areas of concern have been identified as a basis for further research. The ergonomist studies the relationship between people and their tasks and tools. The ergonomist who today studies office furniture design, lighting levels, the angle of video display terminals, and so on, may find those concerns obsolete tomorrow. What if the office of the future is not, at least in the traditional sense, an office at all? The workers may no longer be tied to a workstation, but entirely mobile - working at home or, with a portable computer, almost anywhere (Diebold, 1984). How then may resources be integrated in an office environment that must accommodate both on- and off-site workers? Some or all of the capital investment in office space and equipment may be transferred from the employer to the employee. Would they be willing to trade off that expenditure for the option to work at home?

Turoff states that most organizations would be unable to function if informal communication channels were cut off, but the ability to carry them out through a computer allows human channel capacity to increase fivefold

(Turoff, 1985). Will the use of a computer in the context of remote work enhance or inhibit communication channels in the firm?

Microcomputers and networks may cause a new type of organization to evolve. The characteristics of a "networked" organization will be project groups with geographically dispersed members, more delegation of authority, accompanying management by exception, better accountability, and increased productivity (Turoff, 1985). What roll will working at home play in the evolution of a new organizational structure? How will job functions and tasks be redefined? Will workers become more specialized ... or less?

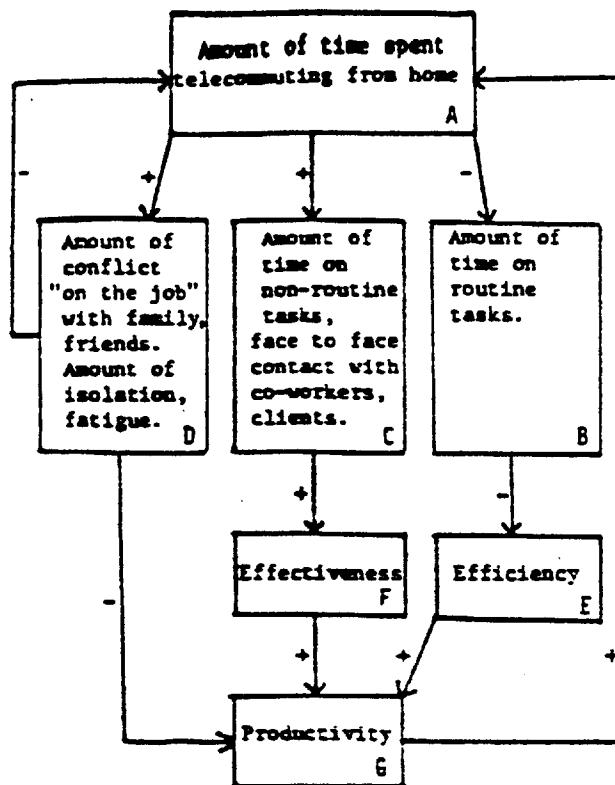
A great potential exists for growth in remote work, but what will make it easy or hard to realize? Kroll states that probably less than one percent of workers are presently telecommuting (Kroll, 1984). But, that is expected to increase to five percent in just a few years (Gordon, 1984; Kroll, 1984). In the more information-intensive businesses, like banking and insurance, ten percent of staff may be telecommuting (Gordon, 1984). Most of those doing cognitively based tasks want even more opportunity to alter the locational and temporal definition of work.

On the other hand, Naisbitt doesn't think many people really want to work at home. "High tech/high touch" is the way he describes the response to technology. Whenever new technology (high tech) is introduced, there must be a human response (high touch) or a technology is rejected. Telecommuting will be limited because people want to be with other people; hence they will want to go

to the office (Naisbitt, 1982).

One thing is certain - change will not come easily. Those who hold power in organizations by controlling information channels will resist implementation of a new structure that dilutes their power (Turoff, 1985). Any strategies for change must recognize and deal with the politics of data and the likelihood of counterimplementation (Keen, 1981). Political forces are intensified when actions and beliefs are perceived to be linked with undertakings having high stakes, and the stakes involved in computer technology are substantial (Mowshowitz, 1981).

Hiltz and Turoff suggest that resistance to change, negative attitude towards computers, valid and invalid fears that may be too difficult to overcome today will not bother the new generations growing up in the world of personal computers (Hiltz and Turoff, 1983). Also, most impressive technologies, such as fiber optics, are now upon us. A strand of glass (fiber) carrying light, usually from a laser, can carry about 10,000 times more information than the same diameter copper wire (Penrose, 1984). With the growing number of microcomputers in homes that can easily be used as terminals and the growing introduction of computer-mediated communications systems, Hiltz and Turoff sees us entering a period of rapid growth. Thousands of individuals in the United States may already be carrying out some substantial portion of their work from home. They feel it may take a generation or two, but working at home for those dealing with cognitive tasks will be the rule, rather than the exception, for some significant portion of their work week (Hiltz and Turoff, 1983).



Model of Direct and Indirect Effects on Productivity of Telecommuting From Home

WORKING WITH AT-HOME PROGRAMMERS ON A CONTRACT BASIS¹

Organization: New York Life Insurance Company

Department: Data Processing

Job Function: Programmer/Analysts

Program Objective: To ease backlog of user requests

Size of Program: Has ranged from 6 to 12 contract programmers at any one time, but may now be expanded...24 programmers have been approved for the program and 14 have actually been under contract.

Summary of Results: Program has been in effect since August, 1982. 32 contracted assignments have been completed...7 now active...4 more are pending. Program has been successful in easing pressure on the DP department and is cost-effective (approximately 33% less costly on a given assignment than if done by in-house programmers).

Support Personnel in Office: Administrator plus Project Leader.

Equipment: Provided by company. IBM 3101 plus Datastream T7 telephone modem using AT&T lines.

Basis of Selection of At-Home Contractors: All have been female former N.Y. Life programmers or analysts with a good record at the company who have left for reasons of maternity or child care. (Male employees would be considered for the program, but none have applied.) The former employee becomes an independent contractor and cannot be otherwise employed in EDP work.

Basis of Payment: Highest company programmer salary level on hourly basis, multiplied by number of hours estimated to do the job. The result is a single contracted amount for each assignment. Each assignment is written up under a separate contract. Payment may be lump sum upon completion of last deliverable (portion of assignment), or as a partial payment on completion of each deliverable. Job length has ranged from 25 to 350 hours. Expenses for telephone line costs are paid by company upon submission of phone bill; other expenses (travel, etc.) are paid upon submission of receipts, if expense has been authorized prior to its being incurred.

Description of Program: A standard contract has been developed which outlines the general mutual responsibilities and liabilities. Contract Appendix A. gives the specifications of the Task to be performed. Contract Appendix B. describes the Deliverables to be provided by the programmer and the dates by which they are due. Contract Appendix C. specifies the Payment Schedule and the amounts.

Part of the success of this program is, of course, due to the fact that no training or "breaking-in" to N.Y. Life's way of working is required. But perhaps even more significant is the attention paid to the Task Specifications, which spell out the precise form and content of the Deliverables and how these are to be developed. The specs may be external, internal or in "pseudo-code," but must be within the experience level of the contractee -- which the company is already aware of.

The Deliverables are clearly defined, as are the due dates -- which must require no more than 17-1/2 hours of work per week. Once agreed to, deliverables may not be altered in any way. If project changes occur, the original contract must be completed and a new contract drawn up for the modifications.

To date, every contract has been completed within budget. Five were late, due to: programmer illness (1)...user failure to provide timely test data (3)...and hardware problems (1).

¹ Electronic Services Unlimited, Telecommuting TC Report, January 1985, p. 6.

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