AN INVESTIGATION OF THE IMPACTS OF REMOTE WORK ENVIRONMENTS AND SUPPORTING TECHNOLOGY

Margrethe H. Olson
Department of Information Systems
NYU Stern School of Business
44 West 4th Street, Room 9-170
New York, NY 10012
(212) 998-0800

August 1987

Working Paper Series
STERN IS-87-80

ACKNOWLEDGEMENTS

This project could not have been completed without the support of a great number of people. I am indebted to the Information Impact Program, of the Division of Information Science and Technology of the National Science Foundation, and in particular to Dr. Charles Brownstein and Dr. Larry Rosenberg, for financial support of this project and the pilot that preceded it. The project benefited greatly from the skills and hard work of multiple research assistants: Moses Pava, Sophia Primps, Kelly Putman, Kit Sun, and Peter Weill. I am particularly grateful to Kit Sun for her excellent development and maintenance of the statistical analyses, and to Peter Weill for picking up her work where she left off and supporting the project to completion.

TABLE OF CONTENTS

CHAPTER 4
COMPANY "PILOT" TELECOMMUTING EXPERIMENTS

CHAPTER 5
DEMOGRAPHIC SURVEYS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

REMOTE WORK AND TELECOMMUTING

INTRODUCTION

The subject of this study is remote work, which refers to organizational work performed outside of the normal organizational confines of space and time. The premise of the research is that remote work will become increasingly important in the future, as it expands to include full-time organizational members working remotely on a regular basis for at least part of the regular work week. The research focuses on the physical location of an individual at work, rather than the physical relationship between individuals working together (remote collaboration) or between employees and their supervisors (remote supervision).

Computer and communications technology may permit more jobs to be performed remotely than were possible before. The terms "telecommuting" [Nilles, et al, 1976] and "telework" [Kraemer, 1982] have been used to refer to work performed remotely augmented by computer and communications technology. Often the implication of these terms is that the work is performed at home; thus "telecommunications" is substituted for "commuting". It has been estimated that as many as fifty percent of all office

work could be performed at or near employees' homes rather than at a central office location, resulting in considerable savings in energy costs [Harkness, 1977].

This research is primarily about office work, and the impact of computer and communications technology on office work. In general, technology removes certain constraints in space and time, so that office work can be performed in different places and within different time frames than it could before. The research takes this potential as a starting point: given this relaxation of constraints, how are organizations and individuals taking advantage of it? Throughout the report, the implicit domain of work addressed is office work rather than industrial work.

There has been much speculation recently about remote work as a general way of working in the future. This chapter puts into perspective the different types of work that fall under the general category of remote work and defines the domain which is addressed by this research.

TYPES OF REMOTE WORK

The idea of remote work is of course not new. In this section, the many different work situations that may be considered "remote work" are systematically categorized. This categorization is

important because much of the general controversy about remote work, particularly work at home, is exacerbated by a generally confused notion of who works at home, under what circumstances, and for what reasons. The primary categories of importance are where, when, and under what employment status.

Where is Remote Work Done?

While most of the interest in remote work implies that the work is done in the home, this is not strictly the only remote work option available. In the broadest sense, remote work includes any situation where the employee is physically separate from the employer. This could include physical decentralization of functions as well at "off-shore" work. Both of these phenomena have been common with industrial work and are now becoming more common with office work, as in back-office decentralization and off-shore data entry. Two more innovative options which take advantage of the potential of technology, as described in [Nilles, et al, 1976], are satellite work centers and neighborhood work centers.

When an organization locates a regional office based on the residential location of its employees, it may be referred to as a satellite work center. The difference between this and a branch office is that any employee who lives near it may work at the satellite work center rather than the central office, regardless of organizational function. This assumes, of course, that the

necessary resources to support the employee's work (primarily computer and communications equipment) are available at the satellite work center. The result of such an arrangement is that while employees may work regular hours and have their own office space, they perform unrelated functions. Of course, for the most part they are supervised remotely.

Although Nilles and his colleagues suggested satellite work centers as a way to save energy in 1976, few companies have actually implemented the concept. Control Data Corporation and Southern New England Telephone are two companies that have set up formal pilots. Other companies have set up satellite locations to perform single functions; an example is Travelers Insurance, which set up "remote programming facilities" in suburban locations and hired local residents to staff them. Each facility employs about 100 people, primarily women, as programmers. When a single function is performed and supervision is on-site, the difference between satellite work centers and back-office decentralization becomes moot.

A neighborhood work center is a shared office facility, where employees from many different organizations as well as self-employed workers share resources in a common facility. It may be equipped with teleconferencing facilities, clerical support, and even day care facilities as well as computer and communications equipment. Workers go to the neighborhood work center nearest their home to perform their duties.

Researchers in Sweden [Hedberg & Mehlmann, 1981] describe a "computer resource center" of the future as a combination of shopping center, work center, post office, and library. It supplies access to information as well as equipment and space for remote jobs for a distant employer, local independent production, and local services such as travel, health, mail, and catalog ordering. A recent experiment in Sweden involved setting up a neighborhood work center in the northern part of the country where jobs are scarce and communities are sparse. The experiment had mixed results and has since been abandoned [Engstrom et al, 1986].

Another more informal category of remote work is occasional work away from the office such as in a hotel room or in transit (airplane, train, automobile). There is a considerable amount of technology which has been applied to this type of remote work: video conferencing, lap-top computers, and automobile telephones are examples. The emphasis is primarily in extending the capacity of a briefcase and in providing the ability for a travelling employee to "keep in touch" with the office.

The most common work location is of course the home. Unless explicitly stated, in the remainder of this report it will be assumed that remote work refers to work performed in the home.

The categories below, when and under what employee status, refer only to work performed in the home.

When is Remote Work Done?

While most popular news magazine stories on work at home imply that this is the only place the person works, this is generally not the case. Most people who claim to telecommute are regular organizational employees who spend substantial amounts of time at home doing job-related tasks on computers or terminals in addition to their regular eight-hour work day at the office. The term electronic briefcase sometimes refers to this phenomenon; the technology facilitates extending the work day into the home. Employees who worked overtime in the workplace because of the need to access computers or physical materials can now accomplish this work at home instead. Some companies have been quick to perceive the value of making the necessary equipment easily accessible; the increased volume of work output easily justifies the additional cost of equipment. The acceptability of such work habits to the employee are typical of the "computer culture" in which the hours spent at the computer have little relation to scheduled work hours [Sproull et al, 1984].

Many professionals and managers, if their jobs have sufficient autonomy and status, work at home occasionally to escape the interruptions of the office or to finish a report for a critical

deadline. In some organizations with a large proportion of professional employees, staying at home on occasion (e.g., once or twice a month) is becoming a relatively common phenomenon.

Another type of informal arrangement is the special case of allowing an employee to work at home several days a week for a temporary period and providing the necessary equipment in the home. This type of informal arrangement is becoming more frequent in the prototypical case of an employee on maternity leave who is highly valued and may otherwise decide to leave the company. Often such arrangements are left informal and kept quiet because they run counter to human resources policy. It is not uncommon for the human resources department to prohibit employees from working at home for a variety of reasons including legal bans (which vary by state as well as industry), insurance liabilities, challenges to Workmen's Compensation, etc. These issues will be discussed further in a later section under employee status.

Formal or permanent arrangements include all those in which a person works at home as a regular substitute for work at a separate work place, either part time (e.g., two days a week) or full time. A formal arrangement of this type is common for writers, consultants, professors, etc. This category of course also includes full-time homemakers as well as artists and crafts persons. It is also important to note that many workers who fall into this category really work "out of their homes" as opposed to

in them. For instance, consultants and salespersons may have their only office in their homes but they spend the work day on the road calling on prospects, or at a client's site.

A formal arrangement to substitute work at home for work in the office from one to five days a week, agreed upon between and organization and a full-time employee, falls into this category. This research will demonstrate that this type of arrangement is in fact today a relatively rare phenomenon.

What is the Worker's Employment Status?

People work at home under a variety of conditions of employment. There has been considerable confusion caused by the tendency to generalize across different conditions. A greater problem has been the tendency to attribute abuses (or potential abuses) of workers to the fact that they are at home rather than to the conditions of their employment.

One class of employment is the full-time, salaried employee who recieves full salary and benefits while working at home either part time or full time. Commonly, when an organization sets up a pilot telecommuting program, the employee's status remains unchanged for the duration of the pilot. Thus changes (e.g., in performance) can in large part be attributed to the work location (e.g., fewer distractions, lack of co-worker interaction).

Arrangements with non-exempt employees involve either hourly pay or piece rates. Presumably, when an employee is on-site the company primarily controls the hours worked; since this is not the case when the employee is at home, management generally prefers piece rates. For instance, Blue Cross and Blue Shield of South Carolina instituted a work-at-home arrangement based on piece rates while comparable work being performed in the office remained on an hourly wage. In addition, the employees working at home do not receive benefits. In such a case it is not valid to compare performance between the two groups. While union opposition to work at home is well known, much of the opposition is based on the potential for companies to exploit employees through low piece rates combined with high quotas. While the potential for abuse is an important issue, it is not necessarily an issue of work at home. Companies can set fair piece rates and adequate protections for employees working at home. On the other hand, companies can set unfair piece rates and quotas for employees working on site.

Recent congressional testimony on work at home focuses on the issue of employment status and raises important questions [U.S. Government, 1986]. A primary issue is whether the worker is actually on contractor or employee status, and what rights the worker has with respect to each. An important case involving a

suit by former employees against Cal West, where the central issue is whether the workers were on employee versus contractor status, is now pending.

The vast majority of people who earn some type of income working at home are, either formally or informally, independent contractors or suppliers. Recent books on work at home refer to a presumably new category of workers who prefer autonomy to security and a steady income and who choose to set up their own businesses at home [Applegath, 1982; Edwards & Edwards, 1985; Hewes, 1981]. These books are primarily about setting up one's own business, which happens to be in the home. As will be discussed in more detail in a later section of this chapter, interest in this work option is motivated by personal needs for flexibility in order to accommodate nonwork responsibilities (e.g., family) as well as a personal desire for autonomy.

Telecommuting

None of the categories discussed above explicitly requires the use of computer and communications technology in performing the work. If technology is used, the work can also be categorized as telecommuting. A formal definition of telecommuting is: **the use of computer and communications technology to transport work to the worker as a substitute for physical transportation of the worker to the location of the work.**

The idea of telecommuting has been proposed on a number of occasions, often with a different new word coined to describe it. Some terms proposed to define it, with dates and originators of the term are the following:

DOMINETICS [Kiron, 1969]

TELEWORK [Nilles, et al, 1976]

FLEXIPLACE [Schiff, 1979]

ELECTRONIC COTTAGE [Toffler, 1980]

The particular focus of this research is the following: organizational employees who work at home, using computers, as a regular substitute (one to five days a week) for commuting to a workplace (i.e., an office). Thus it is a study of telecommuting in the strictest sense of the term.

Throughout the report, the terms "telecommuting", "telework", "remote work", and "work at home" will be used interchangeably.

CURRENT INTEREST IN WORK AT HOME

If work at home is not a new phenomenon, why is it creating so much interest (and controversy) today? In this section, some of the social and economic forces affecting individuals and organizations are discussed. The role of information technology with respect to work at home is put into perspective.

Why Do People Want to Work at Home?

In preliminary surveys and interviews with people who work at home [Olson, 1983a], I identified several recurrent issues with respect to people's interest in work at home. They are the following:

* Need for flexibility. With over seventy percent of women, and over fifty percent of mothers of small children, holding permanent jobs, the amount of conflict between work and nonwork demands for both men and women has increased substantially. Flex-time programs are very limited in scope and do not address the need. Workers search for any kind of work situation that gives them greater control over their own work schedule, and work at home appears to provide that control.

* Desire for autonomy. There is some indication of an increase in the number of people who choose autonomy over job security and consistency in their work lives. For the most part, the desire for autonomy is addressed by setting up one's own business, and the home is a logical place to start because of cost considerations. There is some question as to whether the number of self-employed professionals is really increasing; this will be discussed in Chapter 2, in the review of research on census data.

Furthermore, in many cases what is described as a desire for autonomy is really dominated by needs for flexibility as described above.

* **Commuting hassles.** The tolls of commuting to and from work, on stress and physical health as well as time and cost, have not been adequately studied. For many, the value of even one day a week at home is primarily felt in terms of not commuting; they feel much better and add as many as four hours to their productive day. Although few companies have acknowledged the effect of commuting stress on productivity, it is possible many people spend at least the first half hour of the day simply recovering from getting to work.

* **Limited alternative work options.** For many, a job outside the home is simply not within reach. A stereotypical case is a woman with small children and few or no skills in demand, to whom the only jobs available entail the costs of commuting, clothing, and child care (if it is available). To these people work at home may be the only option. When asked, people who work at home under these conditions are very happy with their work arrangements [Christensen, 1985]; the income is badly needed and the alternative is not working at all.

* **Lifestyle demands.** For a small number of people whose skills are in demand, work at home is a convenience and a privilege. It may be that they choose to live at a distance that precludes commuting, and the company tolerates their work at home because of their valued skills. Others see the benefit because of hobbies and recreation; they can play ball with their kids when they come home from school, or ski in the middle of the week when there are no crowds. A disproportionate amount of attention has been given to people in this situation, such as wealthy stockbrokers and specialized computer "hackers".

Why Do Organizations Want People to Work at Home?

Another intriguing question is why organizations would be interested in work at home as an employee work option. In my own preliminary surveys [Olson, 1983a], I identified some consistent themes.

Organizational interest in telecommuting is spurred primarily by short-term needs, and the most pressing need is to attract and/or retain qualified employees. Shortages of qualified employees are particularly acute in the data processing profession, a primary reason why many company experiments in telework originate in data processing departments. Sometimes an experiment derives from an immediate situation and a need to respond, as is the case with

one of the pilots in this study; the department was relocating and management sought ways to retain key employees who would otherwise leave because of long commute times. More often, the experiment is used to demonstrate that work at home is feasible; the next stage is presumably to hire new employees who are highly qualified but would be unavailable to the firm without the arrangement.

A second organizational interest is productivity improvement. Although most managers are only concerned that productivity does not decrease while the employee is at home, others recognize that significant productivity gains are feasible. There are several possible reasons. The most commonly cited reason is fewer distractions. The employee may work longer hours. Most likely, the employee only counts the time he or she is working. Breaks to do the dishes do not count as work time, whereas in the office informal breaks are part of the work day. Another possibility, particularly with programmers, is the opportunity to solve a problem (e.g., fix a programming error) when the person thinks of it. For instance, there are stories of programmers thinking of a solution in the middle of the night; if the necessary equipment is in the home, the person gets up and tries out the solution instead of waiting until morning and possibly forgetting it.

A third reason for organizational interest in telework is faddism. With the press focusing on work at home, a company may receive favorable publicity for its "enlightened" work style.

One company hired twelve physically home-bound disabled at considerable expense and benefited from the publicity. Others are concerned that if the option does prove to be widespread, they need to be ready. In general, personnel departments view telework as another interesting work option to study.

Management often describes long-term scenarios when talking about work at home. In general, they envision significant savings in indirect costs such as space, cafeteria service, parking. Furthermore, they often make an implicit association between work at home and contract work, and thus envision savings from moving employees to contract status. They presume that if telework is feasible for large numbers of workers, then the organization can enjoy significant savings from reducing many kinds of overhead, including but not limited to employee benefits associated with supporting full-time employees at a work site. It is clear that such savings would only be realized if a significant percent of the employee population were shifted permanently into their homes.

The Role of Information Technology

Information (i.e., computer and communications) technology plays a significant role in the phenomenon of telecommuting. However, it is not the driving force. Information technology facilitates new forms of work organization, of which telework is only one

example, but organizational culture and individual needs play a much more significant role in determining what new forms will be adopted.

The primary tools required to perform office work are changing from paper, pens, telephones, calculators, and typewriters to personal computers. If a person's primary work tools are a personal computer and a telephone, the person can use that equipment at home with relative ease. In addition, there are subtle changes in interdependence among employees. If a professional writer can format his or her own manuscripts and send a completed document over telephone lines to be printed out and distributed by a secretary, both parties can fulfill their functions efficiently and effectively without the necessity of physical proximity.

It is important to note that most businesses have not achieved the level of penetration of information technology into basic office work which would significantly relax the constraints on work in space and time. While personal computers proliferate rapidly, they are far from becoming a basic office support tool of the stature of a typewriter or telephone. Furthermore, while substitution of electronic for other forms of communication is a key requirement for widespread remote work (a person working remotely must be able to keep in touch with all significant

others), most organizations today do not commonly use electronic mail or equivalent tools for work-related communication.

CLASSES OF FULL-TIME REMOTE WORK

Figure 1.1 summarizes the previous discussion of forms and conditions of remote work by reducing it to four scenarios. The labels in each box may not be completely accurate but are meant to be useful descriptors. Each of these is described below.

FIGURE 1-1
CLASSES OF FULL-TIME HOME-BASED WORK

EMPLOYEE REASONS	DEMAND FOR SKILL	
	LOW	HIGH
NONWORK CONSTRAINTS	EXPLOITATION	TRADEOFF
PERSONAL CHOICE	AUTONOMY	PRIVILEGE

"Exploitation"

The primary individuals in this category are relatively unskilled clerical workers. The work they perform at home (e.g., data entry, claims processing) lends itself to piece rates. Often they have few alternative work options. This is the category of

workers for whom unions have the most concern. The unions see the primary issue as the ability of automated office technology to reorganize office clerical work; it can be reduced to routinized, repetitive tasks, monitored by automatic logging of units produced and error rates, and very amenable to payment by piece rates. Although these issues are independent of telework, work at home becomes easier once jobs are organized this way.

The people in this category are overwhelmingly female [Christensen, 1985]. Usually their choice to work at home is consistent with their strong values regarding child care: they feel they should be at home with their children. Given their lack of options for providing badly needed income as well as the lack of adequate outside day care, they are delighted to be given the opportunity to work at home even if the conditions are in some sense exploitative. Hence, they are generally very positive about such a work arrangement.

"Autonomy"

This is the category of "new entrepreneur" about which there has been recent attention. In the popular stereotypes, they choose not to be members of organizations but to operate as independents plying their skills, even if they must sacrifice economic gains to do so. To the extent that these individuals have skills which are in demand, such arrangements can be practical and even

lucrative. As companies increase their own motivations to purchase specialized skills rather than invest long-term in employee retention, the trend to contract work may grow and become a viable means of economic support for more individuals. Presently, there is no efficient market mechanism for advertising individual skills and for many individuals, an adequate supply of work is never ensured.

"Tradeoff"

These individuals are differentiated from those in the "exploitation" category since they have the option of obtaining reasonably lucrative jobs in the full time work force. However, they do not choose to do so, primarily because of nonwork constraints. A typical case is a professional woman whose husband works full time and who lives in the suburbs, a significant commuting distance. When small children become part of the picture, full-time employment becomes logistically difficult, with long days and inadequate or expensive day care. Often, working outside of the home is not even lucrative despite the person's skills, because of the high costs of day care, commuting, and a working wardrobe. The person chooses to drop out of the work force temporarily, but frequently assumes that she will return full time after several years.

To a person in such a situation, the opportunity to work at home is very appealing because it not only brings in income, it keeps her skills up to date and is interesting. Although they may need to fit their work around the schedules and activities of their families, their responses to such arrangements are generally positive. A typical view is: "Working at home is difficult, stressful, but better than not working at all." An organization that has capitalized on this situation is F International [Shirley, 1986]. Based in England, F International has over 1000 employees, almost all on contract status and almost all working out of their homes.

"Privilege"

The group of people in this category represent an ideal situation. The organization gives the employee flexible work options and mechanisms for improving their quality of work life in the interest of long-term retention of their skills. Work at home is one of many innovative work options that demonstrate organizational commitment to the employee. In my survey of computer specialists in "Silicon Valley" [Olson, 1983c], I found a prevalence of this category of home worker. Typically, they were male, with someone else at home full time to "keep the children out of Daddy's hair while he is working". To date, there are few indications that this type of arrangement extends

much beyond those employees whose skills are unique and in extreme undersupply.

SUMMARY

In this chapter, the meaning of remote work or telecommuting as it is currently understood was defined. In describing the types of remote work that are possible and the reasons for current interest in it, I attempted to clarify certain ambiguities and inappropriate generalizations that are prevalent in the popular press. The basic underlying premise of this research was presented: information technology facilitates remote work but is not the driving force. Information technology relaxes the physical and temporal constraints on office work, facilitating alternative work organizations that were not feasible before. However, social and economic forces have a strong influence on whether or not telework, or other new forms of work organization, will be adopted.

In the remainder of this report, a research study which examined the current trend to work at home with information technology is described. The next chapter reviews relevant research. Chapter 3 describes the plan of the study. Chapters 4 through 6 present the research results. Chapter 7 draws conclusions about the current status of remote work in the U.S., and discusses some

predictions for the future as well as directions for further research.

CHAPTER 2

RESEARCH ON REMOTE WORK AND TELECOMMUTING

INTRODUCTION

In this chapter, relevant research on work at home and telecommuting is reviewed. Although there are a great many research topics that are tangentially related to work at home (e.g., work/nonwork stresses, monitoring and control, formalization of supervision, physical proximity in small group decision making), only research with a direct relationship is reviewed here. Although a significant number of research projects are currently in progress, the body of completed research is still relatively small.

RESEARCH ON INDUSTRIAL HOMEWORK

Work at home is not new in the United States. There is a tradition of labor-management struggle of which work at home is clearly a part. In the 1930's a major impetus of the Fair Labor Standards Act was protection of women and children against exploitative labor in the home. In an insightful study, Boris [1986] compares the struggle over protection against work in the home in the 1930's with the current "right to work" debate surrounding women knitters in Vermont. She shows how the current debate is being connected to "women's rights" but is rather part

of a larger reorganization (i.e., deregulation) of the American political economy that would, in her view, "more firmly entrench the sexual division of labor".

Since bans have been placed on home work in certain specific industries, some home work is performed illegally. A study of the apparently large "subterranean" industry of home sewing in Canada [Johnson, 1982] documents widespread abuses of home workers by their employers. These include low pay, lack of benefits, imposition of unrealistic deadlines, and lack of enforcement of government regulations. Industrial home work is viewed negatively by labor unions:

> All clothing workers are threatened by the existence of one category of workers who work under substantially poorer conditions than do the regular labour force. The rise in the prevalence of homework is a symptom of the weakening power of the labour unions in this country [Johnson, p. 10].

EMPLOYMENT STATUS

Much of the debate surrounding industrial home work focuses primarily on the employment status of the worker. There is a prevalent assumption that a person working at home is equivalent to an independent contractor; companies that have set up home

work programs on that assumption are targets for accusations of worker exploitation. Two companies in particular have received recent attention. Cal Western is being sued by eight former home workers for unfair labor practices; they were defined as independent contractors. Wisconsin Physicians Service was an example in recent testimony in the U.S. Congress [Costello, 1986]. In both cases the contractor status was combined with lower pay than on-site employees doing the same work and few or no benefits. In the second case, the move to home work was further seen as a way to circumvent the union, since the company was going through painful labor disputes. According to Costello:

> The WPS case exemplifies the potential for abuse in home-based clerical work. Without regulations preventing companies from replacing more expensive (and unionized) in-house personnel with cheaper, non-union homeworkers, both groups of women stand to lose [p. 129-130].

Moving workers from employment to contractor status certainly has advantages for employers, primarily in giving them the flexibility to expand and contract the labor force with supply and demand. There is evidence that contract work is a growing trend in offices as well as production work [Nelson, 1986]. Although there are costs associated with turning to this "external market", the tremendous recent growth in temporary employment agencies should force these costs lower. In 1984

alone payrolls for temporary agencies were $6 billion, an increase of 33 percent in a single year [Pfeffer and Baron, 1985, as cited in Nelson, 1986].

But the issue of independent contractor status cannot be dismissed as purely a management tactic to reduce labor costs. In an extensive study of home-based clerical workers, Christensen [1985] found that:

> Organizational status overrides occupation when work is done at home. For example, self-employed word processors exercise more autonomy than do employed programmers. Word processors, who would be treated as clerical workers in an office, identify themselves as professionals when they own their own word processing companies at home. [p. 3]

TELECOMMUNICATIONS / TRANSPORTATION TRADEOFFS

A separate stream of research took place in the mid-1970's, partly in response to the then-pressing energy crisis. The basic premise of this work was the following: Since telecommunications can substitute for transportation of the worker (thus "telework"), significant savings in energy costs can be ensured if steps are taken to facilitate this substitution. The best examples of this work are [Nilles, et al, 1976] which developed

alternative scenarios and their implications for a single large firm, and [Harkness, 1977], which elaborated on different scenarios and showed their potential effects on nation-wide energy savings. The latter report ended with suggestions for public policy initiatives to bring about such substitutions. A retrospective view of this work and its influence is found in [Kraemer, 1982].

One problem with this work has been the asumption of technological determinism. The Harkness study states that if fifty percent of all office workers worked in or near their homes six out of every seven working days, the savings in fuel consumption from reduced commuting would be about 240,000 barrels of gasoline daily in 1985 [Harkness, p. 111]. The statement refers to technological potential, but the research has been criticized (perhaps unfairly) because these changes did not come about. The problem of assumed technological determinism pervades many popular stories of telecommuting, and so is an important issue to address. A more appropriate view iS one of contingencies:

> The conclusion from comparing many studies is that information technologies can indeed encourage and also substitute for the physical movement of goods and people, with consequences for centralization and decentralization. Which of the two effects will appear

in any given case appears to depend more on factors other than the choice of technology [Mandeville, 1983].

CENSUS FIGURES

One issue of continuing uncertainty is the lack of accurate figures on how many people work at home as "telecommuters" in the U.S., as well as how many work at home under any conditions. One frequently cited estimate holds that there are currently 10000 teleworkers in the United States [Electronic Services Unlimited, 1984]. This estimate may appear low until one considers that the definition of teleworker is the restricted one of employees working at home with information technology on a regular basis as a substitute for commuting to the office. The basis for the estimate is not given in the report.

Census Bureau figures do report on whether the home is the primary place of employment; a steady decline in this number primarily represents a significant decline in the number of farm workers. As reported in [Kraut, 1987], only 3.5 percent of workers over 16 worked at home in 1970, and this figure declined to 2.3 percent in 1980. Of these, only 32 percent lived in urban or nonurban (non-farm) locations. Pratt and Davis [1986] report that in 1980 there were one and a half million home-based

businesses and three-quarters of a million people working at home as employees; they do not indicate what constitutes an "employee" under this interpretation of census data.

A recent report from the U.S. Bureau of Labor Statistics [Horvath, 1986] is enlightening. According to the report of a 1985 population survey, "Nearly 8.4 million persons had worked at home for eight hours or more in the reference week, as part of a non-farm job." Of these, 965,000 (11.4 percent) worked at home during the reference week 35 hours or more. Seventy percent of these were self-employed in home-based, unincorporated businesses.

Comparing the reported hours worked at home with total hours reported, the Bureau concluded that about 1.9 million people worked at home exclusively in 1985. Two-thirds of these were women. Although it was not possible to determine how many home workers were telecommuting, the report did conclude, "Only about 100,000 of the persons with home-based work in professional specialty occupations, which includes computer programming as a subset, worked entirely at home." Because this was the first time the survey was conducted, it was not possible to determine if home-based work is increasing or decreasing.

RESEARCH ON OFFICE LOCATION

A related issue to the actual numbers of people working at home is the pattern of shifts in office location in relation to the potential labor pool. In a study of back offices in the San Francisco Bay Area, Nelson [1986] shows that companies locate back offices in a relatively narrow geographical band where the demographics of the population are highly constrained. The important trend she documents is that the new back office jobs require a specialized and relatively rare set of qualities and offices are constrained to locations where those qualities can be found. This argument counters the common argument that back office decentralization goes hand-in-hand with deskilling and the search for a lower-skill and cheaper labor pool.

Dahmann [1986] reports data on population migration showing that after years of movement from cities to rural areas, from March 1983 to 1984 there was a shift of 351,000 jobs in the opposite direction. He also shows that average commute times increased only very slightly from 1975 to 1980. Dahmann concludes that although people continue to relocate, the jobs are relocating as rapidly as the people are.

These studies show that, like the evidence on employment status, the issue of the motivation of the employer to relocate jobs is a complex one. There is no apparent systematic effort to deskill, reduce pay, and reduce dependence on the clerical work population

through judicious use of information technology. Work at home would be a natural extension of this effort; it too is significantly more complex.

RESEARCH ON WORK / NONWORK CONFLICTS

Much of the research focusing specifically on experiences with working in the home has been concerned with the relationship between the work and nonwork domains. In particular, the question of whether work at home is an acceptable method for combining income-producing activity and child care is examined. In Chapter 1, several scenarios of the working mother at home were described. In this section, results of recent research are highlighted.

The most significant work to date related to this domain is by Christensen [1985]. In her survey of 215 and detailed interviews of 24 women working at home with computers, Christensen concluded that:

> Women who work at home as a way of balancing child care and paid employment typically lie in traditional two parent households, where the father is the major breadwinner. These women work part-time, primarily for "bonus" money and the psychological benefits of doing

something other than being a full-time home-maker and mother. On average, they contribute well below 25 percent of the household income.

Christensen also concludes:

> Women do not work and care for their children simultaneaously. They most often work when their partners can care for the children, or when their children are at school or asleep. When a professional woman has dependable, steady work, she is apt to employ paid child care, in the home or outside. [p.3]

In my own interviews [Olson & Primps, 1984] of professional and clerical women, I found the following:

> Using work at home as a means of simultaneously working and providing child care has certain negative aspects which should not be overlooked. These women experienced a frantic pace of activity with constant stress and pressure from both work and family demands and little time for themselves or for leisure activities. Not surprisingly, the women with children consistently reported increased stress associated with work at home, regardless of supplemental child support. These women felt they were constantly juggling a complex schedule of activities, and were being pulled by the

simultaneous and conflicting demands of work and family roles. This exploratory analysis raises the important question of whether work at home is beneficial for the employee with primary child care, or dysfunctional to both work performance and child care as well as highly stressful.

The debate over the inadequacy of current child care alternatives and whether work at home is an acceptable alternative continues to be an active one. As Boris [1986] points out, the current administrative efforts to deregulate work at home are based on an appeal to a combination of traditional values of child care with the right to work: Women have a right to work and take care of their children at the same time. What little research there is to date seriously questions whether this combination is a right or a burden borne primarily by women.

COMPUTER USE IN HOUSEHOLDS

There has been a small amount of research on use of personal computers in the home that bears some relationship to the topic of this research. In a survey of 282 home computer users, Vitalari et al [1985] found that approximately 45 percent of computer use in the home was spent on work-related activities. They concluded that "home computers engender a shift from recreational or pleasure-oriented activities (e.g., television

watching) to task-oriented activities .... The household of the futre may be the site of more task-oriented behaviors." Their sample was drawn from computer clubs and was heavily oriented toward early adopters and those in technical professions; it may have been that these people had more justification for a personal computer based on task-oriented needs, and were thus motivated to purchase one sooner than the rest of the population.

In a similar vein, Horowitz [1986] concludes from her research on computer use in the home that there is a preliminary trend to seeing the household as an imcome-producing unit.

RESEARCH ON TELECOMMUTING

Although several of the studies discussed above concerned work at home with computer technology, their primary focus was not on telecommuting per se. In this section, studies whose primary was concern was the relationship between the employee and the employer and the feasibility of telecommuting as a permanent employee work arrangement are reviewed.

In an early study, McClintock [1981] interviewed twenty telecommuters to determine the effects of their work arrangement on their productivity. He found they experienced greater productivity on routine tasks, primarily because of access to an electronic mail system. His respondents also felt they increased

their effectiveness on complex tasks because of fewer interruptions. They felt, somewhat surprisingly, that they had greater interdependence with coworkers and more effective use of face-to-face contact as a result of their home work arrangement.

In an exploratory survey [Olson, 1982], I interviewed ten employees who were geographically separated from their managers at least part of the week; I also interviewed their managers. All the employees were professionals working on long-term deliverables. I found a tendency to formalization of supervision of the remote employee, possibly representing differential treatment. Managers acknowledged that remote supervision was more time-consuming; they also depended on selection of employees who were already highly motivated and self-disciplined, that the manager could trust to be productive. Even so, managers admitted to being uncomfortable not being able to "see" their employees at work.

Other studies report on particular companies or experiments. Kraut [1987] conducted a survey of professionals at Bell Communications Research, and concluded that "Overall, the time people spend working at home is independent of the time they spend working in the office." He concluded that telecommuting is not a significant phenomenon, the primary reason being "incompatibility with the current work ethos."

An experiment to set up "decentralized workplaces through the utilization of teletex" was recently conducted in Germany [Froeschle, 1985]. The researcher concluded that telecommuting was technically feasible, but the high cost of the equipment and its low utilization rate by part-time workers caused significant problems in the experiment. There were also problems with labor contract provisions prohibiting "outwork". Possibly most important, organizations did not feel that the problems addressed by the experiment (primarily skill shortages) were severe enough to warrant participation; thus organizational support was low. The experiment has now ended.

In a recent survey of 210 life insurance companies Moore [1986] shows that only a handful are currently involved in telecommuting. Most reported incidents are in addition to regular work hours; most are informal and random, and companies have no formal policy regarding telecommuting as an employee work option. A recent survey of Canadian companies [Johnson, 1986] shows that, although the need to provide employees with flexible work scheduling alternatives, only 4.5 percent of those responding had any kind of home work program. In response to a request for more information, only 15 percent wanted to know more about home work, the lowest response of six categories of employee work options. In a survey of the fifty largest employers in Pittsburgh, Hughson and Goodman [1986] found only

three with some type of informal, part-time telecommuting arrangement. None of the companies had full-time telecommuting as formal employee work options.

CONCLUSIONS FROM THE RESEARCH TO DATE

Based on the research reviewed in this chapter, the question of whether telecommuting is a significant phenomenon today cannot be answered clearly in the affirmative. One point is certain: information technology is not the driving force. Information technology may make new forms of work organization possible, but organizational culture as well as economic and social concerns of employees and employers have a stronger influence over what choices are actually made.

A second point is also clear: Telecommuting is not necessarily favored by management. In fact, it is quite the opposite: most managers, given the choice, prefer to "see" their employees, and for them telecommuting is more of a hassle than a benefit. These conclusions will be discussed again as they relate to the research results in the remainder of this report.

CHAPTER 3

GENERAL PLAN OF STUDY

In this chapter, the major research questions that motivated this study are presented. The study had three phases of data collection, each of which is described.

MAJOR RESEARCH QUESTIONS

The general objective of the study was to gain insight into the implications of remote work for "quality of work life". The primary focus is individual reactions to remote work rather than broader implications for community structure, energy consumption, or transportation needs; these issues have been addressed in earlier work on telecommunications / transportation tradeoffs [Harkness, 1977; Kraemer, 1982; Nilles et al, 1976]. The methodology to accomplish this objective involved empirical analyses of situations where full-time organizational employees worked at home on a regular basis, augmented by computer and communications technology. The study was further limited to employees occupying professional, as opposed to clerical, positions.

The specific research questions fall into three general areas:

* Impact on performance;
* Impact on individual attitudes toward work;

* The role of information technology in work patterns and supervision.

Research to date has provided basic knowledge about the types of individuals and jobs that are appropriate for work at home as well as its benefits and problems [Diebold, 1981; McClintock, 1981; Olson, 1983]. This knowledge has been evaluated in the context of well-established theories of work motivation, group performance, and performance evaluation to help identify the set of research questions outlined below. The research design and methods of measurement are described in the section following the research questions.

Impact on Performance

* What is the impact of remote work, augmented by information technology, on individual performance?

Increased productivity of employees working at home has been cited in a number of cases to date [Diebold, 1981; Olson 1983a], of both clerical work with very short turnaround times and measurable output, and professional project work with long-term deliverables. The general consensus from these examples is that where increased productivity occurs, it results from the

minimization of disruptions and ability to concentrate afforded by work at home. The flexibility to choose one's work hours may also contribute to the increase.

* What is the impact of remote work on supervision and performance evaluation?

Exploratory investigations of supervision of remote workers have suggested that remote work may be associated with increased formalization of supervision [Olson, 1982]. The decrease in opportunity for informal, unscheduled face-to-face interactions with the supervisor may in part explain this tentative finding. Remote employees more frequently gain access to their supervisors through the telephone, electronic mail, or written media. Face-to-face contact occurs only at those times when the employee visits the office, and frequently requires a formally scheduled appointment. If the supervisor feels a loss of opportunity for "hands-on" control, he or she may establish more formal control procedures for the remote employee. Of course, these effects on the supervisory process are highly dependent on the existing personal supervisory style when the employee begins to work at home. Thus, a supplementary research question is: How is the supervisory process altered to accommodate the remote worker?

Impact on Individual Attitudes

Exploratory findings to date have indicated a number of potential changes in the employee's relationship to work as a result of the shift to work at home, with important implications for attitudes towards work as well as nonwork.

* What is the impact of remote work on employee job satisfaction?

The relationship between remote work and employee job satisfaction is a complex one. (For a complete review and discussion of the research on job satisfaction, see [Locke, 1976].) For instance, work at home may have positive implications for autonomy over scheduling of work, which has been related to increased job satisfaction (see, for example, [Aldag & Brief, 1979; Hackman & Oldham, 1975]). On the other hand, some organizations have switched to piece-rate systems or defined minimum levels of output for employees working at home. This change might result in a perceived decrease in autonomy over the rate of production, with negative implications for employee job satisfaction.

* What is the impact of remote work on the employee's overall life satisfaction?

Although it is difficult to objectively examine the effect of

work at home on the employee's nonwork (i.e., family) life, one goal of the study was to obtain exploratory information on changes in the nonwork domain of the employee. For a discussion of the relationship between job satisfaction and life satisfaction, see [Rice, et al, 1980].

* What is the impact of remote work on the organizational commitment of the employee?

Organizational commitment has been demonstrated to be strongly related to absenteeism and turnover [Mowday et al, 1982]. Organizational commitment is relevant to this study because certain of its antecedents may be influenced by the work site. For example, social interaction and social involvement, presumably stemming from high group interaction and cohesiveness, have been shown to be positively related to commitment [Buchanan, 1974; Sheldon, 1971; Smith et al, 1969]. This suggests that the reduced opportunity for group interaction among employees working at home may have negative implications for commitment and ultimately for turnover. Informal evidence from exploratory studies indicates that decreasing commitment to the organization coupled with an increased sense of autonomy and flexibility may result from the work-at-home situation [Diebold, 1981; Olson, 1983a].

* What is the impact of remote work on employee job involvement?

Job involvement results from achieving high standards of performance, or job success, and has been associated with both level of autonomy and job satisfaction [Hall, 1976, p.126]. Because of the hypothesized impact of remote work on these two variables, it follows that job involvement is relevant for this study as well. Little research on job involvement has dealt specifically with the work environment, however. Evidence from exploratory studies suggests that lack of physical separation from work may lead to increased attachment to the employee's work-related responsibilities and signs of "workaholism" [Diebold, 1981; Olson, 1983a].

* What is the impact of remote work on employee role conflict and ambiguity?

Role conflict refers to the existence of competing responsibilities or demands on the individual. Role ambiguity refers to the lack of clear definition of roles and responsibilities. Both constructs have been shown to be related to stress [Coooper & Marshall, 1978; Rizzo, 1970]. One might expect the teleworker to experience less role conflict and ambiguity than the on-site worker. This is because the teleworker's job is more formally defined and because the employee is not interrupted by requests generating competing

demands. On the other hand, the teleworker might experience conflict between work and nonwork roles, or ambiguity without the physical presence of a supervisor giving directives.

* What is the impact of remote work on employee sources for social support?

Preliminary studies of home workers cite social isolation as a potential problem [Diebold, 1981; Olson, 1983a]. If employees rely on their coworkers for social support, as a result of working at home they would feel a loss of social support or increase their reliance on other sources (i.e., spouse, friends, relatives). It may be that those most suited to telework are those with low overall needs for affiliation (discussed below).

* What is the impact of remote work on employee job characteristics?

Jobs may be organized in a variety of ways along multiple dimensions: skill variety, task identity, task significance, autonomy, and feedback from the job itself [Hackman & Oldham, 1975]. Moving the job from the work site to the home might require it to be explicitly or implicitly reorganized on any or all of these dimensions. For instance, the absence of coworkers may result in assignment to smaller, simpler projects which are

self-contained and can be completed independently by the employee working at home.

The Role of Information Technology

A central component of the study is the analysis of the importance of information (i.e., computer and communications) technology in the remote work environment. A great deal of research has been completed to date on the role of communications media in group process and task accomplishment (see [Short et al, 1976] for a review). This study provides a more qualitative analysis of the uses of technology in day-to-day work. Information technology is expected to play three important roles in the implementation of remote work:

* As a substitute for other forms of communication with supervisors and coworkers,
* As a management tool for performance evaluation and monitoring,
* As a mechanism for obtaining information necessary to perform one's job.

Note that the first two of these describe the process by which the management and control process changes. The third has implications for the employee's perceptions of job characteristics.

ANTECEDENTS OF REMOTE WORK

Exploratory research has indicated that the proposed outcomes are highly dependent on the choice of individuals to work at home and the choice of jobs to be performed. Three classes of antecedent variables were examined in this research: individual characteristics, job characteristics, and situational characteristics.

Individual Characteristics

Certain needs associated with personality may be useful predictors of employee success or failure working at home. Among these are employee needs for achievement, affiliation, autonomy, and dominance [McClelland et al, 1953; Schacter, 1959]. It can be predicted that teleworkers with a high need for autonomy and low needs for affiliation and dominance will be more satisfied with telecommuting. Their needs for achievement might be expected to be higher than those of on-site workers since need for achievement is related to the self-discipline and self-motivation required to be productive away from the external disciplines of the office environment. Employees with a high need for achievement may have higher productivity gains working at home without distraction, while those with a high need for affiliation may find work at home too socially isolating.

Job Characteristics

In my own previous research, I have identified the following characteristics of the job and the work environment as characteristic of remote work [Diebold, 1981; Olson, 1983a]:

* Minimal physical requirements with respect to equipment and space.

* Individual control over work pace. Project-oriented work with long-term completion dates appears to allow this control.

* Well-defined deliverables. Tasks have clearly defined and well understood specifications as well as mutual agreement between the manager and the employee as to what constitutes a completed task.

* Well-defined milestones. Consistent with well-defined deliverables, the tasks have clearly defined and self-contained milestones which serve to mark the progress of the employee. This is particularly important in tasks which take considerable time to complete.

* Need for periods of uninterrupted work time. Tasks which require concentration for extended periods of time are ideally suited to many remote work environments.

* Low requirement for frequent communication with others. Successful task performance does not depend on contact with others; the task can be completed relatively independently of external input.

It should be noted that use of information technology is NOT one of these characteristics. However, programming and other jobs related to system development (e.g., documentation specialist) fit the listed
criteria rather well. It is these characteristics, and not the use of the technology per se, that make these jobs potentially good candidates for remote work.

Situational Characteristics

Situational characteristics of the employee have been shown to have an effect on the success of the home work arrangement [Diebold, 1981; Olson, 1983a]. These are the following:

* Space. Ideally, the employee has adequate work space which is separable from nonwork activities.

* Nonwork-related responsibilities, primarily family care. Preliminary evidence shows that employees with primary family care responsibilities react differently to the work-at-home situation than those for whom it is a

secondary responsibility. For instance, employees in [Diebold, 1981] who scheduled work around full-time child care experienced increased stress while others in the group experienced decreased stress levels.

STUDY COMPONENTS AND PROCEDURES

The study has three components: quasi-experimental field studies of telework pilots in organizations, demographic surveys of who is working at home and why, and cross-sectional attitude surveys of employees currently working at home compared to non-teleworkers. These components are described in detail below.

Pilot Studies

This component of the study takes the form of a series of three quasi-experimental field studies [Campbell & Stanley, 1963]. The nature of the study must be termed exploratory since the total sample size was small. Further, because it took place in natural settings, the degree of experimental control was limited.

The field studies were organizational "pilot programs" of employees working at home on a part-time basis. Each pilot program was studied over a period of six to nine months. For each pilot, a roughly equivalent (in terms of job characteristics and responsibilities) control group of non-participants was

identified and similarly tested. The experiments thus took the form of a series of small "nonequivalent control group designs" [Campbell & Stanley, 1963]. The pilot programs had from four to nine participants each, with an equivalent number of participants in the control groups.

Although companies experimenting with work-at-home pilots have evaluated them, no evaluations have provided comparative data across pilots. The ability to compare across organizations was a major benefit of this study, even though the total sample size was small. In Chapter 4, the pilot studies are described in detail, including results for each case and a comparative analysis across cases.

Demographic Surveys

The second stage of the research involved demographic surveys of readers of selected magazines, in order to gain an accurate perspective on who is telecommuting today and under what employment status. The primary goal of the survey was to establish the true extent of the phenomenon. Rather than choosing a random sample of the U.S. employed population, it made sense to focus on those groups who appear to be the most likely candidates for telecommuting, and on whom there is currently a major focus. Thus, two magazines were chosen:

Datamation: a popular trade magazine for data processing professionals, primarily focusing on mainframe computing within organizations.

Personal Computing: an "upscale" magazine aimed at professionals in a wide variety of occupations who use personal computers in their work. Half of the magazine's readership are self-employed.

The results of the demographic surveys are reported in Chapter 5.

Attitude Surveys

In an effort to expand the base of comparative data, the final component of the research was an extension of the sample to a broader set of individuals who work at home on a regular basis but not as part of a formal pilot program. In this survey the same attitude questionnaires were utilized as in the formal pilot programs. However, no attempt was made to collect "before-after" data, to obtain activity logs, or to provide a control group for comparison. Subjects were chosen from the respondents to the demographic survey described above. The attitude surveys were also sent to respondents who worked at home only after regular work hours and those who did not work at home but would like to,

for comparison purposes. Results of this stage of data collection are reported in Chapter 6.

Data Collection Procedures

For the pilot studies, interviews were conducted and questionnaires completed prior to beginning and after completion of the pilots. The survey respondents completed the questionnaires once. Appendices A-D contain copies of the instruments used. The specific information obtained and the type of instrument used are described below:

1. Employee interviews: Case studies (Appendix A)
   - -- Work experience
   - -- Job description
   - -- Home situation
   - -- Use of information technology for work-related tasks
   - -- Performance evaluation methods
   - -- Commuting situation
   - -- Opinions (before and after) about work at home

2. Manager interview: Case studies (Appendix B)
   - -- General information about responsibilities and procedures
   - -- Formal control procedures
   - -- Management procedures
   - -- Opinions (before and after) about work at home

3. Attitude questionnaires: Case studies, survey (Appendix C)

-- The Job Description Index (JDI) [Smith et al, 1969]. This index measures five separate facets of job satisfaction: the work itself, supervision, coworkers, pay, and promotion.

-- Life Satisfaction Questionnaire [Robinson et al, 1969]. This questionnaire measures life satisfaction through a number of specific moods or affects. Life satisfaction is the overall attitude about both work and nonwork and the relationship between them.

-- Organizational Commitment Questionnaire [Mowday et al, 1982]. This questionnaire addresses the extent to which the employee feels a sense of commitment and loyalty to the organization.

-- Job Involvement Scale [Kanungo, 1982]. This instrument measures the importance of the job to the employee and the role of work in the employee's life.

-- Role Conflict and Ambiguity [Caplan et al, 1975; Rizzo et al, 1970]. This instrument measures the degree to which the individual experiences competing job demands or responsibilities as well as the degree to which responsibilities are clearly and unambiguously defined.

-- Social Support [Robinson et al, 1969]. This scale measures the degree to which the employee relies on three different categories of people for work-related social support. The categories are: immediate supervisor; other people at work; spouse, friends, and relatives.

-- Job Diagnostic Survey (JDS)[Hackman & Oldham, 1975]. This survey measures the characteristics of jobs along the following dimensions: autonomy, feedback, skill variety, task identity, and task significance. The Motivating Potential Score (MPS) is an arithmetic combination of all five dimensions; the higher the MPS, the more the job has the potential to motivate the employee to be more productive.

-- Manifest Needs[Hermans, 1970] (survey only). This instrument measures the degree to which the individual has a need for achievement, affiliation, autonomy, and dominance related to his or her job.

5. Daily logs: Case Studies (Appendix D). Participants in the pilot programs and control groups completed daily logs on one-third to one-half of the actual work days during the pilot. Logs were of two types:

-- Activity logs. These captured the employees' daily work schedules and self-evaluations of their accomplishments that day.

-- Communications logs. These tabulated both the quantity and mode (e.g. face-to-face, electronic mail, telephone) of all work-related communications in which the employee engaged throughout the work day.

Table 3-1 summarizes the attitude scores and their ranges. On all scales, a high score is interpreted as strong on that attitude.

TABLE 3-1
SUMMARY OF ATTITUDE CONSTRUCTS AND MEASURES

CONSTRUCT	MEASURE	RANGE
Job satisfaction	Job Description Index (JDI)	
Work	[Smith et al, 1969]	0 - 54
Supervision		0 - 54
People		0 - 54
Pay		0 - 27
Promotion		0 - 27
Life Satisfaction	[Robinson et al, 1969]	8 - 56
Organizational Commitment	[Mowday et al, 1982]	15 - 105
Job Involvement	[Kanungo, 1982]	16 - 96
Role Conflict	[Rizzo et al, 1979]	6 - 42
Role Ambiguity		8 - 56
Social Support	[Robinson et al, 1969]	
Supervisor		1 - 16
Coworkers		1 - 16
Spouse, etc.		1 - 16
Job Characteristics	Job Diagnostic Survey (JDS)	
Skill Variety	[Hackman & Oldham, 1975]	1 - 7
Task Identity		1 - 7
Task Significance		1 - 7
Autonomy		1 - 7
Feedback from the job		1 - 7
Motivating Potential Score		7 - 343
Manifest Needs	[Hermans, 1970]	
Achievement		0 - 35
Affiliation		0 - 35
Autonomy		0 - 35
Dominance		0 - 35

SUMMARY

This chapter described the general plan of the research study. The major research questions fall into three categories: impact on employee performance, impact on employee attitudes toward work and the organization, and the role of information technology. Three classes of antecedents of a predilection to work at home are individual characteristics, job characteristics, and situational characteristics. The general plan of the study was described; this includes quasi-experimental field studies of three company telecommuting pilots, demographic surveys from two major magazines, and attitude surveys or full-time telecommuters compared to after-hours telecommuters and non-telecommuters.

CHAPTER 4

COMPANY "PILOT" TELECOMMUTING EXPERIMENTS

INTRODUCTION

The first component of data collection for this study was a systematic assessment and comparison of three corporate telecommuting experiments or "pilots". These pilots are described in detail in this chapter.

Background

The general motivation for this approach to studying the phenomenon was the lack of in-depth understanding of the changes that occur when an employee changes work location and begins to work at home. Several surveys of home workers, including the author's own (reviewed in Chapter 2) utilized primarily interviewing to assess general feelings toward the arrangement. A systematic assessment over time and across organizations, using not only interviews but well-established attitude questionnaires, should yield more meaningful results.

In addition, there appeared at the initiation of this study to be a great deal or corporate interest in experimenting with telecommuting as an employee work option. Newspapers and popular

magazines claimed that dozens of companies were experimenting or "studying the issue" [Business Week, 1982; New York Times, 1981].

Although with hindsight it appears that the popular press reports were exaggerated, several companies did run telecommuting experiments [Olson, 1983c]. In most of these the number of participants was quite small and the goals were modest; a pilot could be deemed a "success" if productivity did not decrease. In addition, none of the pilots utilized a control group, so that attribution of any change in performance to the change in work situation was questionable. It appeared that both the addition of control groups and the ability to systematically compare results to other similar pilots (thus increasing the overall sample size) would be appealing to corporations seeking a true understanding of the phenomenon.

General Description of Pilots

The criteria for a pilot program to be acceptable for the study were the following:

* Duration of at least six months,
* At least four participants who were full-time employees,
* Participants:

- Work at home at least one day a week as a substitute for working in the office;
- Remain full-time employees, with full salary and benefits;
- Have access to information technology in their homes and they utilize it in their work.
- Are professional / managerial employees

* Participation of a control group of the same number of participants and with approximately equivalent job responsibilities.

DATA COLLECTION PROCEDURES

For each pilot, interviews were conducted and questionnaires completed prior to beginning and after completion of the pilot. The specific information obtained is described below. Copies of the instruments contained in Appendices A through D.

Background Interviews

The following background data was collected from each telecommuting and control group participant (Appendix A):

* Work experience
* Job description
* Home situation

* Use of information technology for work-related tasks
* Performance evaluation methods
* Commuting situation
* Opinions (before and after) about work at home

The following background data was collected from managers of telecommuting and control group participants (Appendix B):

* General information about responsibilities and procedures
* Formal control procedures
* Management procedures
* Opinions (before and after) about work at home

Attitude Questionnaires

Questionnaires were completed by participants and controls before and after the pilot. The constructs and references to instrument development and validation are contained in Chapter 3; the actual instruments are contained in Appendix C. Data was collected on the following attitudes:

* Job satisfaction (Job Description Index)
* Life satisfaction
* Organizational commitment
* Job involvement
* Role conflict and ambiguity

* Social support
* Job characteristics (Job Diagnostic Survey)

Data analysis emphasized the relative change in attitudes before and after the pilot. Using a statistical technique called *regressed change*, the attitudes scores of participants and controls before the pilot are treated as covariates and partialled out of the scores after the pilot. If the remaining difference between the two groups is significant, the possibility that the difference is due to the difference in work situation cannot be ruled out.

Activity and Communication Logs

Participants in the pilot programs and the control groups completed logs of daily activities, either every other day through the duration of the pilot or every day for several weeks at periodic intervals. Logs were of two types (Appendix D):

* Activity logs. These were completed at the end of a work day. They captured the employees' daily work schedules and self-evaluations of their performance.

* Communications logs. These tabulated both the quantity and mode (e.g., face-to-face, telephone, electronic mail) of all work-related communications in which the employee engaged throughout the work day.

Role of the Control Group

The importance of having an on-site control group for each pilot evaluation must be stressed. The control group did approximately the same type of work as the telecommuters, so that other significant events within the organization, such as a realignment of management, would effect both controls and telecommuters approximately equally. Thus the control group measures help to systematically remove biases in the data caused be events external to the experiment. Data collected about telecommuters' activities and attitudes is thus presented relative to the control group rather than in absolute terms.

COMPANY A -- PILOT I

Company A is a major national bank with its corporate headquarters in downtown Manhattan in New York City.

Background and Description of Pilot

The Systems Group in the Wholesale Banking Division of Company A first became interested in work at home early in 1981. Management felt telecommuting might be an incentive for those who were not presently available to the bank, either because of nonwork responsibilities which required flexible work hours or because of excessive commuting distances. In the long run, the bank saw possible cost savings in terms of energy utilization and reduced need for urban office facilities if telecommuting were to become a general phenomenon. The long-run objective was to hire new employees with the understanding that they would work primarily at home.

The pilot and the evaluation began in April 1983. Two telecommuters and three controls began participation in the evaluation at that time. In October 1983 two more telecommuters and two more controls began the evaluation. The data collection ended in April 1984.

All telecommuters and controls were experienced programmers or programmer/analysts. The primary focus of their work was the

implementation phase of systems projects, including program specification, coding, and testing.

Telecommuters were expected to work a 35-hour week, the same as on-site employees. Their schedules were flexible, and based on agreement with their managers. They were expected to attend the office at least one day a week. Telecommuters remained on full salary and benefits during the pilot.

Each telecommuter had a low-cost ASCII terminal installed in the home; it had additional support for simulation of a bisynchronous environment (i.e., IBM 3270). They also had two business telephone lines, a 1200-baud modem, a small printer, conference call facilities, and access to a paging system for emergencies. All equipment was provided and paid for by the bank. All employees also had access to an electronic mail system which had a large corporate-wide subscription base.

Description of Participants and Jobs

Table 4-1 shows the demographics and work experience of the nine employees in the project. All four employees working at home were female, while four out of five in the control group were male. While three out of four of the telecommuting employees were married, only one had child care responsibilities that would

overlap with normal work hours; she had full-time child care help in her home. They had a slightly longer commute than the control group, but it cost slightly less money.

On average, the telecommuters had been with the company slightly longer than the control group. Since two were reassigned in order to work at home, their tenure in their present position is not a good indication of their work experience. (Two controls also changed jobs at about the same time.) All participants were professional-level employees.

TABLE 4-1
EMPLOYEE DEMOGRAPHICS AND WORK EXPERIENCE
COMPANY A -- PILOT I

	TELECOMMUTERS	CONTROLS
Age	20-29: 1 30-39: 2 40-49: 1	20-29: 2 30-39: 3
Education level	some college: 1 college deg.: 1 some grad.: 2	no college: 1 some college: 1 college deg.: 1 grad. deg.: 2
Sex	F: 4 M: 0	F: 1 M: 4
Marital status	Married: 3 Single: 1	Married: 3 Single: 2
Number of children	None: 2 One: 1 Two: 1	None: 3 One: 1 Two: 1
Commuting Distance (One way)	73 min. avg.	54 min. avg.
Commuting Cost (per day)	$1.75	$3.00
Tenure with company	2.2 yrs. avg.	1.5 yrs. avg.
Tenure in present position	.7 yrs. avg.	.6 yrs. avg.

All employees held technical positions with no managerial responsibilities. The jobs were part of larger projects with relatively fixed schedules and well-defined milestones. Deadlines were often critical because of project interdependencies.

The average length of time for a deliverable was typically two weeks or longer. The workload was often highly irregular, meaning the employee sometimes had a great deal to do and

sometimes very little. Although the telecommuters indicated that their workloads were more regular after the pilot than before, the same was observed by the control group.

Generally, the employees' need for concentration varied depending on the specific task on which the employee was working. All employees had a relatively low need for clerical support; both groups perceived the clerical support available as adequate for the duration of the pilot. The employees did much of their own document preparation, drafting of memoes, etc. online, thus eliminating the need for clerical support. This may have represented a shift in working style, especially for the telecommuters, but they did not perceive it to be a disadvantage.

All participants used the computer extensively in their work. The average estimate of time "online" for telecommuters was less than those on-site; but they also indicated a much wider variation from day to day. Telecommuters expressed appreciation at the convenience of having a dedicated terminal. Downtime of the online system was a problem during the pilot period for everyone.

Employees in both groups communicated primarily with their supervisors, fellow members of their project team, and users in the course of their work. They rarely if ever communicated with vendors, clients external to the organization, or other service functions within the organization.

All participants stressed work quality and the ability to meet deadlines as the important criteria on which they were evaluated. Although they communicated often (most at least once a day) with their supervisors, they felt that they rarely received feedback on their overall performance.

Results of Interviews -- Before and After

In general, telecommuters' perceptions of their jobs and their managers' expectations of their performance did not seem to be appreciably affected by their work at home. They did report slightly less frequent informal feedback from their supervisors than they had received before the pilot. They did not feel that telecommuting negatively affected their chances of promotion. If anything, they felt that the attention paid to the pilot may have increased their visibility and thus their chances for promotion.

Telecommuters felt that they communicated less frequently with their supervisors during the pilot than before. If anything the control group felt they communicated more with their supervisors over the same period of time. Telecommuters also felt they communicated somewhat less with coworkers and users, but thought this was really a function of project stage rather than their telecommuting status. (Summaries of actual communications reported in a later section of this chapter show that in fact

telecommuters communicated more frequently with coworkers and supervisors; their communications were shorter and many took place by electronic mail.)

Telecommuters with child care responsibilities did not report any substantial changes in these; nor did they report changes in spouses' work schedules or responsibilities in the home. One employee felt she had more time for leisure activities; she had taken up jogging or walking on a regular basis. Another felt she had more time for household responsibilities, and felt she was being more responsive to her family's needs. The others reported no change in the amount of time spent on either.

All telecommuters had found a particular place to work in the home. For two of the four, this was a separate area which did not also serve as a living space.

The telecommuting employees did not feel that their relationship with their supervisors had been negatively affected by the arrangement. The two employees who reported improved relationships had been assigned to new managers when the project began; the other two reported no change. Participants reported either no change in their relationships with their coworkers or slightly adverse effects. One telecommuter mentioned that for a small period of time she felt that her coworkers resented the

arrangement. On the other hand, the control group reported that their relationships with their telecommuting colleagues had improved rather than had a negative effect.

Two telecommuters reported increased commitment to the organization, expressing that they were "grateful" for the opportunity to work at home. The others reported no change.

When telecommuters were asked about the general advantages of work at home, they cited cost savings on clothes, lunch, and commuting. They had no opinion when they began working at home about its effect on their promotability. After the pilot, they had mixed feelings about it. Two telecommuters felt that participation had increased their chances of promotion because of the visibility of the pilot. They also felt they had demonstrated their ability to work independently. One employee had made a lateral move from a managerial to a technical position in order to participate in the pilot; she therefore felt telecommuting had set her back in terms of promotion. The last felt there was no effect on promotion potential. Although the control group at first felt that work at home would have a negative effect on promotion, their observation of the pilot apparently changed their minds.

The general consensus among the telecommuting employees was that their personal work effectiveness was enhanced, because of fewer interruptions, better concentration, and greater motivation to

work. Although prior to the pilot they expressed concerns about the negative effects of separation from colleagues on professional development, after the pilot the telecommuters did not feel there were any such negative effects. They felt that working independently allowed them to grow more in terms of professional development, and that they took more initiative themselves than they would have otherwise.

As they expected, telecommuters felt less general stress as a result of the arrangement. One of the major reasons they cited for this was the elimination of commuting, which they all saw as a major advantage of the arrangement. Other reasons given related to better concentration and fewer interruptions. Two of four employees reported increased satisfaction with their jobs, as a result primarily of their increased independence on the job.

Telecommuters had mixed feelings with regard to child care. One participant felt that the arrangement was ideal for her to care for an infant. On the other hand, a participant with older children felt that she had increased the amount of work she did for them as a result of being at home more. All telecommuters reported an increase in time for leisure activities, primarily due to decreased commute time; as mentioned previously, except in one case the type of leisure activities in which they engaged did not change.

Generally, the relationship of the telecommuters to their community did not change, although one reported that she had met more of her neighbors. All participants with families felt their relationships had improved. They cited less rushing in the morning, seeing their families more, and feeling better in general about their family responsibilities. In terms of general social interaction, there seemed to be a tradeoff between missing friends at the office and seeing friends at home. None reported that social interactions overall were diminished as a result of working at home.

Frequent anecdotes of telecommuters refer to increases in physical habits such as compulsive eating and smoking. The control group, when asked if they could work at home, cited problems such as eating too much or watching too much television or smoking too much. The telecommuters did not find such habits to be problems. One said she ate somewhat more but did not feel it was a problem. Another dealt with a potential problem by having no food in the house when she worked at home.

Results of Interviews -- Managers

Three managers of employees who worked at home were interviewed.

Each manages between four and ten people, one or two of whom worked at home. All telecommuters were expected to work seven hours a day and to be reachable by telephone or pager during business hours. Otherwise, their hours were flexible.

Although the managers did not think the frequency of informal performance evaluations differed between the telecommuters and other employees, two reported spending a little more time with the telecommuting employees when they were in the office. The supervisors made a point of scheduling this time rather than relying on casual unscheduled contact which they considered adequate for on-site employees. They did not perceive the criteria for performance to be different between the two groups, although one manager reported that he tended to assign his telecommuting employee to longer-term deliverables.

The managers reported no significant changes in their own management style as a result of managing employees at home. They did not feel they needed to increase monitoring. There were few reported emergencies, and the telecommuters were always available when necessary.

The managers did feel there was less communication between them and their telecommuting employees than their on-site people. There was very little informal communication between them and the telecommuters. The bulk of communication continued to take place face-to-face.

Overall, the managers felt it was necessary to devote more time to preparing projects for the telecommuters, since only certain tasks were suitable and they needed to be defined more specifically. Once the project was assigned, however, the managers found that less day-to-day supervision was required. This was attibuted more to the fact that the project was well defined than to the employee's work location.

When asked the effect of work at home on their employees' productivity, the managers were conservative. None reported increases in productivity, although one reported that the quality of his employee's work had improved. They felt some loss of flexibility in assigning work to employees. When asked if they still felt comfortable with the work-at-home concept, the managers were generally positive. They all felt that their own jobs were more difficult because greater planning was required, they had less flexibility in job assignments, and there were greater time constraints. Two managers emphasized that experienced employees were essential to a successful telecommuting arrangement.

When asked if they would like to work at home themselves, all managers felt that it would be impractical because of the need for frequent communication in their jobs.

Summary of Employee Attitude Scores

Table 4-2 shows the difference in attitude scores of participants and controls after the pilot. The F-score shows the result of the regressed change calculation (described in Chapter 3). If the F-score is significant, the difference in scores between participants and controls after the pilot, with scores before the pilot removed, is significant. The possibility that this difference is attributable to the difference in work situation (i.e., telecommuting) cannot be ruled out.

Results should be treated with great caution since the sample sizes are so small. In a later section of this chapter, the results are analyzed for the combined sample of all pilots, giving an acceptable sample size for moderate effects.

TABLE 4-2
RESULTS OF ATTITUDE SCORES -- WORK AT HOME VS CONTROLS
COMPANY A -- PILOT I

		WAH N=4	CONTROLS N=5	F	Sig of F
JOB SATISFACTION					
WORK	BEFORE	27.00	32.25	0.451	.53
	AFTER	30.75	31.00		
SUPERVISION	BEFORE	25.67	27.00	1.381	.29
	AFTER	27.00	27.00		
PEOPLE	BEFORE	22.00	26.50	0.730	.43
	AFTER	21.25	23.60		
PAY	BEFORE	6.67	9.00	0.166	.70
	AFTER	8.00	9.40		
PROMOTION	BEFORE	11.00	12.75	0.418	.54
	AFTER	13.25	14.20		
LIFE SATISFACTION	BEFORE	13.67	18.75	0.444	.54
	AFTER	13.33	21.80		
ORG. COMMITMENT	BEFORE	48.75	62.00	2.184	.19
	AFTER	38.00	61.00		
JOB INVOLVEMENT	BEFORE	55.33	38.60	0.165	.70
	AFTER	49.75	37.60		
ROLE CONFLICT	BEFORE	14.67	16.60	5.562	.07*
	AFTER	10.75	17.40		
ROLE AMBIGUITY	BEFORE	24.67	33.60	1.675	.25
	AFTER	18.50	31.80		
SOCIAL SUPPORT					
BOSS	BEFORE	13.00	11.40	4.951	.07*
	AFTER	14.50	11.00		
COWORKERS	BEFORE	11.75	11.60	0.187	.68
	AFTER	11.25	11.80		
FRIENDS	BEFORE	15.25	12.20	0.605	.47
	AFTER	15.50	12.00		
JOB CHARACTISTICS					
SKILL VARIETY	BEFORE	5.33	5.53	0.378	.56
	AFTER	5.92	5.60		
TASK IDENTITY	BEFORE	6.08	4.93	0.070	.80
	AFTER	5.92	4.87		
TASK SIGN.	BEFORE	5.25	4.20	0.036	.86
	AFTER	4.67	3.93		
AUTONOMY	BEFORE	5.58	5.26	11.185	.02*
	AFTER	6.08	4.80		
FEEDBACK	BEFORE	4.92	5.53	2.606	.16
	AFTER	5.50	4.93		
MPS	BEFORE	157.37	149.67	3.627	.11
	AFTER	189.81	120.82		

Several attitude scores show significant differences. After the pilot, teleworkers had less role conflict and felt more reliance on their supervisor for social support than the control group. They felt they had significantly more autonomy in their jobs than the control group. The overall Motivating Potential Score (MPS) of their jobs was also higher.

Summary of Activity and Communication Logs

Employees in Company A completed activity and communication logs at the end of every third day during the pilot, regardless of their work location.

The activity logs illuminated reasons for employees to be satisfied or dissatisfied with their accomplishments on a given day and differences based on work location. Table 4-3 summarizes these results.

TABLE 4-3
SUMMARY OF ACTIVITY LOGS
COMPANY A -- PILOT I

A. DAYS IN WHICH EMPLOYEE WAS SATISFIED WITH WORK ACCOMPLISHMENT (N=NO. OF DAYS)

	WAH-HOME	WAH-OFFICE	CONTROLS
	N = 77	N = 42	N = 216
SATISFIED	42 (54.5%)	32 (76.2%)	126 (58.3)
NEUTRAL	13 (16.9%)	4 (9.5%)	57 (26.4)
DISSATISFIED	22 (28.6%)	6 (14.3%)	33 (15.3)

B. REASONS GIVEN FOR EMPLOYEE SATISFACTION WITH WORK ACCOMPLISHMENT (% OF DAYS REASON GIVEN; N=NO. OF DAYS)

REASON	WAH-HOME	WAH-OFFICE	CONTROLS
	N = 42	N = 32	N = 126
Good concentration	57.1%	12.5%	23.8%
No interruptions	42.9	15.6	21.4
Information available when needed	28.6	43.8	26.2
Coworkers available when needed	23.8	56.3	19.0
Good response time	21.4	12.5	5.6
Good planning	11.9	15.6	3.2

C. REASONS GIVEN FOR EMPLOYEE DISSATISFACTION WITH WORK ACCOMPLISHMENT (% OF DAYS REASON GIVEN; N=NO. OF DAYS)

REASON	WAH-HOME	WAH-OFFICE	CONTROLS
	N = 22	N = 6	N = 33
Software problems	45.5%	66.7%	33.3%
Hardware problems	27.3	33.3	6.1
Task difficulty	22.7	33.3	27.3
Lack of concentration	22.7	16.7	18.2
Poor response time	13.6	16.7	27.3
Coworkers unavailable when needed	4.5	0	6.1
Information unavailable when needed	4.5	0	27.3
Interruptions	4.5	0	18.2

As seen from Table 4-3, all employees had far more days when they were at least somewhat satisfied with their work accomplishment than anything else. When the remote employees came on site, their work schedules dealt mainly with meetings, which precluded them from dealing with the normal problems of hardware, software, and response time. The work-at-home employees had a few more days when they were dissatisfied at home than the others. However, there were no particular reasons given for this, and of course there is no indication that their productivity actually suffered. What is more likely is that on the days they were at home they were more acutely aware of lack of accomplishment of set work goals.

As seen in Part B of Table 4-3, the primary reasons for satisfaction with work accomplishment given by the work-at-home employees were good concentration and no interruptions. These were cited much less by the other two groups. Availability of information and coworkers were apparently more important to the work-at-home employees when they attended the office; hence they often cited it as contributing to satisfaction with work accomplishment on those days. These categories were cited about the same for work-at-home employees on days they were home as for the controls, indicating that lack of availability was not a problem.

Indeed, Part C of Table 4-3 shows that lack of availability of

coworkers or information were rarely cited as problems for employees working at home. Their biggest problems were exactly the same as the other groups: software, hardware, and poor response time.

Table 4-4 summarizes the employee communication logs.

TABLE 4-4
SUMMARY OF COMMUNICATION LOGS
COMPANY A -- PILOT I

A. MEDIUM USED TO COMMUNICATE

	WAH-HOME N = 395	WAH-OFFICE N = 148	CONTROLS N = 516
FACE-TO-FACE	1.3%	95.3%	91.1%
TELEPHONE	59.0	4.7	7.4
ELECTRONIC MAIL	38.5	0.0	1.4
OTHER	1.2	0.0	0.2

B. MEDIUM USED BY TELECOMMUTERS BY OTHER PARTY OF COMMUNICATION

	MANAGER N = 122	COWORKERS N = 48	OTHER* N = 225
FACE-TO-FACE	0.8%	4.2%	1.0%
TELEPHONE	45.1	75.0	63.1
ELECTRONIC MAIL	52.5	20.8	34.7
OTHER	1.6	0.0	1.2

*Users, support personnel

C. LENGTH OF COMMUNICATION

	WAH-HOME N = 388	WAH-OFFICE N = 142	CONTROLS N = 525
< 5 MINUTES	76.5%	10.6%	37.3%
5-10 MINUTES	17.8	36.6	26.3
> 10 MINUTES	5.7	52.8	36.4

Table 4-4 shows that employees working at home used electronic mail frequently, especially for communication with their supervisors. In the office both telephone and electronic mail were used rarely, even when the person to be contacted, such as a user, was elsewhere. Communications of employees at home tended to be much briefer than the others. Since they indicated no lack of information to do their jobs, one can only conclude that their communications were more efficient than communications which took place in the office.

Discussion of Results -- Pilot I

The results, especially from the attitude questionnaires, reinforce an important point; the work-at-home participants were carefully selected based on demonstrated self-motivation and a relationship of trust with their supervisors. They also had a personal motivation to ensure the success of the pilot.

With these important issues in mind, it is safe to conclude that work at home had no negative effect on employee performance, motivation, or satisfaction with their jobs. Employees working at home experienced increased autonomy in their work and responded positively to the increase. They also experienced

a decrease in work-related role conflict. They perceived that the degree of social support they received from their supervisors increased, possibly due to supervisors' increased attention to planning their work and to seeing them on days they attended the office.

The ability to concentrate afforded by work at home attributed to employees' own feelings of satisfaction with work accomplishment, a subjective indicator of work performance. There was no indication that their work suffered from lack of availability of coworkers or information. Their communications with their managers, coworkers, and others were more frequent and shorter; electronic mail and telephone seemed adequate substitutes for face-to-face even though the latter was relied upon exclusively by employees on site.

In general, the work-at-home employees were very happy with the arrangement and for the most part wished it would continue.

Both participants and managers emphasized one important change: an increased need for planning. Both groups felt that their ability to plan and to be organized had improved as a result of the pilot.

The long-term effects of work at home on employee career paths could not be determined from the pilot. The employees did not feel that they had been negatively impacted in this respect by

the arrangement. Managers did not express particular concern about differential methods applied to some aspects of evaluation.

Follow-up on Pilot I

At the end of the evaluation period, management considered the pilot a success on the criteria that productivity did not decrease and supervisors felt the arrangement was manageable. One year later, the pilot was still in place with four participants, two of whom had been in the original evaluation. Management had plans to expand the pilot to fifteen participants.

COMPANY B -- PILOT II

Company B is a major national bank bank with corporate headquarters in midtown New York City.

Background and Description of Pilot

In the spring of 1983, a telecommuting pilot project was proposed for the Personnel Systems Department at Company B. The proposal was motivated by the imminent relocation of the department to Long Island. Both the time and expense of commuting would be increased dramatically for a number of key employees; management viewed telecommuting as a way of easing the burden of the commute

and thus possibly retaining key employees. Management felt that if the concept could be demonstrated to be feasible through a pilot telecommuting experiment, it could be an effective mechanism for attracting and retaining key employees on a broader scale.

The department moved to Long Island in July, 1983. Although the pilot was originally scheduled to start at the same time, late deliveries of equipment delayed it several months. The pilot began October 1, 1983, and was completed March 31, 1984. There were six participants originally; four employees were also selected for the control group. One of the original participants dropped out shortly after the beginning of the pilot because of a change in job responsibilities that made work at home infeasible. All telecommuters remained on full salaries and benefits, and were expected to maintain a flexible schedule of working at home one to three days per week.

Each employee was equipped with a terminal and modem at home. They utilized their own telephones to dial in to the company's main computer.

Description of Participants and Jobs

Table 4-5 shows the demographics and work experience of the nine employees involved in the pilot. Both groups are relatively uniform in terms of age, amount of education, and marital status. The estimated commuting cost per day is substantially larger for those who volunteered to work at home than for the controls, although the amount of time it takes is on average only slightly greater. For both groups, both aveerage tenure with the company and average tenure in their present jobs are relatively long. Tenure in present position varied from three months to eleven years.

TABLE 4-5
EMPLOYEE DEMOGRAPHICS AND WORK EXPERIENCE
COMPANY B -- PILOT II

	TELECOMMUTERS	CONTROLS
Age	30-39: 3 40-49: 1 50-59: 1	30-39: 2 40-49: 2
Education level	some college: 1 college deg.: 3 some grad.: 1	some college: 2 college deg.: 1 grad. deg.: 1
Sex	F: 1 M: 4	F: 1 M: 3
Marital status	Married: 5 Single: 0	Married: 3 Single: 1
Number of children	None: 3 One: 0 Two: 1 Three: 1	None: 3 One: 0 Two: 1
Commuting Distance (One way)	84 min. avg.	77 min. avg.
Commuting Cost (per day)	9.75	4.00
Tenure with company	12.3 yrs. avg.	9.1 yrs. avg.
Tenure in present position	4.0 yrs. avg.	3.7 yrs. avg.

Most of the employees worked primarily on long-term maintenance projects with relatively well-defined deliverables, although one was responsible for short-term ad hoc requests that averaged one day turnaround. The workload was generally perceived as very regular, although there was persistent time pressure to meet deadlines. The jobs required some uninterrupted concentration, and the current work setting was perceived as not necessarily adequate for the degreee of concentration needed. The employees who chose to work at home found disturbances in the office to be

a greater problem than did the others. They did not often require clerical support and felt that the support available was satisfactory.

The employees were not intense computer users. Initially, when asked to estimate how much time they actually spent "online", their reponses averaged 40 percent. After the pilot, the telecommuters reported average usage of 32 percent of their time, the controls only 15 percent. They considered access to the computing facility, regardless of how low their usage, critical to their work. They considered the availability of these facilities, both at work and at home, to be adequate.

Results of Interviews -- Before and After

Employees were asked to evaluate the effect of telecommuting on their work performance. Although they were not able to give tangible evidence of their performance, none felt that it had been negatively affected by work at home. Two of the five gave estimates: one who worked at home one day a week estimated an overall performance increase of 15 percent; another who worked at home two days a week estimated his overall performance had improved by 30 percent. The other two reported no effect on performance, but one of these indicated that there had been a dramatic increase in his workload since the pilot started. He also indicated that having the equipment at home was the only way

he was able to keep up with this workload; he used the equipment to work nights and weekends even during the last several months of the pilot, when he reported that he rarely if ever stayed home during the day. Where productivity was estimated to be higher, the employees strongly attributed it to the telecommuting arrangement.

Before the pilot, employees felt they received informal feedback on performance only rarely (once a month or less); the same was true after the pilot. The employees who were working at home were asked if they felt the arrangement had any effect on their chances for promotion. Three responded it had no effect and one felt it had helped because he had demonstrated an ability to work independently.

Telecommuters estimated that they communicated with their supervisors at least once a day and did not feel this had decreased as a result of the pilot. They also communicated as much with coworkers as before. They thought their communications with users had decreased, but this may have been because of the move to Long Island rather than the pilot. The control group also indicated that communications with users had decreased.

Before the pilot began, participants thought the arrangement would have a positive effect on their commitment to the organization, their personal work effectiveness, and their

professional development. They also felt it would positively affect work-related stress (by reducing it), their satisfaction with their jobs, and their time for leisure activities.

After the pilot, the telecommuters felt the arrangement had had a positive effect on their satisfaction with their jobs, personal work effectiveness, and time for leisure activities. They cited greater concentration, fewer interruptions, more variety, and generally feeling better about their work situation as reasons for the improvement in personal work effectiveness and job satisfaction. They felt more relaxed, more interested in their work, and more pleased with the variety. Three of five reported reduced stress as a result of the reduction in commute time and better concentration. They felt the arrangement had no effect on their commitment to the organization or professional development. They did not perceive the arrangement to have an impact on their nonwork (family, community) relationships.

The only thing the control group seemed to change their opinions about was physical habits, which included whether they ate too much, smoked too much, drank too much coffee, etc. at home. Before the pilot, they did not know what effect working at home would have. Afterwards, they were all quite sure that working at home would be relatively "unhealthy" in this respect for them personally. They indicated that their

observation of those who worked at home convinced them it was not an ideal situation for themselves although they did not imply they thought it was "unhealthy" for the others.

Results of Interviews -- Managers

Three managers of employees working at home were interviewed at the end of the pilot. Two of these each managed one telecommuting employee, the third managed three.

The managers were more conservative than their employees in their estimates of the effect of the pilot on performance. For three cases they reported that performance had not deteriorated, and on balance (considering the long commute and the threat of losing the employee) the arrangement was satisfactory. In one of these cases the manager observed that the employee's ability to plan and structure his work had improved as a result of the arrangement. The managers also reported that their own ability to evaluate performance was not hindered by the arrangement since the employees all worked on well-defined deliverables.

Two cases were reported as problems. In one case, the manager felt the employee required a considerable amount of supervision and had trouble at times understanding assignments. The manager felt that work at home was a hindrance, although he was not sure if it had contributed to a deterioration in performance. In the

second case, the manager felt uncomfortable because the employee's work assignments were "intangible" and he often felt frustrated by the employee's lack of accessibility.

In both of these "problem" cases, the employees in question reported in the follow-up interview that they had not worked at home at all for nearly three months prior to the interview. Therefore, it appears that the problems were incorrectly attributed to the telecommuting arrangement.

Summary of Employee Attitude Scores

Table 4-6 shows the relative change in attitudes of participants and controls before and after the pilot. The F-score shows the result of the regressed change calculation (described in Chapter 3). If the F-score is significant, the difference in scores between participants and controls after the pilot, with scores before the pilot removed, is significant. The possibility that this difference is attributable to the difference in work situation (i.e., telecommuting) cannot be ruled out.

Results should be treated with great caution since the sample sizes are so small. In a later section of this chapter, the results are analyzed for the combined sample of all pilots, giving an acceptable sample size for moderate effects.

TABLE 4-6
RESULTS OF ATTITUDE SCORES -- WORK AT HOME VS CONTROLS
COMPANY B -- PILOT II

		WAH N = 5	CONTROLS N = 4	F	Sig F
JOB SATISFACTION					
WORK	BEFORE	31.00	34.00	0.028	.87
	AFTER	33.20	32.50		
SUPERVISION	BEFORE	27.20	30.00	0.941	.37
	AFTER	27.40	23.25		
PEOPLE	BEFORE	28.00	22.75	0.205	.67
	AFTER	24.40	21.50		
PAY	BEFORE	10.00	8.50	0.154	.71
	AFTER	8.80	9.50		
PROMOTION	BEFORE	12.40	12.75	0.014	.91
	AFTER	12.20	14.00		
LIFE SATISFACTION	BEFORE	20.60	21.50	0.437	.53
	AFTER	19.40	23.25		
ORG. COMMITMENT	BEFORE	53.60	41.25	0.022	.89
	AFTER	50.30	45.50		
JOB INVOLVEMENT	BEFORE	51.00	40.50	0.743	.42
	AFTER	48.20	30.75		
ROLE CONFLICT	BEFORE	17.40	13.75	13.251	.01*
	AFTER	18.00	12.50		
ROLE AMBIGUITY	BEFORE	32.00	28.50	0.000	.99
	AFTER	28.40	25.00		
SOCIAL SUPPORT					
BOSS	BEFORE	12.80	13.50	1.749	.23
	AFTER	13.20	14.75		
COWORKERS	BEFORE	10.20	12.25	0.007	.94
	AFTER	11.20	11.75		
FRIENDS	BEFORE	13.80	15.25	0.033	.86
	AFTER	12.80	13.50		
JOB CHARACTISTICS					
SKILL VARIETY	BEFORE	5.87	5.75	0.847	.39
	AFTER	6.07	6.25		
TASK IDENTITY	BEFORE	6.20	6.25	0.650	.45
	AFTER	5.80	6.42		
TASK SIGN.	BEFORE	5.27	5.17	0.200	.67
	AFTER	5.33	5.58		
AUTONOMY	BEFORE	6.33	6.17	0.014	.91
	AFTER	5.80	5.67		
FEEDBACK	BEFORE	5.47	6.25	1.743	.24
	AFTER	5.47	5.83		
MPS	BEFORE	199.08	219.57	0.473	.52
	AFTER	219.57	200.08		

The only attitude score showing a significant difference as role conflict: after the pilot, the telecommuters had significantly higher role conflict than the control group.

Summary of Activity and Communication Logs

Employees in Company B completed activity and communication logs at the end of every other day during the pilot, regardless of their work location.

The activity logs illuminated reasons for employees to be satisfied or dissatisfied with their accomplishments on a given day and differences based on work location. Table 4-7 summarizes these results.

TABLE 4-7
SUMMARY OF ACTIVITY LOGS
COMPANY B -- PILOT II

A. DAYS IN WHICH EMPLOYEE WAS SATISFIED WITH WORK ACCOMPLISHMENT (N=NO. OF DAYS)

	WAH-HOME	WAH-OFFICE	CONTROLS
	N = 61	N = 170	N = 198
SATISFIED	53 (86.8%)	117 (68.8%)	119 (60.1%)
NEUTRAL	4 (06.6%)	41 (24.1%)	60 (30.3%)
DISSATISFIED	4 (06.6%)	12 (07.1%)	19 (09.6%)

B. REASONS GIVEN FOR EMPLOYEE SATISFACTION WITH WORK ACCOMPLISHMENT (% OF DAYS REASON GIVEN; N=NO. OF DAYS)

REASON	WAH-HOME	WAH-OFFICE	CONTROLS
	N = 53	N = 117	N = 119
Good concentration	64.2%	52.1%	75.6%
Good planning	56.6	52.1	39.5
No interruptions	45.3	7.7	19.3
Information available when needed	30.2	38.5	56.3
Imminent deadline	26.4	31.6	2.5
No unforeseen problems	20.8	27.4	53.8
Coworkers available when needed	1.9	26.5	21.0
Good response time	7.5	29.5	21.0
Task less difficult than expected	3.8	11.1	14.3

As shown in Table 4-7, employees reported satisfaction with their work accomplishment on most days. Still, the highest percent of days in which employees reported satisfaction were those spent at home. As shown in Part B of Table 4-7, the reasons most commonly given for task accomplishment for telecommuters were good

concentration, good planning, and no interruptions. The number of responses giving reasons for dissatisfaction with work accomplishment was too small to be reported.

Employees also reported their daily work-related communications for 35 percent of the days of the pilot. Table 4-8 shows the results.

TABLE 4-8
SUMMARY OF COMMUNICATION LOGS
COMPANY B -- PILOT II

A. MEDIUM USED TO COMMUNICATE

	WAH-HOME N = 461	WAH-OFFICE N = 593	CONTROLS N = 1343
FACE-TO-FACE	1.1%	82.5%	77.4%
TELEPHONE	64.0	17.4	22.0
ELECTRONIC MAIL	33.2	0.0	0.5
OTHER	1.7	0.1	0.1

B. MEDIUM USED BY TELECOMMUTERS BY OTHER PARTY OF COMMUNICATION

	MANAGER N = 134	COWORKERS N = 76	OTHER* N = 251
FACE-TO-FACE	0.7%	2.6%	0.8%
TELEPHONE	50.0	81.6	66.1
ELECTRONIC MAIL	47.8	14.5	31.1
OTHER	1.5	1.3	2.0

*Users, support personnel

C. LENGTH OF COMMUNICATION

	WAH-HOME N = 454	WAH-OFFICE N = 596	CONTROLS N = 1340
< 5 MINUTES	73.2%	40.1%	45.5%
5 - 10 MINUTES	20.9	38.3	24.4
> 10 MINUTES	5.9	21.6	30.1

Table 4-8 shows that employees working at home used electronic mail frequently, especially with their supervisors. In the office face-to-face was overwhelming preferred; electroni mail was virtually unused on-site. Communications of telecommuting employees tended to be much briefer than communications in the office.

Discussion of Results -- Pilot II

The evaluation of Pilot II uncovered no negative effects on employee performance or attitudes toward their jobs as a result of work at home. In general, the employees were very enthusiastic about the arrangement and hoped it would continue. Managers did not express opposition to it in concept and considered it a satisfactory arrangement when the threat of losing the employee was taken into consideration. It is possible that more marked positive impacts on performance would have occurred had the employees spent more days at home. Based on a sample of days in which the employees completed forms, they worked at home 25 percent of the time as opposed to the planned 40 percent (two days per week).

Follow-up On Pilot II

Despite positive reports, the pilot was discontinued after the evaluation period. The general problem was that supervisors did not feel they could effectively manage telecommuting employees. By the end of the pilot, three of the four participants were already spending little or no work time at home due to supervisory pressure to be on site. One employee continued to work at home two days a week under an informal agreement with his supervisor. After several months his responsibilities changed and even this limited telecommuting arrangement was no longer feasible.

The pilot started in conjunction with a physical relocation of the department that resulted in significantly longer commute times for many employees. At the time of the move, employees were not given the option of accepting other positions in the bank rather than relocating. Many were considering leaving the bank. An implicit goal of the pilot was to make the relocation somewhat more palatable to several key employees. In this respect the pilot was a success. The employees accepted the relocation and had made the transition, including adjusting to the commute, by the time the pilot officially ended.

COMPANY C -- PILOT III

Company C is a major insurance firm whose corporate headquarters are in Hartford Connecticutt.

Background and Description of Pilot

The Information Management Systems Department in Company C began planning for a telecommuting pilot in March of 1984. The stated objectives of a work-at-home program, of which the pilot would be a part, were the following:

- Reduce company expenses
- Increase the potential labor pools of systems specialists
- Increase employee productivity
- Reduce employee expenses
- Social benefits

The goals of the pilot were the following:

- Determine if people can work productively at home
- Determine if people can be managed effectively at home
- Determine the best work at home configuration (technology)
- Determine the least expensive work at home configuration.

Once it could be determined that employees could work effectively at home and managers could learn how to supervise off-site employees, Comany C's goal was to implement a permanent telecommuting program and gain the concrete benefits of decreased company expenses (i.e., recruiting costs, space) and increased employee productivity.

The telecommuting pilot was initiated in March 1986 and lasted nine months. There were initially nine telecommuters, all in the positions of Programmer II or Programmer Analyst. They were chosen from a "pool" of potential candidates (volunteers) depending on the project to which they were assigned and the stage of that project. There was an attempt to represent a range of project size and project stage; both new development and maintenance projects were included. Another consideration was the employee's relationship to his or her manager; only those managers with a positive attitude toward their employees working at home had employees participate.

Telecommuting employees were required to come into the office for a planned employee/supervisor meeting once a week. The employee was also required to submit a written weekly status report on completed and planned activities. Each employee was required to sign a "memorandum of understanding" specifying the conditions of the pilot and the liabilities of both the employee and the company.

Each telecommuting employee was assigned a "buddy" to provide on-site assistance with procedures, keypunch, problem resolution, etc. The "buddies" also became the control group in the pilot evaluation.

Each employee was supplied in the home with an ITT personal computer, a printer, and an internal modem. If needed, a second telephone line was installed in the home paid for by the company.

Description of Participants and Jobs

Table 4-9 shows the demographics of the fifteen employees for whom before-after data was collected. One telecommuter and two members of the control group did not submit follow-up questionnaires; they were dropped from the analysis.

TABLE 4-9
EMPLOYEE DEMOGRAPHICS AND WORK EXPERIENCE
COMPANY C -- PILOT III

	TELECOMMUTERS N = 8	CONTROLS N = 7
Age	20-29: 3 30-39: 3 40-49: 2	20-29: 2 30-39: 3 40-49: 2
Education level	some college: 4 college deg.: 1 some grad.: 1 grad deg.: 2	high school: 1 some college: 1 college deg.: 2 some grad.: 2 grad. deg.: 1
Sex	F: 7 M: 1	F: 5 M: 2
Number of children	None: 3 One: 3 Two: 2	None: 1 One: 2 Two: 4 Three: 1
Commuting Distance (One way)	46 min. avg.	36 min. avg.
Commuting Cost (per day)	$3.20	$2.35
Tenure in present position	1.4 yrs. avg.	1.4 yrs. avg.

The table shows that the telecommuters and controls were very similar on average. The telecommuters had a somewhat longer and more expensive commute than the control group. Although most of the telecommuters had small children, they were not using the telecommuting arrangement to combine work and child care.

All employees held technical positions of programmer or programmer/analyst, and were professional (exempt) level. Their jobs required periods of concentration, for which the office was

only viewed as "sometimes" adequate. They needed some clerical support in their jobs; the available support was only considered "sometimes" adequate by the majority.

General Opinions about Work at Home -- Before and After

In this section, employee responses to the general questionnaire about their jobs, home life, and opinions about telecommuting are summarized. Responses were submitted in written questionnaires rather than interviews. Controls were asked if their opinions about their own capabilities to work at home had been altered by the experience of observing the pilot.

Telecommuters estimated that they communicated more with their supervisors, cowokers, and users over the period of the pilot, while controls' estimates remained the same. Clearly the telecommuters did not feel their work-related communication was significantly reduced.

Did the telecommuters spend more time on child care and household duties than they would if they were out of the home full time? The answer for this group is NO. For whatever reason, they reported they spent less time on child care and on household activities, while the control group estimated exactly the same both before and after in both categories. It should be noted, however, that the telecommuters initially reported they spent

more time on average in child care than the control group; this may have been one of the reasons the arrangement was initially appealling to them. The telecommuters reported they spent slightly more time on leisure activities, the control group significantly less (one hour per day) than before the pilot. However, in the answer to the question on how many hours per week telecommuters spent on leisure activities, they also estimated more than an hour a day less than before the pilot. It appears that since both groups reported significantly less leisure time after the pilot, it is probably due to the business cycle (i.e., a busy period generally at work) or the season (i.e., bad weather) rather than anything to do with telecommuting.

In general, telecommuters reported that work at home had no effect on their relationships with their supervisors or coworkers. They felt it had either a positive or no effect on their commitment to the organization. While all the telecommuters thought originally that the arrangement would improve their personal work effectiveness and reduce stress, their conclusions after the pilot were decidedly more mixed, with three out of eight feeling their personal work effectiveness had been hurt and two out of eight that they experienced more stress rather than less. Two claimed the arrangement had a negative effect on their job satisfaction, the opposite of what they originally predicted. In terms of leisure activities and social interaction, several who thought the arrangement would have a positive effect found that it made little or no difference. For

the most part the telecommuters were positive about the effect of work at home on physical habits prior to the pilot but found after the pilot it really made little difference.

Summary of Employee Attitude Scores

Table 4-10 shows the attitude scores of participants and controls before and after the pilot. The F-score shows the result of the regressed change calculation (described in Chapter 3). If the F-score is significant, the difference in scores between participants and controls after the pilot, with scores before the pilot removed, is significant. The possibility that this difference is attributable to the difference in work situation (i.e., telecommuting) cannot be ruled out.

Results should be treated with great caution since the sample sizes are so small. In a later section of this chapter, the results are analyzed for the combined sample of all pilots, giving an acceptable sample size for moderate effects.

TABLE 4-10
RESULTS OF ATTITUDE SCORES -- WORK AT HOME VS CONTROLS
COMPANY C -- PILOT III

		WAH N = 8	CONTROLS N = 7	F	Sig F
JOB SATISFACTION					
WORK	BEFORE	36.75	41.00	0.201	.66
	AFTER	35.50	39.14		
SUPERVISION	BEFORE	47.63	42.43	0.597	.46
	AFTER	42.50	44.71		
PEOPLE	BEFORE	38.88	39.71	0.022	.89
	AFTER	38.00	36.00		
PAY	BEFORE	19.00	16.29	4.822	.05*
	AFTER	16.25	20.43		
PROMOTION	BEFORE	17.36	13.14	1.130	.31
	AFTER	13.25	15.71		
LIFE SATISFACTION	BEFORE	22.38	18.14	0.094	.76
	AFTER	22.00	21.00		
ORG. COMMITMENT	BEFORE	43.57	44.43	0.754	.40
	AFTER	44.43	43.29		
JOB INVOLVEMENT	BEFORE	47.25	50.57	0.244	.63
	AFTER	50.57	45.57		
ROLE CONFLICT	BEFORE	18.25	18.26	0.013	.91
	AFTER	18.88	18.43		
ROLE AMBIGUITY	BEFORE	30.00	26.00	0.914	.36
	AFTER	31.13	26.29		
SOCIAL SUPPORT					
BOSS	BEFORE	13.00	11.00	0.034	.86
	AFTER	12.25	11.57		
COWORKERS	BEFORE	12.50	11.71	0.817	.39
	AFTER	11.75	9.29		
FRIENDS	BEFORE	13.13	12.86	0.034	.86
	AFTER	12.57	12.54		
JOB CHARACTISTICS					
SKILL VARIETY	BEFORE	5.63	5.10	0.060	.81
	AFTER	5.25	4.78		
TASK IDENTITY	BEFORE	5.13	4.71	0.082	.78
	AFTER	5.50	5.39		
TASK SIGN.	BEFORE	4.71	4.90	1.432	.26
	AFTER	5.20	5.00		
AUTONOMY	BEFORE	5.13	5.29	0.223	.65
	AFTER	5.17	4.83		
FEEDBACK	BEFORE	5.13	5.24	0.311	.59
	AFTER	4.96	5.33		
MPS	BEFORE	139.40	132.71	0.016	.90
	AFTER	141.67	132.28		

The only attitude measure showing a significant difference was satisfaction with pay. After the pilot, the telecommuters were significantly less satisfied with pay than the control group.

Summary of Activity and Communication Logs

Employees in Company C completed activity and communication logs for three periods of 10 to 20 days each during the pilot. For the telecommuters, this represented days both at home and in the office.

The activity logs illuminated reasons for employees to be satisfied or dissatisfied with their accomplishments on a given day and differences based on work location. Table 4-11 summarizes these results.

TABLE 4-11
SUMMARY OF ACTIVITY LOGS
COMPANY C -- PILOT III

A. DAYS IN WHICH EMPLOYEE WAS SATISFIED WITH WORK ACCOMPLISHMENT (N=NO. OF DAYS)

	WAH-HOME N = 149	WAH-OFFICE N = 78	CONTROLS N = 242
SATISFIED	107 (71.8%)	48 (61.5%)	164 (67.8%)
NEUTRAL	19 (12.8%)	18 (23.1%)	49 (20.2%)
DISSATISFIED	23 (15.4%)	12 (15.4%)	29 (12.0%)

B. REASONS GIVEN FOR EMPLOYEE SATISFACTION WITH WORK ACCOMPLISHMENT (% OF DAYS REASON GIVEN; N=NO. OF DAYS)

REASON	WAH-HOME N = 107	WAH-OFFICE N = 48	CONTROLS N = 164
Good concentration	1.9%	2.1%	3.7%
Good planning	22.4	37.5	21.3
No interruptions	43.0	35.4	22.6
Information available when needed	37.4	56.2	42.1
Imminent deadline	20.6	27.1	23.8
No unforeseen problems	29.0	45.8	31.7
Coworkers available when needed	37.4	66.7	37.8
Good response time	64.5	27.1	53.0

C. REASONS GIVEN FOR EMPLOYEE DISSATISFACTION WITH WORK ACCOMPLISHMENT (% OF DAYS REASON GIVEN; N=NO. OF DAYS)

REASON	WAH-HOME N = 23	WAH-OFFICE N = 12	CONTROLS N = 29
Software problems	39.1%	25.0%	41.4%
Hardware problems	47.8	8.3	13.8
Task difficulty	26.1	16.7	44.8
Lack of concentration	17.4	16.7	10.3
Poor response time	52.2	0.0	10.3
Coworkers unavailable when needed	17.4	0.0	10.3
Information unavailable when needed	4.3	8.3	13.8
Interruptions	17.4	58.3	34.5
Unplanned tasks required attention	21.7	50.0	65.5
Poor planning	17.4	16.7	6.9
Underestimated needed time	26.1	0.0	20.7

As Table 4-11 shows, telecommuters generally were more satisfied with their accomplishments on days they were at home than days in the office.

Technical issues dominated the sources of satisfaction or dissatisfaction for telecommuters. On days when they were satisfied, they most frequently mentioned response time. Their reasons for dissatisfaction were dominated by hardware and software problems and poor response time; the days they reported dissatisfaction are relatively few in number, however.

Telecommuters had greater frustrations than the control group when they came into the office, with both interruptions from coworkers and unplanned tasks requiring attention. It should be expected that when they came into the office there would be a backlog of unplanned tasks that would prevent them from accomplishing what they had originally planned. It is interesting that these tasks were not or could not be communicated to the employees when they were at home.

On the same days that employees filled out activity logs, they kept track of all their communications throughout the day. The results are shown in Table 4-12.

TABLE 4-12
SUMMARY OF COMMUNICATION LOGS
COMPANY C -- PILOT III

A. MEDIUM USED TO COMMUNICATE

	WAH-HOME N = 380	WAH-OFFICE N = 608	CONTROLS N = 1212
FACE-TO-FACE	11.0%	85.5%	77.9%
TELEPHONE	82.1	13.2	19.3
ELECTRONIC MAIL	6.1	0.8	1.7
OTHER	0.8	0.5	1.1

B. MEDIUM USED BY TELECOMMUTERS BY OTHER PARTY OF COMMUNICATION

	MANAGER N = 68	COWORKERS N = 186	OTHER* N = 116
FACE-TO-FACE	10.3%	12.3%	6.9%
TELEPHONE	85.3	75.3	93.1
ELECTRONIC MAIL	2.9	11.3	0.0
OTHER	1.5	1.1	0.0

* Users, support personnel

B. LENGTH OF COMMUNICATION

	WAH-HOME N = 380	WAH-OFFICE N = 645	CONTROLS N = 1196
< 5 MINUTES	51.8%	33.2%	45.8%
5-10 MINUTES	38.2	31.6	26.9
> 10 MINUTES	10.0	35.2	27.3

It is no surprise that employees used the telephone when they were at home and relied on face-to-face communication in the office. What is surprising is that neither the telecommuters nor the control group reported any use of electronic mail for communication. Communications of telecommuters at home tended to be shorter than either their communications in the office or those of the control group.

Discussion of Results -- Pilot III

In general, the only attitude showing a significant change was in employee job satisfaction for telecommuters; that decreased and this effect should be noted with caution. In particular, decrease in satisfaction with pay was significant. If pay was not actually decreased, the source of this dissatisfaction should be investigated further.

In the questionnaires, there was no pattern of equipment problems. However, in open-ended comments, employees did refer to equipment (response time) and telephone problems as sources of frustration and lack of productivity.

Overall, the results indicate that participants in Pilot III worked productively at home and were managed effectively at home. Their decrease in satisfaction with their compensation should be noted.

Follow-up on Pilot III

The pilot was declared complete in March 1987, and all telecommuters returned to work on-site full time. As of this writing, a decision on whether to create a full-time telecommuting program, and if so, in what form, is still pending.

SUMMARY OF COMBINED RESULTS

The data on employee attitudes was combined to give an overall sample of 32 cases, 17 telecommuters and 15 controls. The results for the attitude measures are shown in Table 4-13. The F-score shows the result of the regressed change calculation (described in Chapter 3). If the F-score is significant, the difference in scores between participants and controls after the pilot, with scores before the pilot removed, is significant. The possibility that this difference is attributable to the difference in work situation (i.e., telecommuting) cannot be ruled out.

TABLE 4-13
RESULTS OF ATTITUDE SCORES -- WORK AT HOME VERSUS CONTROLS
COMBINED SAMPLE

		WAH	CONTROLS	F	Sig of F
JOB SATISFACTION					
WORK	BEFORE	36.12	37.13	0.025	.87
	AFTER	38.65	38.07		
SUPERVISION	BEFORE	43.94	41.06	2.727	.11*
	AFTER	44.12	46.53		
PEOPLE	BEFORE	38.18	40.19	0.129	.72
	AFTER	39.42	40.47		
PAY	BEFORE	16.06	16.38	2.822	.10*
	AFTER	15.82	18.47		
PROMOTION	BEFORE	16.59	15.50	0.704	.41
	AFTER	15.94	17.40		
LIFE SATISFACTION	BEFORE	20.19	19.20	1.001	.33
	AFTER	19.56	21.40		
ORG. COMMITMENT	BEFORE	48.00	49.12	0.927	.34
	AFTER	45.18	49.38		
JOB INVOLVEMENT	BEFORE	49.94	44.31	0.010	.92
	AFTER	46.12	38.47		
ROLE CONFLICT	BEFORE	17.31	16.63	0.077	.78
	AFTER	16.71	16.80		
ROLE AMBIGUITY	BEFORE	29.63	29.00	0.000	.99
	AFTER	27.35	28.07		
SOCIAL SUPPORT					
BOSS	BEFORE	12.94	11.75	0.111	.74
	AFTER	13.06	11.93		
COWORKERS	BEFORE	11.65	11.81	0.284	.60
	AFTER	11.47	10.93		
FRIENDS	BEFORE	13.82	13.25	0.132	.72
	AFTER	13.38	12.53		
JOB CHARACTISTICS					
SKILL VARIETY	BEFORE	5.63	5.40	0.122	.73
	AFTER	5.65	5.44		
TASK IDENTITY	BEFORE	5.67	5.17	0.081	.78
	AFTER	5.69	5.49		
TASK SIGN.	BEFORE	5.00	4.75	0.281	.60
	AFTER	5.12	4.80		
AUTONOMY	BEFORE	5.59	5.50	1.627	.21
	AFTER	5.57	5.04		
FEEDBACK	BEFORE	5.18	5.58	1.321	.26
	AFTER	5.24	5.33		
MPS	BEFORE	161.18	159.73	1.205	.28
	AFTER	163.58	146.54		

It is clear from Table 4-13 that with the combined data, very few attitude scores showed significant differences between telecommuters and the control group. Satisfaction with supervision and with pay showed the greatest differences; in both cases, the largest change is an increase in satisfaction in the control group. Thus is is unlikely the difference can be attributed to the telecommuting arrangement.

The results are discussed in more detail in Chapter 6, where they are compared to the results of the attitude survey.

SUMMARY OF THE PILOT STUDIES

In this chapter, longitudinal evaluations of experimental telecommuting programs in three major corporations were discussed in detail. The evaluations show modest changes in employee performance and attitudes toward their jobs. In all three pilots, management concluded that the experiment was a success on the modest criteria that telecommuting is feasible and does not degrade employee performance. In all three cases, however, management was only mildly enthusiastic. In none of the cases did management see telecommuting as a significant benefit to the employee or the organization. In all cases supervisors' general feeling was that they would prefer to have the employee on site if they had the choice.

Those employees who adjusted to the telecommuting arrangement and settled into a work pattern were positive about it. There were few signs of expected concerns -- social isolation, distractions in the home, etc. Their attitudes toward their jobs for the most part did not change, although there were indications of dissatisfaction with pay and supervision.

The results of the pilots are compared to the results of the attitude survey in Chapter 6. Conclusions are drawn in Chapter 7.

CHAPTER 5

DEMOGRAPHIC SURVEYS

INTRODUCTION

In this chapter, the results of two magazine surveys on telecommuting are discussed. There were two objectives of the surveys:

1. To identify a sample of people who telecommute for the in-depth attitude survey;

2. To document the extent of the trend to telecommuting in a population which is presumably doing so today.

Because of these objectives, a random sample of U.S. households or of U.S. office workers was not feasible. It was decided instead to target two trade magazines whose readership best fits those who appear most likely to be telecommuters under the best of circumstances (i.e., the "privileged" category discussed in Chapter 1).

PROCEDURES

The editor of each of the two magazines was contacted directly and requested to provide a mailing list of 5000 readers. In return, the magazine received a complete tabulation and report of the results for its readers.

The questionnaire was adapted from a survey prepared for printing in a popular women's magazine (1). The primary changes involved adjusting the categories (e.g., salary, job description) to fit the demographics of the magazines to be used. In total, 10,000 questionnaires were sent.

The questionnaire was written in such a way that readers could respond even if they did not work at home. There were two reasons for seeking these responses: to compare responses between telecommuters and non-telecommuters from the same population, and to provide a sample of non-telecommuters for comparison purposes in the follow-up mail survey.

DESCRIPTION OF MAGAZINES

Datamation is a trade magazine for data processing professionals with a circulation of approximately 300,000. A large portion of its subscriptions are free. It caters primarily to the environment of traditional organizational data processing, i.e.,

mainframe computing. Personal Computing is directed to an audience of users of personal computers, with a bias toward the user of IBM and IBM-compatible personal computers. However, it is not a hobbyist's magazine. Rather it caters to the (general) professional who seeks to use a personal computer in his or her business. The circulation is about 250,000, primarily through paid subscription. Over half of the readers of Personal Computing are self-employed.

Thus, the readers of these two magazines represent two groups which have been the focus of articles on telecommuting: data processing professionals and general, often self-employed professionals who use personal computers in their work.

The results have been published in both magazines [Olson,1985; Antonoff,1985].

RESULTS

This section contains the results of the demographic surveys. With the exception of occupation, the responses from the two magazines were combined and the results are reported for the combined sample. First, the responses and occupations for each magazine are reported.

Datamation

From a mailing of 5000, 958 surveys were returned. Of these, 434 (45 percent) of the respondents claimed to do at least some of their work at home. Table 5-1 shows the breakdown of occupation of the 434 who work at home.

TABLE 5-1
OCCUPATION OF DATAMATION READERS WHO WORK AT HOME

OCCUPATION	FREQ	PCT
* Other	122	28.0
Director of DP	51	11.8
Manager/supervisor	61	14.1
Programmer/analyst	47	10.9
Vice President	43	9.9
Systems analyst	26	6.0
Programmer	24	5.5
Service coordinator/ user liaison	14	3.2
Professor/teacher/ researcher	14	3.2
President/officer	14	3.2
Consultant	7	1.6
Engineer	5	1.2
Auditor/planner	5	1.2
Computer operator	1	0.2

* Includes those reporting "other" and not reporting occupation

Personal Computing

From a mailing of 5000, 657 surveys were returned. Of these, 373 (57 percent) of the respondents reported doing some work in their homes. Table 5-2 shows the breakdown of occupation of the 373 who work at home.

TABLE 5-2
OCCUPATION OF PERSONAL COMPUTING READERS WHO WORK AT HOME

OCCUPATION	FREQ	PCT
* Other	73	19.6
Professor/Researcher	29	7.8
Programmer/Analyst	29	7.8
Consultant (general)	24	6.5
Teacher	21	5.6
Accountant	20	5.4
Administrator/Supervisor	19	5.1
Data processing Consultant	16	4.3
Engineer	14	3.8
Secretarial/Clerical	14	3.8
General Sales	13	3.5
General Manager	11	2.9
Project Manager	11	2.9
Financial/Investments	10	2.7
Real Estate Sales	10	2.7
President	9	2.4
Data Processing Sales	9	2.4
Attorney	8	2.1
Distribution/Transport	6	1.6
Maintenance/Technician	6	1.6
Craft	6	1.6
Physician/Nurse/Pharmacist	5	1.3
Student	5	1.3
Clergy	5	1.3

* Includes those reporting "other" and not reporting occupation

Results -- Combined Sample

In the combined sample, Table 5-3 shows the number who reported working at home. The remaining tables report only on that portion of the sample.

TABLE 5-3
DO YOU WORK AT HOME?

	FREQ	PCT
Yes	807	50.0
No	808	50.0

TABLE 5-4
WHEN YOU ARE WORKING AT HOME,
WHAT IS YOUR EMPLOYMENT STATUS?

	FREQ	PCT
Employed by a company or another person	342	42.4
Self-employed	351	43.5
Other	114	14.1

TABLE 5-5
HOW ARE YOU PAID FOR THE WORK
THAT YOU DO AT HOME?

	FREQ	PCT
Salary	310	38.4
Commission, contract, etc.	134	16.6
Profits	110	13.6
Hourly or daily	105	13.1
Piece-rate	38	4.7
Other	110	13.6

TABLE 5-6
HOW MUCH OF YOUR INCOME IS PROVIDED
BY YOUR WORK AT HOME?

	FREQ	PCT
Less than 25%	525	65.1
25 - 49%	77	9.5
50 - 74%	37	4.6
75 - 99%	21	2.6
100%	63	7.8
Other/no response	84	10.4

TABLE 5-7
ARE YOU COVERED BY HEALTH INSURANCE?

	FREQ	PCT
From employee's program	506	62.7
From individual, self-paid policy or own business	110	13.6
From spouse's policy	63	7.8
No health insurance	49	6.1
Other/no response	79	9.8

TABLE 5-8
HOURS WORKED

How many hours do you work in an average week? 50.6 hours avg.

How many of those hours do you work at home? 14.7 hours avg.

TABLE 5-9
ARE THE HOURS THAT YOU WORK AT HOME:

	FREQ	PCT
In addition to regular work hours	469	58.1
An occasional substitute for work at another location	97	12.0
A regular substitute for work at another location	95	11.8
All the paid work you do	87	10.8
Other/no response	59	7.3

TABLE 5-10
WHERE IN YOUR HOME DO YOU WORK?

	FREQ	PCT
Office in my home	443	54.9
Dining/living/family room	158	19.6
Bedroom	56	6.9
Kitchen	29	3.6
Basement	24	3.0
Other/no response	97	12.0

TABLE 5-11
WHAT WOULD BE YOUR IDEAL WORK ARRANGEMENT?

	FREQ	PCT
To work part-time in my home, part-time outside	535	66.3
To work only in my home	126	15.6
To work entirely outside of my home	53	6.6
Other	93	11.5

TABLE 5-12
OVERALL, HOW SATISFIED ARE YOU WORKING AT HOME?

	FREQ	PCT
Very satisfied	407	50.4
Somewhat satisfied	282	35.0
Somewhat dissatisfied	43	5.3
Very dissatisfied	4	0.5
No response	71	8.8

TABLE 5-13
WHY DID YOU FIRST DECIDE TO WORK AT HOME?
(Respondents gave multiple answers.)

	FREQ	PCT
To increase my productivity	414	51.3
To work in my own way, at my own pace	390	48.3
To earn extra money	266	33.0
To save time commuting	160	19.8
Tax benefits	129	16.0
Low overhead	124	15.4
Other	124	15.4
To ease conflicts between work and family	110	13.6
To take care of family	63	7.8
To avoid office politics	61	7.6

TABLE 5-14
WHAT ARE THE ADVANTAGES OF WORKING AT HOME?
(Respondents gave multiple answers.)

ADVANTAGE	FREQ	PCT
More productivity	499	61.8
More time with my family	290	35.9
More time to myself	263	32.6
More money	223	27.6
Increased career opportunities	185	22.9
Less personal conflict	116	14.4
No advantages	18	2.2

TABLE 5-15
WHAT ARE THE DISADVANTAGES OF WORKING AT HOME?
(Respondents gave multiple answers.)

DISADVANTAGE	FREQ	PCT
Lack of interaction with co-workers	269	33.3
Work too much	258	32.0
Less time to myself	134	16.6
Less time with my family	82	10.2
Spouse resents it	69	8.6
Increased stress	63	7.8
No disadvantages	151	18.7

TABLE 5-16
WHAT TYPE OF COMPUTER EQUIPMENT DO YOU HAVE AT HOME FOR WORK-RELATED USE?
(Respondents gave multiple answers.)

	FREQ	PCT
Personal computer	588	72.9
Modem	309	38.3
Word Processor	151	18.7
Terminal	150	18.6
Other	54	6.7

TABLE 5-17
WHO OWNS THE EQUIPMENT?

	FREQ	PCT
My family or I do	493	61.1
Employer or client	119	14.7
Other	195	24.2

TABLE 5-18
WHAT DO YOU USE THE EQUIPMENT FOR?
(Respondents gave multiple answers.)

	FREQ	PCT
Word processing	520	64.4
Business correspondence	352	43.6
Bus. Planning and forecasting	293	36.3
Data entry	252	31.2
Communicaton (electronic mail)	200	24.8
Programming, other	201	24.9

TABLE 5-19
DEMOGRAPHICS

SEX	FREQ	PCT
Male	678	84.0
Female	127	15.7
No response	2	0.3

MARITAL STATUS	FREQ	PCT
Married. or living with partner	666	82.5
Divorced, or widowed, or single	141	17.5

HOUSEHOLD INCOME	FREQ	PCT
Under $30,000	98	12.1
$30,000 - 59,999	438	54.3
$60,000 and over	250	31.0
No response	21	2.6

AVERAGE AGE: 42.5 years

AVERAGE NUMBER OF CHILDREN: 2.1

DISCUSSION

One immediate question that arises is whether there are differences in the two samples. For the most part, the differences are not significant and therefore combining the samples is justified. A few issues are worthy of note. The sample from Personal Computing was expected to have more self-employed than the sample from Datamation. Indeed, 53.6 percent of the first sample are self-employed compared to 34.8 percent of the latter.

In terms of equipment, since the readers of Personal Computing are by definition users or potential users of personal computers, this would seem to explain why the personal computer is the overwhelming equipment of choice for telecommuters. This is in fact more indicative of trends in technology, as more and more programming workstations for data processing professionals become personal-computer-based. In fact, 69.8 percent of the Datamation readers, as well as 76.4 percent of the Personal Computing readers, used personal computers for work at home. It is notable that most of the equipment is owned by the respondent rather than an employer.

Is work at home a significant departure form the daily commute to a nine-to-five workplace? The data shows that the respondents, like others in similar professions, work long hours. Although the average number of hours worked at home is equivalent to

nearly two work days, most them appear to be worked in addition to regular work hours. It appears that the one significant change in work habits is that now an employee can perform (unpaid) overtime work in the convenience of one's home and surrounded by one's family, instead of having to stay long hours at the office in order to have access to the equipment.

Although more of the self-employed work strictly in their homes, it is still only 23 percent, while 63 percent of the self-employed work at home only in addition to regular work hours. Only 14 percent work at home as a substitute for going to another workplace, the true "telecommuting" arrangement. On the other hand, of those who consider themselves "employees", 32 percent claim to telecommute, in the sense of substitution, at least occasionally. The rest work at home strictly in addition to regular work hours.

Why did they decide to work at home? Clearly this group is motivated to increase their productivity. Whether they find the office too distracting or are worried about not getting enough work done or are constantly under deadlines, they choose to extend their work day into their home life in order to get more work accomplished. It is fairly clear that for the most part they are not compensated directly by employers (i.e., as overtime) for the work they do at home. They are also not motivated by family considerations, although many seem to feel that it is a better choice to be near one's family while working

than working longer hours at the office (2). They may feel in this way they can share regular meals with their families and be physically present in the evening hours, even though they might be off in a separate office toiling over their terminals while the rest of the family watches television.

How do they like working at home? Clearly many feel that they accomplish their goal of increasing productivity. Of course this result must be considered with caution, since strictly speaking productivity is output per unit of input (hours worked) and they may be simply extending their hours rather than increasing their output per hour. On average, they work over fifty hours per week regardless of location.

The most frequently cited disadvantage is lack of interaction with coworkers. This is particularly interesting for the Datamation readers, of whom 36 percent considered it a disadvantage. The stereotype of programmers as solitary types, preferring their terminals to people and thus ideally suited to working in the solitude of the home, is not supported by this sample. In fact, it is generally conceded today that programmers are very social types, with a primary topic of converation being how to use their computers. Thus an important part of learning and professional development of computer professionals is constant interaction with peers, which they miss when they work at home.

Secondly, this group of people tends to work too much, and at least some recognize that the convenience of the equipment in the home brings the disadvantage that they tend to use it, sometimes causing family conflict. The terminal or computer is close and inviting, and it is tempting, particularly with electronic mail, to just sign on and "check my mail" or "see who else is on the system". The productivity benefits cited above have this downside in that the presence of the machine compels them to work.

Overall, however, those who work at home and responded to this survey seem to feel that the advantages outweigh the disadvantages. Over 85 percent reported being at least somewhat satisfied with the opportunity to work at home. They do not want to work at home full time, as is apparent from Table 5.11. The overwhelming majority favor the flexibility to be able to work at home part of the time but still have a regular workplace outside of the home.

This is a homogeneous group. Most are male and married (no data was collected about spouse's occupation); eighty-five percent earn at least 30,000 per year (although the question was stated in terms of household income which also includes spouse's income); thirty-one percent earn over $60,000.

CONCLUSIONS FROM THE DEMOGRAPHIC SURVEYS

Does the data indicate that a dramatic shift in work location, from central offices to "electronic cottages", has taken place? The answer is clearly no. Instead, information technology has made it easier to increase the total number of hours worked by allowing work at home to substitute for what might have been longer hours in the office.

Clearly, the respondents to this survey fall for the most part into the "Privilege" category described in Chapter 1. The jobs they do at home are those that have always enjoyed a significant degree of autonomy and have been performed at least partly in the home without technological support. Those who work at home, even in addition to regular work hours rather than as a substitute, choose to do so because of the autonomy to work at one's own pace and to thus benefit from increase productivity. The large majority have a spouse who lives with them, and although we did not ask if the spouse works outside of the home, it is clear that very few of the respondents work at home even in part in order to help with child care.

For those who work at home in this sample, the advantages far outweigh the disadvantages. Since most do not work exclusively in the home, the disadvantage of lack of interaction with coworkers is probably not critical. However, having access to

equipment and work-related materials in the home may encourage them to work too much. Indeed, they work long hours and otherwise show signs of being "workaholics".

The next chapter describes the results of an attitude survey on a subset of this sample, in order to increase understanding of underlying attitudes that may help to explain these results.

FOOTNOTES

1. The questionnaire was developed by Kathleen Christensen with assistance by the author and published in Family Circle magazine.

2. The author is currently working with Professor Christensen to compare this sample with the sample from Family Circle, whose readership is primarily women earning second incomes. The differences between the two samples are expected to be dramatic.

CHAPTER 6

RESULTS FROM ATTITUDE SURVEYS

In this chapter, the results of the final stage of data collection are discussed. This stage was an attitude survey of individuals who work at home full time on a regular basis, compared to those who work at home only outside of regular work hours and those who do not work at home but would like to.

DATA COLLECTION PROCEDURES

The sample for this survey was drawn from the respondents to the demographic survey described in Chapter 5. A random sample of respondents who answered NO to the question "Do you work at home?" (see Table 5-3) were selected as a control group. From the responses shown in Table 5-9, respondents who answered that work at home was "All the paid work that you do" and a separate sample of those answering and of the other three categories were also selected. The response rates and sample demographics are summarized in Table 6-1.

TABLE 6-1
ATTITUDE SURVEY SAMPLE DEMOGRAPHICS

GROUP A: WORK ONLY IN THE HOME N = 44
GROUP B: WORK IN THE HOME IN ADDITION TO REGULAR WORK HOURS OR ON OCCASION N = 66
GROUP C: DO NOT WORK IN THE HOME N = 62

	GROUP A	GROUP B	GROUP C
ARE THE HOURS THAT YOU WORK AT HOME:			NA
In addition to regular work hours		56.1%	
An occasional substitute		16.7	
A regular substitute		13.6	
All the paid work you do	100.0%		
Other		13.6	
EMPLOYMENT STATUS			NA
Employed by a company	11.4%	36.4%	
Self-employed	84.1	47.0	
Other	4.5	16.6	
AVERAGE HOURS WORKED PER WEEK	36.8	51.7	NA
AVERAGE HOURS WORKED AT HOME PER WK	28.0	13.4	NA
SEX			
Male	65.9%	80.3%	85.5%
Female	34.1	18.2	14.5
AVERAGE AGE	44.4	41.5	39.9
MARITAL STATUS			
Married, living with spouse	75.0%	66.7%	75.8%
Divorces, single, widowed	16.0	24.3	19.3
Other	9.0	9.0	4.9
NUMBER OF CHILDREN			
0	27.3%	42.4%	35.5%
1-2	45.4	37.9	37.1
3 or more	27.3	19.7	27.4
HOUSEHOLD INCOME			
< $30,000	36.3%	16.7%	27.4%
$30,000 - 60,000	36.4	42.4	43.6
> $60,000	22.7	36.4	25.8
missing		4.5	3.2

It is clear from Table 6-1 that there are two types of telecommuters represented. Group A, full-time telecommuters, work only in, or primarily out of, their homes; they are primarily self-employed. They work an average number of hours per week, three-quarters of them in the home. Their average incomes are not outstanding; more than a third make less than $30,000 per year. In many respects, they look more like the "autonomy" stereotype described in Chapter 1 than the "privilege" stereotype.

Group B is the "after-hours" telecommuters of Chapter 5. Primarily male, they work long hours and much of their work at home is apparently overtime. They appear to have a higher income than full-time telecommuters, on average. They are slightly younger, less inclined to be married, have fewer children.

Most of the demographic data was not collected about Group C; they all responded on the survey that they do not presently work at home but would like to.

RESULTS

For each attitude measure in the survey, analysis of variance was performed in order to determine if there was a significant difference between groups. The results are summarized in Table 6-2.

TABLE 6-2
SUMMARY OF ATTITUDE SURVEY RESULTS

	MEANS A	MEANS B	MEANS C	F	sig F
JOB SATISFACTION					
WORK	39.4	39.5	35.7	2.884	.06
SUPERVISION	19.3	36.4	37.9	17.765	.00*
PEOPLE	31.7	40.9	38.8	6.574	.00*
PAY	12.7	16.2	15.7	3.540	.03*
PROMOTION	7.9	12.2	8.6	3.718	.03*
LIFE SATISFACTION	19.4	21.4	20.7	0.715	.49
ORGANIZATIONAL COMMITMENT	39.7	50.4	52.9	5.622	.00*
JOB INVOLVEMENT	52.9	51.0	49.4	0.800	.45
ROLE CONFLICT	13.4	16.2	16.0	2.781	.06
ROLE AMBIGUITY	34.2	34.8	37.8	2.258	.11
SOCIAL SUPPORT					
BOSS	4.7	10.3	11.0	24.573	.00*
COWORKERS	6.7	11.0	10.9	19.471	.00*
FRIENDS	13.0	13.7	13.1	1.063	.35
JOB DIAGNOSTIC SURVEY					
SKILL VARIETY	5.8	6.2	6.0	1.665	.19
TASK IDENTITY	5.7	5.3	5.4	1.450	.24
TASK SIGNIFICANCE	5.8	5.7	5.9	0.931	.40
AUTONOMY	6.3	6.1	5.5	7.547	.00*
FEEDBACK	5.7	5.4	5.2	1.557	.21
MOTIVATING POTENTIAL SCORE	218.8	192.6	178.9	3.321	.04*
MANIFEST NEEDS					
ACHIEVEMENT	26.3	27.6	27.6	2.053	.13
AFFILIATION	18.7	20.2	20.2	4.065	.02*
AUTONOMY	21.9	19.5	18.4	9.330	.00*
DOMINANCE	22.4	25.1	25.0	4.707	.01*

DISCUSSION OF RESULTS

In this section, each attitude measure, the underlying construct, and the relationship of the construct to telecommuting are discussed. The results of the pilots (see Table 4-13) are also discussed for each construct and compared to the survey results.

Job Satisfaction

Job satisfaction was measured using the Job Description Index, or JDI [Smith et al, 1969]. This index measures five separate facets of job satisfaction: the work itself, supervision, people, pay, and promotion.

Overall, the full-time telecommuters are relatively dissatisfied with their jobs. On satisfaction with the work itself, the non-telecommuters are less satisfied than the other two groups; A Scheffe test revealed no significant differences between means for any of the pairings of groups. For all four of the other facets of job satisfaction the F-ratio is significant. A Scheffe test further revealed that the full-time telecommuters have a significantly lower mean score (at a .05 significance level) than both "after-hours" telecommuters and non-telecommuters for satisfaction with supervision, coworkers, and pay. For satisfaction with promotion the "after-hours" telecommuters scored highest; a Scheffe test showed no significant differences (at a .05 significance level) between any two means.

In the pilots, telecommuters' satisfaction with supervision was significantly lower than that of the control groups. The difference cannot be attributed to the telecommuting arrangement, however, since it is primarily due to an average increase in satisfaction with supervision on the part of the control group.

Telecommuters in the survey were less satisfied with pay than the other two groups. Similarly, in the pilots telecommuters experienced a decrease in satisfaction with pay relative to the controls. This result is not intuitive. However, it may be that without the environment of the office where many intangible benefits of the job are highly visible (office space, coworkers, hardware access, etc.), employees become more focused on pay as a motivator, and thus more dissatisfied with pay. It may also be that opportunities to increase their job status and compensation are less visible and thus appear less accessible.

Life Satisfaction

Life satisfaction is a person's overall attitude about work and nonwork and the relationship between them. Many components besides work enter into this attitude, and no information was available regarding survey respondents' nonwork situation.

Although full-time telecommuters scored slightly lower on life satisfaction than the other groups, the difference is not significant.

In the pilots, there was also no significant difference in life satisfaction. However, it is interesting to note that in all three cases, the average life satisfaction scores of the telecommuters decreased over time while the average scores for all three control groups increased. The very complex relationship between the work and nonwork domains should be investigated further, particularly as it is strongly affected by moving work closer to the nonwork domain in the home. Based on these results, it should be noted that the view frequently portrayed in popular magazines of an adult contentedly and easily managing both domains simultaneously has no supporting evidence in this study.

Organizational Commitment

Organizational commitment is the extent to which the employee feels a sense of commitment and loyalty to the organization. It has frequently been suggested that if an employee works at home, organizational commitment will decrease, as the employee feels a greater sense of independence from his or her employer. A counter-argument is that organizational commitment will increase

if the employee is given the opportunity to work at home, since it not only is desirable but also demonstrates that managment has trust and confidence in the employee.

The results from the attitude survey show a significant difference in organizational commitment across the three groups. A Scheffe test further showed that the full-time telecommuters had a significantly lower sense of commitment to the organization than either of the other two groups. This result should be interpreted with caution since the person must be an employee for the construct to be meaningful and a large proportion of the full-time telecommuters are self-employed.

In the pilots, there was no significant difference in organizational commitment between telecommuters and controls. However, in Company A the scores for telecommuters were significantly lower after the pilot than before.

Job Involvement

The Job Involvement scale measures the importance of the job to the respondent and the role of work in the respondent's life. It has been suggested that work at home encourages "workaholism", which would be reflected in a higher job involvement score. Alternatively, telecommuters might find nonwork distractions compelling and become less job-involved.

The survey indicates that full-time teleworkers have higher job involvement, but not significantly so, than the other two groups. In the pilots there was no significant difference in job involvement between telecommuters and controls. It is interesting to note, however, that for all three cases, the average score for telecommuters decreased over time; the average score for controls also declined in all three cases.

Role Conflict and Ambiguity

These two constructs are closely related. Role conflict refers to the existence of competing responsibilities or demands on the individual. Role ambiguity refers to the lack of clear definition of roles and responsibilities. Both constructs have been shown to be related to stress. One might expect the teleworker to experience less role conflict and ambiguity than the on-site worker. This is because his or her job is more formally defined by the supervisor and because the employee does not experience the kind of interruptions and immediate requests by which competing demands are usually delivered.

In the survey, full-time telecommuters demonstrate less role conflict than the other two groups. The group with the highest score on role ambiguity is the non-telecommuters. In the pilots there were no significant differences in either score and no consistent pattern of changes across the three pilots.

It should be noted that these measures refer only to work-related role conflict and ambiguity. It is likely that with telecommuting, conflicts between work and nonwork responsibilities, and ambiguity regarding priorities on each, will be major issues. These types of role conflict and ambiguity need further investigation.

Social Support

This instrument measures the dgree to which the respondent relies on three categories of people for work-related social support: supervisor, coworkers, and others (spouse, friends, relatives). It might be expected that telecommuters rely less on support from supervisors and coworkers, since they interact with them less frequently, and more on friends, relatives, spouse. The results on the attitude survey bear this out. The F-ratio is significant for social support from boos and coworkers. A Scheffe test further showed that the full-time telecommuters rely less on

supervisors and coworkers than the other two groups. However, they do not score higher on support from spouses, friends, and relatives.

The results from the pilots show no significant differences in social support between telecommuters and controls and no consistent pattern of changes in social support across the three cases.

Job Diagnostic Survey

The Job Diagnostic Survey, or JDS, measures perceived characteristics of a job on five dimensions: skill variety, task identity, task significance, autonomy, and feedback from the job. A job which is high on all dimensions is said to be "enriched"; an enriched job has the potential to motivate the employee to be more productive. The Motivating Potential Score, or MPS, is an arithmetic combination of all five dimensions; the higher the MPS, the more enriched the job. Jobs may be designed to have high motivating potential; the notion of job design grew out of this theory [Hackman & Oldham, 1975]. The notion behind including the JDS in this study is that some job characteristics might be prevalent in jobs performed at home; if these characteristics can be related to performance, jobs can be redesigned to be best suited to the alternative work

arrangement. In particular, it has been suggested that telecommuters will perceive their jobs to have higher autonomy than on-site workers.

In the survey, the F-ratio for autonomy is significant; a Scheffe test further revealed that both full-time and "after-hours" telecommuters scored significantly higher (at a .05 significance level) on autonomy than non-telecommuters. Reflecting all five characteristics, there were also significant differences in Motivating Potential Scores (MPS). The Scheffe test revealed a significant difference (at a .05 level) only between full-time telecommuters and non-telecommuters. In the pilots there were no differences in perceived job characteristics between telecommuters and controls and no consistent patterns of change across cases.

Manifest Needs

Scales measuring four personality traits in terms of the strength of work-related needs were added for the attitude survey. These are needs for: achievement, affiliation, autonomy, and dominance. These traits are considered individual differences which may be important for the selection process of candidate telecommuters. It is predicted that teleworkers will have a lower need for affiliation, a higher need for autonomy, and a lower need for dominance than on-site workers. Their needs for

achievement might be expected to be higher since this is an antecedent of the self-discipline and self-motivation required to be productive away from the external disciplines of the office environment.

The results of the attitude survey are generally as predicted. The F-ratio is significant for needs for affiliation, autonomy, and dominance. The Scheffe test further demonstrated that the full-time teleworkers had a significantly lower need for affiliation, higher need for autonomy, and lower need for dominance (at a .05 level) than either of the other two groups. There are no significant results in terms of need for achievement.

SUMMARY OF THE ATTITUDE SURVEYS

Attitude surveys of full-time telecommuters compared to non-telecommuters and "after-hours" telecommuters revealed significant differences. Full-time telecommuters are less satisfied with all facets of their jobs that are extraneaous to the work itself than the other two groups. They demonstrate significantly less organizational commitment and somewhat less role conflict than the other two groups. They appear to be fairly self-reliant, scoring low on all sources of work-related social support. They consider their jobs to have high autonomy

and high motivating potential. In terms of individual needs, they have low needs for affiliation and dominance and high needs for autonomy.

Most of the characteristics of the full-time telecommuter identified in the survey would be expected in those who choose to be self-employed. Indeed, 84 percent of the full-time telecommuters responding to the attitude survey were self-employed. In Chapter 7 a profile of the telecommuter is described and the relationship betwen telecommuting and self-employment is discussed.

CHAPTER 7

SUMMARY AND CONCLUSIONS

INTRODUCTION

In this chapter, the results of the three phases of the study are briefly summarized and interpreted. Based on these results, I draw conclusions about the present and future of telework as an organizational phenomenon. Finally, I suggest directions for future research and pose some relevant research questions.

CONCLUSIONS FROM THE ORGANIZATIONAL EXPERIMENTS

A significant amount of effort on the part of both participating organizations and researchers went into the implementation and evaluation of the three corporate pilot telecommuting programs. For the most part, they were implemented with appropriate attention paid to the selection of participants and provision of resources. The results, in terms of increasing our understanding of the phenomenon, are disappointing.

Statistical Results

The pilots followed as closely as possible a quasi-experimental field design as recommended by Campbell and Stanley [1963]. In particular, the control groups and statistical methods used

ensured to some extent controls on external factors. Even so, a number of factors may attribute to attitudes toward the job besides the work-at-home situation.

The only attitudes that showed a significant change in the pilots were certain facets of job satisfaction, in particular satisfaction with pay and satisfaction with supervision. As discussed in Chapter 6, the difference in pay satisfaction may be attributable to enhanced importance attached to pay as a motivator when other intangible signs of job status are less accessible. The difference in satisfaction with supervision is also noteworthy. As will be discussed below, supervisors were also generally unhappy with the arrangements. Supervision of a single remote worker when the others are supervised on-site with traditional methods appears to be a problem for both employee and supervisor.

The telecommuters only worked at home two or three days a week, so the lack of change in other attitudes toward work as a result of the changed work situation may not be surprising. However, it is noteworthy that there was no evidence to support concerns that have frequently been voiced in the popular press. Employees did not decrease their organizational commitment, did not become less involved in their jobs, did not feel a loss of social support from coworkers. It may be that with a part-time telecommuting arrangement these are not important issues.

There was no hard evidence available of changes in performance of telecommuters.

A Profile of the Telecommuters in the Pilots

The group of employees who participated in the organizational pilots are relatively homogeneous. Any conclusions can only be limited to a certain profile of worker. In the first place, they were all data processing professionals. Many pilots originate in data processing departments [Olson, 1983c]; the primary reason appears to be that these departments experience chronic shortages in personnel. The jobs also fit the profile suggested in Chapter 3.

All participants were programmers or systems analysts. This is a job whose status as a "profession" is debatable. Most of the employees had some college but no academic training outside of corporate training programs to learn the skills required for their work. In terms of the stereotypes shown in Figure 1-1, they most closely fit the "privilege" category but not well. Their skills are in some demand but as individuals they do not appear to have a high degree of bargaining power with their employers. In only one case was the employee part of the pilot because of his bargaining power; he had threatened to quit if an alternative to a significant daily commute time was not found for him. In all the other cases, employees were chosen through a

careful screening process where lack of criticality of their work in terms of deadlines and time pressure was considered important. Furthermore, it appeared that employees with high potential for management were ruled out of eligibility. Thus these were relatively low-level employees with relatively little leverage with their management. After careful screening by management, chosen candidates were given a choice as to whether or not to participate; those employees who felt they would not be happy with the arrangement at this point selected themselves out of the pilots.

All three cases were "pilot" programs in the true sense; they were only temporary arrangements and they had a high degree or visibility within the firm. By virtue of their participation employees gained a certain status. There was no assurance that the arrangement would continue after the pilot, and it did in only one of the three cases.

Employees were given job assignments that required minimal interaction with others. They had less access to resources such as manuals and documentation than their coworkers; in some cases the technology they used also put them at a disadvantage. For example, most worked online with 1200-baud communication lines, significantly slower than 9600-baud speed used by their on-site colleagues. They had greater problems if the mainframe computer was "down" because they had fewer alternative assignments not

requiring the computer. Some experienced problems with the telephone connections that could hinder their productivity considerably.

Supervisors consistently expressed concern that managing a remote employee required more planning, more organization, more attention to formal communication. Clearly, many felt uncomfortable with the arrangement and, given the choice, would have preferred to have the employee on-site. In general, the remote employees had differential treatment: they communicated differently with management, reported on work accomplishment differently, and took different job assignments. It is important to emphasize this issue. The rest of the work group remained intact; no procedures were changed to accommodate a remote employee and for the most part only one member of the work group was at home. Thus treatment of that employee was always handled as a "special case" and no general changes in work group process or organization took place.

In two of the three pilots, planning was long-term and very extensive. The pilots were probably over-planned and over-evaluated for such a small number of participants, and this emphasis on the pilot probably tended to highlight management discomfort with the arrangement.

CONCLUSIONS FROM THE SURVEYS

The demographic and attitude surveys described in Chapters 5 and 6 did show some interesting differences between telecommuters and on-site workers. The samples fit more closely the "privilege" category described in Chapter 1.

A Profile of the "Privileged" Telecommuter

The typical full-time telecommuter revealed by the surveys is male, fortyish, and makes an adequate income. He is married and has children, but is not primarily responsible for child care. He does not score high on any facet of job satisfaction except the work itself; he likes what he does but tends to be less satisfied with supervision, coworkers, pay, and promotion than his counterparts who work in offices. His job tends to score high on characteristics that give it a high Motivating Potential Score,particularly on the autonomy dimension. His terms of his work-related needs, he has a relatively low need for affiliation through his work, and a relatively low need for dominance over others. He has a high need for autonomy. He does not suffer particularly from role conflict or ambiguity, and he has low organizational commitment. He does not experience social support from coworkers but appears to have relatively low work-related social support needs.

This profile indeed fits the stereotype of a "privileged" professional whose skills are in demand. Is it because of telecommuting that the person is this way? Probably not, for several reasons. First, eighty-four percent of the full-time telecommuters in the sample are self-employed, and many of the characteristics described above fit the profile of a person who chooses to be "his own boss" rather than work for a corporation. The fact that the person works primarily out of his home may be irrelevant. Furthermore, these characteristics are most likely antecedents of the telecommuter selection process rather than attitudes which were changed as a result of working at home. For example, it is more likely that an individual whose job has a high degree of autonomy will telecommute than that telecommuting itself increases the autonomy component of the job.

Profile of the "After-Hours" Telecommuter

In the demographic survey, the majority of those reporting they worked at home did so in addition to regular work hours. Most of these work a regular forty-hour week in the office and on average an additional ten hours a week at home. Table 6-1 shows that this group works, on average, fifteen hours per week more that the full-time telecommuters, regardless of work location. The sample was specifically chosen to find the most likely

telecommuters. Therefore, it must be concluded that most telecommuting today by computer and general professionals takes place in addition to regular work hours.

Is this a significant phenomenon? If one's concern is the relationship between the employee and the organization and how that would be altered by telecommuting, the answer is no. These people require no special provisions in terms of supervision or performance. The attitude survey demonstrates that their work-related attitudes are generally much closer to those of the on-site workers than of the full-time telecommuters. Therefore, if this is the primary form of telecommuting taking place today it does not require any special organizational attention.

In another way it is important, however. It represents the fact that many people who work with information technology have access to it in their homes and use it for work-related activity. They may be doing additional work for the employer or they may be "moonlighting" for additional compensation. If they are doing the former, the access to information technology allows them to perform work at home they would previously have had to stay in the office to do. They can spend more time with their families, even though they are working. Does the ease of access make it more likely they will work more at home? Although we do not know, it is quite probable. From a management standpoint this represents a fairly straightforward advantage: provide the employee with equipment at home and it will easily pay for itself

in term of increased (unpaid) production. It is quite possible that this form of telecommuting, primarily having access to information technology in the home outside of regular work hours, represents a significant opportunity to exploit professional office workers in terms of expectations of unpaid additional work.

If on the other hand the primary work performed is for additional compensation outside of the person's regular employment, this could represent potential conflict of interest and may be a problem of another sort.

ANSWERS TO RESEARCH QUESTIONS

A number of research questions were posed in Chapter 3. They are restated here with a summary of the findings on each question.

Impact of Telecommuting on Job Performance

How does telecommuting affect individual job performance? Does productivity indeed increase because of fewer distractions or interruptions? There was little evidence from the pilots that individual productivity changed as a result of the arrangement. Where data on hours worked was available, it showed that the number of work hours the employees reported at home was the same on average as the number of hours in the office.(1) At first

this appears surprising and leads to the conclusion that teleworkers do not work longer hours, as some have suggested. However, interviews revealed that when at home one's definition of "working" versus "not working" changes subtly. On-site, an employee is "working" by virtue of the fact that he or she is there; it is based on the hours present rather than the work accomplished, and social breaks, even the most informal or brief, are included in the time. At home, employees put a clock on the number of hours they are actually at the terminal or desk; they may stop after seven and a half hours of clocked time but breaks to do the dishes, read the paper, or pick up the children have been subtracted. Thus they may actually have more production in the same amount of reported work time. While there were no hard output measures of production available, employees frequently mentioned in interviews that they worked harder and were more tired on the days they worked at home. While employees estimated modest productivity gains, they tended to doubt that managers recognized the improved output or quality of their work.

Supervisors did indeed tend to discount changes in output or quality of the telecommuters. They were more concerned that they did not know what the employee was doing much of the time and tended to feel uncomfortable with employee estimates of improved performance. Thus supervisors tended to conservatively estimate that employee performance did not decrease. They did feel that managing the remote employee caused more work for them, and they did not feel this additional time was particularly beneficial

even though it resulted in better planning and time estimates. Supervision of remote employees was generally more formalized than supervison of on-site employees but this was not perceived by supervisors as a benefit.

Impact of Telecommuting on Work Attitudes

As discussed earlier in this chapter, the only work attitudes showing significant differences between telecommuters and controls in the pilots were satisfaction with pay and satisfaction with supervision. No other changes in work attitudes were detected. In the survey, a number of work attitudes were significantly different for the full-time telecommuters than for the other two groups; these are more likely antecedents of a self-selection process for successful telecommuters than a result of the telecommuting arrangement itself.

The Role of Information Technology in Telecommuting

In Chapter 1 it was specifically stated that information technology is expected to be a facilitator of telecommuting but not the driving force. The evidence from this study clearly bears that out. There were three potential roles of information

technology posed in Chapter 3: as a source of work materials, as a vehicle for communication, and as a management tool for monitoring.

In terms of work materials, in all the pilots a primary tool of the employee's work was a terminal or personal computer with connection to the company's mainframe computer. As pointed out earlier, there were reasons besides technology that data processing was commonly the source of telecommuters. It is not clear how many other jobs could be done away from the office or if using a computer is an important factor. However, as more office jobs utilize personal computers, the role of the computer becomes clearer. It does reduce the need for other work materials such as paper and calculators and typewriters; it also reduces interdependence on other people such as typists for support. However, few information systems are complete enough that they replace paper filing systems and other sources of information such as employee manuals or library facilities. Thus many resources which remain on site are still required for most office jobs.

The role of information technology as a means of communication with others was minimal in the pilots in this study. In all cases, employees had access to an electronic mail system. But it is clear from the summary of communication logs that this was used rarely by telecommuting employees. The dominant mode of communication was still face-to-face, done by telecommuters in

batches when they were in the office. When they needed to communicate by telephone, they overwhelmingly favored the telephone over electronic mail.

This is an important observation because it shows that differential use of a mode of communication is not adequate. One employee cannot use electronic mail effectively if all the other members of his or her work group share relevant information primarily face-to-face. Electronic mail is an effective mode of communication only if it is used by a critical mass and in ways that compel continued access to it. In most business organizations today, electronic mail is not used extensively and most communication still takes place face-to-face. In such an environment the telecommuter is always at a distinct disadvantage in terms of communication when removed from the office.

In none of the pilots was information technology used as a vehicle for management monitoring of employee performance. It was also not used in any other way as a tool to help supervisors manage telecommuting employees.

In summary, information technology is in the homes of telecommuters and used for work-related tasks. However, in the ways it is predominantly used today in business organizations, it has not loosened the constraints on work in terms of space and time. Its potential to facilitate working outside of offices and

outside regular work hours is still strong, but organizational culture which supports standard work hours in the office still predominates.

Antecedents of Telecommuting

Three classes of antecedents to telecommuting were posed in Chapter 3: Individual characteristics, job characteristics, and situational characteristics.

The individual characteristics that appear to make a person a likely candidate for telecommuting have been discussed as a profile of a "privileged" telecommuter. In particular, these telecommuters have relatively low needs for affiliation and dominance and high needs for autonomy.

It should be emphasized that these characteristics apply to someone who telecommutes by choice, not because of other (i.e., nonwork) constraints that make it difficult to work outside of the home. The reader is referred to [Christensen, 1985] for a thorough discussion of they types of individuals who might work at home, and how they like it, under circumstances where their work-related choices are constrained.

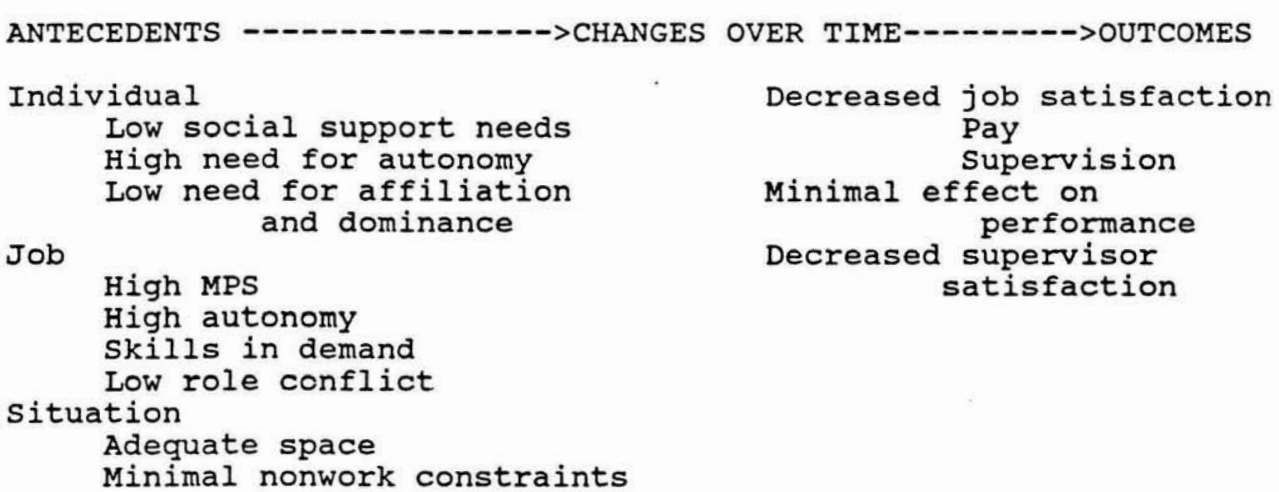
The characteristics of the jobs covered in this study were very homogeneoous. They were all "professional" jobs requiring training primarily provided by the employer. The jobs are fairly "enriched" on the measure of the Motivating Potential Score; in particular they score high on autonomy. The jobs are defined such that work-related role conflict is low. In addition, they tend to meet the criteria proposed in Chapter 3: minimal physical space requirements, individual control over work pace and scheduling, well-defined deliverables and milestones, and periods where intense concentration is required.

In terms of situational characteristics, most of the individuals in the pilots met the two criteria for success of a telecommuting arrangement identified in Chapter 3. Space was not mentioned as a problem; the telecommuters had adequate work space even when it was shared with other activities. None of the telecommuters were caring for small children at the same time they worked during the day. For the most part they were home alone during the days they worked there, which minimized both space problems and distractions. They tended to confine their work to those hours.

SUMMARY -- A MODEL OF THE TELECOMMUTING ARRANGEMENT

Figure 7-1 summarizes the evidence from this study about the telecommuting professional and his or her work arrangement. It emphasizes the differences between antecedents to a telecommuting arrangement and changes over time as a result of the arrangement.

FIGURE 7-1
MODEL OF A PROFESSIONAL TELECOMMUTING ARRANGEMENT



OVERALL CONCLUSIONS ABOUT TELECOMMUTING

The overwhelming conclusion from this study is that in today's business environment, telecommuting as an employee work option is not a significant phenomenon. It is not becoming a common mode of working. This study focused on professional and technical jobs and demonstrated clearly that telework as a substitute for

commuting to an office is not happening in these jobs. The study does point out the reasons for this lack of interest, which are discussed in this section.

Organizational and Individual Constraints

First, telecommuting is not an ideal work situation from any standpoint; it is a tradeoff. For the individual telecommuter, unless he or she fits the profile of a person with high needs for autonomy and low needs for affiliation, something is given up in terms of social support in the office. Furthermore, other evidence shows it is a relatively poor solution to child care [Olson & Primps, 1984; Christensen, 1985]. Telecommuting is also a tradeoff for the organization. Supervisors find it very inconvenient and general organizational culture argues against it. If it is a tradeoff for both the organization and the employee, is there any surprise organizational interest is low?

Second, as discussed above, telecommuting is not driven by technology. Information technology has great potential to increase the time and location independence of most office jobs but today's business organizations have not taken advantage of that potential. Thus use of electronic communication as a substitute for face-to-face interaction is rare; electronic mail is not used extensively in most organizations even when it is available.

There are two possible reasons for this technology lag. Organizations are typically slow to adapt to new innovation, and it may be that they have simply not tapped this potential. It is also possible that the merits of information technology today do not warrant its substitution for face-to-face. In other words, electronic mail with its limited capabilities as a passive medium is not an adequate substitute for face-to-face or voice communication. Thus it may be concluded that information technology today still represents a constraint on the potential for telecommuting.

Today, telecommuting is primarily constrained by existing organizational culture. The old model of organizational membership signified by being on-site, supervised primarily by visual observation, is strong. Furthermore, the signs of organizational membership and status which motivate and encourage organizational members require observation. The number of windows in one's office, the quality of the furniture, and the size of the desk are important signs of status and power; they are invisible if the employee's office is at home and there are no electronic substitutes for them. The world of electronic communication is flat rather than hierarchical, both formally and informally.

However, it appears that something is happening. Information technology is beginning to change the fundamental nature of office work. As information technology becomes more integrated into organizational environments, the opportunities to reorganize the division of labor and responsibilities among office workers expand. Information technology changes the nature of the work in the following ways:

* Portability: As work becomes more dependent on availability of a workstation, and as workstations become smaller and lighter, the work becomes more portable. Furthermore, as local and wide area networks become commonly integrated into systems of workstations, an employee's work materials may be accessible from any workstation.
* Location independence: As the work is more portable, so it becomes less dependent on any particular location, since the work materials and other resources (i.e., other people) are readily accessible through any workstation. Thus a job is not tied to the materials in the immediate surroundings of the employee's desk.
* Time independence: The tasks required to perform a particular job are more integrated with the technology and require less interdependence of multiple employees with different skills. A simple example is writing where word processing software allows the writer to take care of formatting and thus not require the use of a skilled

typist. The writer now has greater time independence of the tasks to be performed. Electronic communications systems also increase the time independence of work since communication can be asynchronous (i.e., non-simultaneous) and still efficient.

* Flexibility: All of the characteristics above contribute to greater flexibility in where, when, and how office work is performed.

Clearly, information technology will not cause jobs to become more portable, more time and location independent, more flexible. However, technology provides the opportunity for office work to be reorganized such that it is more flexible and also more challenging, motivating, enriched.

The telecommuting experiments reported in this study were implemented without regard for the potential of information technology to fundamentally change the nature of the work performed. They were implemented under the traditional model of work and division of labor. The concept of telecommuting under this old model, which I shall call the "Industrial Age View", was too radical and met with considerable resistance. If the capability of information technology to enrich jobs is considered first, and jobs become organized and integrated in ways that are not only enriched but portable, flexible, location and time

independent, what is the potential of telecommuting? This question is the focus of the remainder of this chapter. The following types of phenomena will be considered:

* Remote work groups
* Remote supervision
* Changing physical organizational structures
* Changing hierarchical organizational structures

NEW TRENDS IN INFORMATION TECHNOLOGY AND WORK ORGANIZATION

The phenomena discussed in this section are new and not well documented. They are discussed here primarily as research questions. Indeed, a considerable amount of research on these phenomena, referenced below, is beginning.

Remote Work Groups

Remote work groups actively participate in a project or function which requires coordination and interdependence among work group members. Unlike traditional work groups, however, the members are geographically separated from each other. They may be in different parts of a building or different parts of the country; they do not, however, coordinate their work primarily through face-to-face contact. For remote work groups, information technology has the potential to be a powerful tool for work coordination and information sharing.

In traditional modes of operating, work group members may be geographically separated but the work is designed in such a way as to minimize communication requirements. A typical example is a travelling salesperson who needs minimal coordination with his or her counterparts because responsibilities are defined clearly by region and do not overlap. What coordination is required is handled through the traditional hierarchical structure and the sales manager.

With the capabilities provided by information technology, work groups requiring a considerable amount of coordination and communication may be formed across geographical boundaries. This capability has powerful implications in terms of efficient utilization of scarce employee skills in geographically distributed organizations. For instance, an engineering firm working on a highly specialized project in San Francisco can bring the skills of an engineer in Boston to the project without the expense and disruption of relocation of the employee.

In the domain of information technology, there is a considerable amount of research taking place in development of technological support for work group collaboration. This is evidenced by two recent conferences at which much of this research was reported. The first was the Conference on Technological Support for Cooperative Work in Austin Texas in December 1986. The second was the NYU Symposium on Technological Support for Work Group

Collaboration, held in New York City in May 1987. At both of these conferences, the focus was on moving beyond support for individual productivity to support for work group productivity. Although the issue of remote work groups was not directly addressed, the link is obvious: all the technological tools discussed make the work performed more portable, location and time independent, and flexible, thus making remote work groups feasible.

Some of the current work on technological support for work group collaboration is the following:

* Group Decision Support Sytems [Applegate et al, 1986; King & Kraemer,1986]
* Value-added Communication Systems [De Cindio et al, 1986; Malone et al, 1986; Winograd & Flores, 1986]
* Project and Human Resource Management [Dhar & Olson, 1987]
* Hypertext Systems [Trigg et al, 1986; Garrett et at, 1986]
* Shared data Systems [Greif & Sarin, 1986]
* Multi-user Interfaces [Lantz, 1986; Stefik et al, 1986]
* Meeting enhancement [Begemen et al, 1986; Stefik et al, 1987]]
* Management Support [Cashman & Stroll, 1986]
* Transmiting Organizational Culture [Goodman & Abel, 1986]

From a research standpoint, there are a number of interesting questions regarding the nature of remote work groups, some related to technological support and some not. The research

community has begun to recognize that the nature of collaboration itself is not well understood and deserves investigation [Kraut et al, 1986; Suchman & Trigg, 1986].

Remote Supervision

In a remote work group, where is the supervisor? For at least some members of the group, supervision takes place remotely. It is my feeling that remote supervision, where the supervisor and employee are geographically distant, will become more prevalent as remote work groups and technological support for collaboration become common.

It was clear in the pilots reported in this study that managers felt uncomfortable with remote supervision. They preferred having employees where they could watch them. Managerial competence may be an issue. However, these supervisors had little or no experience with anything but traditional, fairly informal face-to-face interaction with subordinates and were ill-prepared for the challenges of a remote employee.

The results of the pilots are not a good indication of the feasibility of remote supervision. First, they had no measures of performance; programming work typically is difficult to measure or monitor, and having remote employees exacerbates the difficulties of analyzing their performance. Second, there was

no technological support for supervision of any kind. Even though all the remote employees used information technology, they rarely if ever used it to communicate with their supervisors, to send work assignments and deliverables back and forth, or to get help on problems such as program bugs.

Remote supervision is not uncommon today. It is very common where output is clearly measurable and control can rely on output only. Two common examples are travelling salespersons whose monitoring is almost exclusively by results, and "factory-type" clerical data entry work, where piece rates are often instituted to measure and reward based on output. In the latter case, a supervisor may be on site but the span of control is so wide that each individual receives little or no face-to-face supervision.

Can remote supervision be effective in jobs, such as programming, systems analysis, and other professional work, where the output is intangible and performance ratings are relatively subjective? Is remote supervision of administrative jobs, which frequently have little or no tangible output, feasible? My answer is that remote supervision is not only feasible, it will become commonplace as remote work groups become common. Managers will have to learn to cope with remote supervision, and their traditional informal methods of "hands-on" monitoring and control will be brought into question. The methods of supervision themselves will need to change, and information technology will play a central role in the new methods.

There are at least two alternative philosophies under which remote supervision might be implemented:

* External (centralized) control: Under this approach, work will become more formalized and wherever possible, formal measures of output will be developed. Technology can play a major part in measurement, as it does now with centrally-controlled word processing systems that track keystrokes, error rates, etc. by workstation. Furthermore, the technology can be used to enforce machine pacing and/or machine scheduling and delivery of work. For example, a recently implemented claims processing system in a major insurance company delivers claims to a processor's screen for adjudication; the pace is determined by centralized (computer) control, even to the extent of enforcing break times. Finally, information technology can be used for electronic "surveillance" monitoring of the work process itself. The supervisor can periodically "look in" on the actual work being performed on any one workstation without the knowledge of the employee doing the work [Marx & Sherizen, 1986].

* Internal (decentralized) control: The alternative approach to using information technology to support remote supervision is to provide the employees, through information technology, with all the tools they need to pace their own

work, determine and receive feedback on performance levels, etc. The fact that the supervisor is physically remote reinforces the notion that the employee is trusted to take responsibility and perform without the requirement of "hands-on" supervision. Thus, remote supervision reinforces a changing management style that emphasizes trust, loyalty, and employee responsibility. With this approach to supervision, having an employee remote is not a major barrier and may even be an advantage.

Changes in Organizational Structures

With remote work groups and remote supervision, with the increasing portability, location independence, and time independence of office work, will organizational structures change? Basically, increasing flexibility makes organizational forms besides traditional physically-centralized hierarchies feasible.

In terms of physical structures, telecommunications technology already provides the location independence that allows office facilities to be located based on real-estate and energy costs and availability of personnel. "Back office" functions no longer need to be physically close to "front offices" where client interaction occurs. Thus in New York City most back office

functions are now located in suburban locations where costs are lower and more highly skilled personnel readily available [Nelson, 1986; Moss]. The types of "collaborative" work centers, such as neighborhood and satellite work centers discussed in Chapter 2 [Nilles et al, 1976], are also more feasible today as telecommunications facilities are more sophisticated and the costs lower. However, such arrangements are still not prevalent.

Another way that physical structures are affected besides office location is the reduction in necessity for physical movement and relocation of employees. As pointed out above, remote work groups can be formed using employees with specialized skills without incurring the cost of relocation. One organization regularly promotes employees to "home office" functions without relocating them, at significant cost savings to the firm, and thus incurring remote supervision [Olson, 1982].

Authority structures have more dramatic potential for change as a result of the increasing flexibility and portability of office work. I expect we will see a stronger emphasis on project organizations, with project teams brought together for the duration of a project. More complex structures such as matrix forms are now more feasible because the organization does not require a complex relocation of employees. In one organization, every employee is moved on average once every eighteen months, primarily as a result of reorganizations, at tremendous cost to the firm. If remote supervision relying on electronic

communication becomes the norm, complex matrix structures can be maintained with relative ease and reorganizations become much simpler. Hence, the real benefit to a firm is the flexibility of organizational structure; this is a key benefit in an environment where the ability to adapt the organization quickly to changing environments is critical.

Another way organizations may adapt organizational structures, using the capabilities of information technology for support, is to increase the number of functions performed on a contract basis [Williamson, 1976; Malone et al, 1987]. If contracting of professional work becomes more commonplace, the real growth of telecommuting may occur with contractors, providing specialized skills to multiple firms and working out of their homes, communicating task assignments and delivering completed work electronically. A model of this has been implemented by Rank Xerox with former employees now on contract as independent consultants [Judkins, 1987].

FUTURE RESEARCH DIRECTIONS

What should be the next step for research on the interaction between work organization and information technology? I have already mentioned that computer scientists are turning to work group collaboration as an important new area of research. This work is particularly encouraging because it is happening in many

cases in collaboration with social scientists: sociologists, social psychologists, and anthropologists. This new set of endeavors is reminiscent of the beginning of the now well established area of "human factors in computer interaction", when computer scientists and cognitive and experimental psychologists began serious collaboration.

Research Questions

I believe that we need to start on a broader set of research questions, focusing on the much more subtle interactions between information technology and organizational culture. The relationship between the two may have at least the following possibilities:

* Information technology as the driving force (technological determinism)
* Information technology as facilitator of cultural change
* Interaction / circular / lag effects
* Organizational culture as the driving force determining implementation and use of information technology
* Information technology as the embodiment or reflection of organizational / cultural values

Research Methods

To understand the complex relationship between information technology and organizational culture, inferential methods are basically inadequate. More qualititative, longitudinal studies are required, employing case and even ethnographic methods. At New York University we are embarking on a series of studies, described below, which follow case-oriented, longitudinal methods.

Current Research Projects

The following projects are currently in progress with involvement of myself and other NYU faculty and doctoral students:

* A longitudinal study of remote collaboration in a research laboratory of a major vendor of office equipment. The laboratory has a mandate to develop technological support for remote collaboration. It has opened a new office in a different city 400 miles away. The two sites are connected continuously by a video and audio link; they communicate extensively also via their computer systems. The project focuses on the changing organizational culture of the lab and the relationship between the two sites over a two-year period.

* A longitudinal study of a new product strategy group at a major computer vendor. The group is responsible for developing a strategy for new product development based on market demands and is involved in an intensive effort which integrates business strategy with engineering development. It is a newly-formed group with rapid growth in personnel, operating in an environment of complexity and rapid change. Although the personnel are not experts in the use of technological tools, they are being provided with sophisticated technology for dealing with their complex environment. The two-year study focuses on their adoption and use of the tools and the effect of the tools on product strategy and work group culture [Cashman & Stroll, 1986].

* A series of small case studies of implementation of a "work group productivity system" in a major insurance firm.

* A longitudinal study of the use of automated productivity tools for system development in a "big eight" accounting firm, focusing on how the tools are actually used and how they affect work group and client relations.

* A longitudinal study of the implementation of a powerful integrated workstation at a major retail investment firm. The study will include analysis of changes in broker and

branch performance as well as changes in the nature of brokers' work and interdependence among office personnel.

CONCLUSIONS

Is telework, or telecommuting an important phenomenon today, worthy of continued study? Clearly my conclusion is no.

There are many arguments against telework, primarily in terms of its potential to be used to exploit workers. In these arguments, organizations are usually described as poised and ready to implement telework in exploitative ways as soon as certain legal barriers are removed. I hope this paper has demonstrated that, in the U.S. at least, this is simply not the case. Organizations are NOT particularly interested in telework as an employee work option. Furthermore, the technological support for telework has not been fully developed, so that from a technical standpoint telework is still difficult or infeasible for most office jobs.

I believe that as technical developments encourage remote collaboration and remote supervision, telework will take on a different meaning, not focused on work location "in or out" of the organization. Physical organizational boundaries will become less

clearly defined in a general way. The definition of "employment" will also become less clear as part-time and contract work become commonplace. These trends will override telework.

For organizations, there are many ways that information technology can be used to implement more flexible, adaptive organizations that are better able to respond to competitive pressures. Furthermore, at the same time the technology can be implemented in ways which enhance employee productivity, motivation, and job satisfaction. We should turn our attention to these issues and watch telework evolve with them as a natural outgrowth.

According to Robert Howard [1986]:

> In the computerized workplace, workers need <u>more</u> access to information, more training in both computer systems and work organization, more integrated jobs, and more autonomy and discretion over how technology is organized and used. Most of all, the effective computerization of work depends on <u>motivated</u> workers who are willing to adapt to new technology, to perform their jobs responsibly to persist in the face of abstract tasks.

As researchers, we should be turning to the task of reassuring that information technology is designed and implemented in ways to meet this challenge, that increase worker motivation andjob satisfaction as well as organizational effectiveness.

FOOTNOTES

1. One company requested that the average number of hours worked by both telecommuters and controls not be reported to its management.

REFERENCES

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

Antonoff, Michael, Personal Computing, July 1985.

Applegate, L.M., Konsynski, B.R., Nunamaker, J.F., "A Group Decision Support System for Idea Generation and Issue Analysis in Organizational Planning," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Applegath, J., Working Free, Washington DC: World Future Society Press, 1982.

Begemen, M., Cook, P., Ellis, C., Graf, M., Rein, G., and Smith, T., "Project NICK: Meeting Augmentation and Analysis", Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Boris, E., "'Right to Work' as a 'Women's Right': the Debate over the Vermont Knitters, 1980-1985", Series 1, Legal History Progam Working Papers (LHP-#1:5), Institute for Legal Studies, University of Wisconsin - Madison Law School, February 1986.

Buchanan, B. "Building Organizational Commitment: the Socialization of Managers in Work Organizations," Administrative Science Quarterly, Volume 19, 1974, pp. 533-546.

Business Week, "If Home is where the Worker Is," May 3, 1982, p. 66.

Campbell, D.J. and Stanley, J.C., Experimental and Quasi-Experimental Designs for Research, Chicago: Rand-McNally, 1963.

Caplan, R.D., Cobb, S., French, J.R.P., Harrison, R.D., and Pinneau, S.R., Job Demands and Worker Health: Main Effects and Occupational Differences, Washington, D.C.: U.S. Government Printing Office, 1975.

Cashman, P. and Stroll, D., "Achieving Sustainable Complexity Through Information Technology: Theory and Practice," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Christensen, K., "Impacts of Computer-Mediated Home-Based Work on Women and Their Families", Graduate Center, City University of New York, June 1985.

Cooper, C.L. and Marshall, J., "Sources of Managerial and White Collar Stress," in Cooper, C.L. and Payne, R., (Eds.) Stress at Work, Chichester: John Wiley & Sons, 1978, pp. 81-106.

Costello, C., "The Office Homework Program at the Wisconsin Physicians Service Insurance Company", Hearing Record, Pros and Cons of Home-Based Clerical Work, House of Representatives, Employment and Housing Subcommittee of Committee on Government Operations, February 26, 1986 (Doc. #58-9460).

Dahmann, D., Geographical Mobility: March 1983 to March 1984, U.S. Department of Commerce, Bureau of the Census, Series P-20, No. 407, September 1986.

De Cindio, F., De Michelis, G., Simone, C., Vassallo, R., and Zanaboni, A., "CHAOS as a Coordination Technology," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Dhar, V., and Olson, M.H., "Assumptions Underlying Systems that Support Work Group Collaboration," Proceedings, New York University Symposium on Technological Support for Work Group Collaboration, New York, May, 1987.

Diebold Automated Office Program, Office Work in the Home: Scenarios and Prospects for the 1980's, New York: The Diebold Group, Inc., August, 1981.

Edwards, P.,and Edwards, S., Working From Home: Everything You Need to Know about Living and Working under the Same Roof, Los Angeles: J.P. Tarcher, 1985.

Electronic Services Unlimited, Telework: A Multi-Client Study, New York, 1984.

Engstrom, M., Paavonen, H., and Sahlberg, B., Neighborhood 90: Tomorrow's Work in Today's Society, Swedish Council for Building Research, Stockholm, Sweden, 1986.

Froeschle, H.P., The Establishment of Decentralized Places of Work through the Utilization of Teletex, Fraunhofer Institute for Technical Engineering, Stuttgart, Germany, May 1985.

Garrett, L.N., Smith, K., and Meyrowitz, N., "Intermedia: Issues, Strategies, and Tactics in the Design of a Hypermedia Document System," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

General Mills American Family Report, Families at Work: Strengths and Strains, 1980-81.

Goodman, G., and Abel, M., "Collaboration Research in SCL," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Gregory, J. and Nussbaum, K., "Race Against Time: Automation in the Office", Office: Technology and People, Vol. 1 (2 & 3), 1982.

Greif, I., and Sarin, S., "Data Sharing in Group Work," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Hackman, J.R. and Oldham, G.R. "Development of the Job Diagnostic Survey," Journal of Applied Psychology, Volume 60, 1975, pp. 159-170.

Hall, D. T. Careers in Organizations, Glenview, Illinois: Scott, Foresman and Co., 1976.

Harkness, R.C., Technology Assessment of Telecommunications / Transportation Interactions, Menlo Park, CA: SRI International, May, 1977.

Hedberg, B. and Mehlmann, M., "Computer Power to the People: Computer Power to the People: Computer Resource Centers or Home Terminals? Two Scenarios", Working Paper No. 1981:4, Swedish Center for Working Life, Stockholm, Sweden, 1981.

Hermans, H.F.M. "A Questionnaire Measure of Achievement Motivation", Journal of Applied Psychology, 1970, Vol. 54, pp. 353-363.

Hewes, J.J., Worksteads: Living and Working in the Same Place, New York: Doubleday, 1981.

Horowitz, J., "Working at Home and Being at Home: The Interaction of Microcomputers and the Social Life of Households", PhD dissertation, Dept. of Environmental Psychology, Graduate Center, City University of New York, 1986.

Horvath, F.W., "Work at Home: New Findings from the Current Population Survey," Monthly Labor Review, November 1986., pp. 31-35.

Howard, R., Brave New Workplace, 1986.

Hughson, T. L. and Goodman, P. S., "Telecommuting: Corporate Practices and Benefits", National Productivity Review, Autumn, 1986.

Johnson, L. C., The Seam Allowance: Industrial Homework in Canada, Toronto: The Women's Press, 1982.

Johnson, L. C., "Working Families: Workplace Supports for Families", Social Metropolitan Planning Council, Toronto, Canada, 1986.

Judkins, P., "Networking -- the Rank Xerox Experiment and its Implications", International Conference on Telework, Empirica, GmbH, Bonn, Federal Republic of Germany, March 1987.

Kabanoff, B., "Work and Nonwork: A Review of Models, Methods, and Findings," Psychological Bulletin, Vol. 88 (1), 1980, pp. 60-77.

Kanungo, R.N., "Measurement of Job and Work Involvement," Journal of Applied Psychology, Vol. 67 (3), 1982, pp. 341-349.

Kiron, A., "You'll Never Have to Go to Work Again", Washington Post, August 24, 1969.

Kraemer, K. L., "Telecommunications - Transportation Substitution and Energy Productivity: A Re-Examination," Telecommunications Policy, Vol. 6 (1), March 1982, pp. 39-59, and Volume 6 (2), June 1982, pp. 87-99.

Kraemer, K.L., and King, J., "Computer-Based Systems for Group Decision Support: Status of Use and Problems in Development," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Kraut, R.E., Galegher, J., and Egido, C., "Relationships and Tasks in Scientific Research Collaborations," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Kraut, R. E., "Telework: Cautious Pessimism", in R.E. Kraut (editor), Technology and the Transformation of White-Collar Work, Erlbaum, 1987.

Lantz, K., "An Experiment in Integrated Multimedia Conferencing", Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Locke, E. A., "The Nature and Causes Job Satisfaction," in Dunnette, M.D. (Ed.), Handbook of Industrial and Organizational Psychology, Chicago: Rand-McNally, 1976, pp. 1297-1350.

Malone, T.W., Grant, K.R., Lai, K.Y., Rao, R., and Rosenblitt, D., "Semi-Structured Messages are Surprisingly Useful for Computer-Supported Coordination," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Malone, T.W., Yates, J., and Benjamin, R.I., "Electronic Markets and Electronic Hierarchies", Communications of the ACM, forthcoming, 1987.

Mandeville, T., "The Spatial Effects of Information Technology: Some Literature", Futures, February 1983.

Marx, G., and Sherizen, S., "Monitoring on the Job: How to Protect Privacy as Well as Property," Technology Review, November - December, 1986, pp. 64-72.

McClelland, D.C., Atkinson, J.W., Clark, R.A., and Lowell, E.L., The Achievement Motive, New York: Appleton-Century-Crofts, 1953.

McClintock, C. C., "Working Alone Together: Managing Telecommuting," National Telecommunications Conference, December 1981.

Milber, B., D. and Krebsbach-Gnath, C., "International Research Program on Work/Family Organization in Industrial Society," unpublished planning report, Battelle Memorial Institute, 1980.

Moore, K. 1986 Personnel Policies And Practices Survey, Atlanta: Life Office Management Associate, 1986.

Moss, M. and Dunau, A., "Will the Cities Lose Their Back Offices?", Real Estate Review, Vol. 17 (1), Spring 1987, pp. 62-68.

Mowday, R.T. Porter, L.W. and Steers, R.M. Employee - Organization Linkages: The Psychology of Commitment, Absenteeism, and Turnover, New York: Academic Press, 1982.

Nelson, K., "Automation, Skill, and Back Office Location," paper presented to Association of American Geographers, Minneapolis, MN, May 1986.

New York Times, "Rising Trend in the Computer Age: Employees Who Work at Home." March 12, 1981, pp. A1 and D6.

Nilles, J.M., Carlson, F.R., Gray, P., and Hanneman, G.G., The Telecommunications-Transportation Tradeoff, New York: John Wiley and Sons, 1976.

Olson, M. H., "New Information Technology and Organization Culture," Management Information Systems Quarterly, Vol. 6 (5), December 1982, pp. 71-92.

Olson, M. H., "Remote Office Work: Changing Work Patterns in Space and Time", Communications of the ACM, Vol. 26 (3), March 1983, pp. 182-187 (a).

Olson, M. H., Final Project Report, NSF Grant No. IST-8208451, 7/182-3/3/83, March 1983 (b).

Olson, M. H., "Overview of Work-at-Home Trends in the United States", Center for Research on Information Systems, New York University, Working Paper # 57 (GBA #83-87), August 1983. (c)

Olson, M.H. and Primps, S.B., "Working at Home with Computers: Work and Nonwork Issues", Journal of Social Issues, Vol. 40 (3), 1984, pp. 97-112.

Olson, M.H., "Do You Telecommute?", Datamation, October 1985.

Pfeffer, J. and Baron, J., "Taking the Workers Back Out?: Recent Trends in Labor Contracting", paper presented for Stanford Graduate School of Business / Business and Social Research Institute Joint Workshop, Stockholm, Sweden, September 1985.

Pratt, J.H. and Davis, J.A., "Measurement and Evaluation of Family-Owned and Home-Based Businesses", U.S. Department of Commerce, National Technical Information Service, Springfield, VA, July 1986.

Rice, R.W., Near, J.P., and Hunt, R.G., "The Job-Satisfaction / Life Satisfaction Relationship: A Review of Research," Basic and Applied Social Psychology, Vol. 1 (1), 1980, pp. 37-64.

Rizzo, J.R., House, R.J. and Lirtzman, S.I. "Role Conflict and Ambiguity in Complex Organizations," Administrative Science Quarterly, Volume 15, 1970, pp. 150-163.

Robinson, J.P., Athanasiou, R. and Head, K.B., Measures of Occupational Attitudes and Occupational Characteristics, Survey Research Center, Institute for Social Research, 1969.

Rotondi, T., "Identification, Personality Needs, and Managerial Position," Human Relations, Volume 29, 1976, pp. 507-515.

Schacter, S., The Psychology of Affiliation, Stanford, CA: Stanford University Press, 1959.

Schiff, M., "Flexiplace: An Idea Whose Time has Come," Washington Post, September 2, 1979.

Sheldon, M.E., "Investments and Involvements as Mechanisms Producing Commitment to the Organization," Administrative Science Quarterly, Volume 16, 1971, pp. 142-150.

Shirley, S., "A Company Without Offices," Harvard Business Review, January - February, 1986, pp. 127-136.

Short, J., Williams, E. and Christie, B., The Social Psychology of Telecommunications, London: John Wiley & Sons, 1976.

Smith, P.C., Kendall, L.M. and Hulin, C.L. The Measurement of Satisfaction in Work and Retirement, Chicago: Rand McNally, 1969.

Sproull, L.S., Kiesler, S., and Zubrow, D., "Encountering an Alien Culture," Journal of Social Issues, Vol. 40 (3), 1984, pp. 31-48.

Stefik, M.J., Foster, G., Lanning, S., and Tatar, D., "WYSIWIS Revised: Early Experiences with Multi-User Interfaces," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Stefik, M.J., Foster, G., Bobrow, D.G., Kahn, K., Lanning, S., and Suchman, L., "Beyond the Chalkboard: Computer Support for Collaboration and Problem Solving in Meetings", Communications of the ACM, Vol. 30 (1), January 1987, pp. 32-47.

Suchman, L., and Trigg, R., "A Framework for Studying Research Collaboration," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

Toffler, Alvin, The Third Wave, New York: Morrow, 1980.

Trigg, R., Suchman, L., and Halasz, F., "Supporting Collaboration in NoteCards," Proceedings, MCC Conference on Computer Support for Cooperative Work, Austin, Texas, December 1986.

U.S. Government Printing Office, Pros and Cons of Home-Based Clerical Work, House of Representatives, Employment and Housing Subcommittee of Committee on Government Operations, February 26, 1986 (Doc. #58-9460).

Vitalari, N.P., Venkatesh, A., and Gronhaug, K., "Computing in the Home: Shifts in the Time Allocation Patterns of Households", Communications of the ACM, Vol. 28 (5), May 1985, pp. 512-522.

Winograd T.,and Flores, F., Understanding Computers and Cognition: A New Foundation for Design, Norwood, NJ: Ablex, 1986.

APPENDIX A

Dear study participant:

The Center for Research on Information Systems at New York University is sponsoring a study of employees who work at home on a regular basis. We are very interested in having you participate in the study.

You will be asked to respond to some questions regarding your attitudes about the work-at-home arrangement. You will also be asked to record certain activities related to your job, primarily information about work-related communications and daily activities.

All data collected for the study will be strictly confidential; none of it will be made available to your company. At the end of the pilot, the company will receive a report which summarizes all data but not by individual and no individuals will be identified. There is no risk or potential harm involved in participation; a potential benefit is the enhanced insights you may have regarding your own feelings about work at home (whether or not you personally will be working at home).

As the principal investigator on this project, I will be happy to answer any questions you may have regarding the procedures involved.

Margrethe H. Olson
Associate Professor
Center for Research on Information Systems
New York University

Participant Consent

I have read the statement regarding the procedures involved in participating in the study of work at home sponsored by New York University. I understand that my participation is voluntary and that there are no risks or potential harm to myself involved in participation. I understand that all data collected is strictly confidential. Under these conditions I agree to participate in the study.

_____

Signature

_____

Date

Work Experience

How long have you worked for the Hartford Insurance Group?_____

What is your current job title?_____

How long have you held this position?_____

What was your previous position?_____

How long did you hold that position?_____

Job Description

Briefly describe your current responsibilities.

What is the primary output of your work (e.g., programs, documentation, etc.)?

How and by whom (you, your boss, customer, etc.) are deadlines determined for completing this work output?

How many times per week (approximately) do you communicate with the following in the performance of your job? (If you communicate with someone once a month, your estimate for a week will be .25.)

Boss _____ (Times per week)

Colleagues _____

Clients - internal (users) _____

Clients - external _____

Vendors _____

Other (specify) _____

Other (specify) _____

Other (specify) _____

What percent of your job requires uninterrupted concentration?

_____%

Is your current work setting adequate for the amount of concentration you need?

Always _____

Usually _____

Sometimes_____

Never _____

Do you have adequate clerical/secretarial support for your work?

Always _____

Usually _____

Sometimes_____

Never _____

Home Situation

How many individuals share your household? _____

If you have children, please give their ages.

How many hours per day, on average, do you spend on the following activities (weekdays only):

Household _____

Child care _____

Leisure/Recreation _____

What general forms of leisure and relaxation activities do you engage in? How many hours per week do you spend on each of these activities and with whom (if anyone)?

Activity	Hours per week	With whom

If you have a spouse, does he or she work outside of the home?

Yes_____

No _____

If so, how many hours per week?_____hours

If you have children, what percent ofchild care responsibilities are allocated to you and what percent to your spouse?

You _____%

Spouse_____%

Use of Computer

What computer and communications equipment do you use in your work? (e.g., personal computer, word processor, terminal, modem, etc.)?

_____

_____

_____

_____

_____

What percent (on average) of your work day is spent using this equipment? _____%

Performance Evaluation

How frequently is your work evaluated (e.g., daily, monthly, yearly)?_____

What are the important criteria by which your performance is evaluated (e.g., rate of output, meeting deadlines, expertise, absenteeism, etc.)?

What are the criteria for promotion?

Within the next two years how likely is it that you will be promoted?

What type of position would you like to hold in five years?

Commuting

Approximately how much time do you spend commuting EACH WAY to work?_____

How do you travel (e.g., bus, train, car)?_____

On a daily basis, how much does commuting cost you?_____

Work at Home

Would you like to work at home at least two days a week instead of going to the office?

Yes_____
No _____

If you did work at home two days a week, please indicate whether it would have a positive effect, a negative effect, or no effect on the following:

	Positive Effect	Negative Effect	No Effect
Relationship to supervisor	_____	_____	_____
Relationship to coworkers	_____	_____	_____
Commitment to the company	_____	_____	_____
Compensation	_____	_____	_____
Promotability	_____	_____	_____
Personal work effectiveness	_____	_____	_____
Professional development	_____	_____	_____
Stress	_____	_____	_____
Commute time	_____	_____	_____
Satisfaction with your job	_____	_____	_____
Child care	_____	_____	_____
Time for leisure activities	_____	_____	_____
Type of leisure activities	_____	_____	_____
Relationship to community	_____	_____	_____
Social interaction (non-work-related)	_____	_____	_____
Physical habits (diet,smoking, etc.)	_____	_____	_____
Other _____	_____	_____	_____

Are there any other comments that you would like to add?

APPENDIX B

COPIES OF APPENDIX B MAY BE OBTAINED
UPON REQUEST

APPENDIX C

ACTIVITY FORM

DATE_____
LOCATION_____

In general, how satisfying was your day today?

Very satisfying__	Somewhat satisfying__	Neutral__	Somewhat dissatisfying__	Very dissatisfying__

Please provide a brief summary of the hours that you worked today.

Please list your work goals for the day.

How specific were your work goals for the day?

Very specific___	Somewhat specific___	Neutral___	Somewhat vague_____	Very vague___

Did you accomplish your work goals for the day?

No___ Some___ Yes___

What factors contributed to your ability to achieve your goals? (Please select as many categories as are relevant. The list is not in any order of priority.)

___Coworkers available when needed
___Information available when needed
___Overestimation of needed time
___Task less difficult than anticipated
___Imminent deadline
___Other (Please list all other factors)
___Good concentration
___Good system response time
___No unforseen problems
___Good planning
___No interruptions

What factors prevented you from achieving your goals? (Please select as many categories as are relevant. The list is not in any order of priority.)

___Boredom/Lack of concentration
___Interruptions from coworkers
___Task more difficult than anticipated
___Unplanned tasks required attention
___Coworkers unavailable when needed
___Information unavailable when needed
___Other (Please list all factors)
___Problems with system hardware
___Problems with system software
___Poor system response time
___Underestimation of needed time
___Poor Planning

COMMUNICATIONS

Date: _____
Location: _____

Use one column per communication	1	2	3	4	5	6	7	8	9	10
WITH WHOM DID YOU COMMUNICATE?										
a. Manager										
b. Coworker										
c. Support Group										
d. Meeting with 3 or more people										
e. Other										
WHAT DID YOU USE?										
a. Telephone										
b. Face to face										
c. Electronic Mail										
d. Conference Call										
e. Other(specify)										
FOR WHAT PURPOSE?										
a. Information										
b. Problem Identification										
c. Problem Identification										
d. Problem Resolution										
e. Small Documents (memos)										
f. Large Documents										
g. Other										
HOW LONG DID IT TAKE?										
a. Less than 5 minutes										
b. 5-10 Minutes										
c. More Than 10 Minutes										

APPENDIX D

NATIONAL SURVEY OF COMPUTER PERSONNEL AND WORK AT HOME

(Please ignore numbers next to answers. they are for tabulation only)

SECTION I

What is your current occupation? (Check only one.)

7-01 ☐ Vice President
02 ☐ Director of DP or MIS
03 ☐ Service Coordination/User Liaison
04 ☐ Manager of Systems Analysis
05 ☐ Senior Systems Analyst
06 ☐ Systems Analyst
07 ☐ Manager of Applications Programming
08 ☐ Lead Applications Programmer
09 ☐ Senior Applications Programmer
10 ☐ Applications Programmer
11 ☐ Junior Applications Programmer
12 ☐ Systems Analysis/Programming Manager
13 ☐ Lead Systems Analyst/ Programmer
14 ☐ Senior Systems Analyst/ Programmer
15 ☐ Systems Analyst/ Programmer
16 ☐ Manager of Operating Sys. Programming
17 ☐ Senior Systems Programmer
18 ☐ Manager of Database Administration
19 ☐ Manager of Computer Operations
20 ☐ Shift Supervisor
21 ☐ Lead Computer Operator
22 ☐ Computer Operator
23 ☐ Control Clerk
24 ☐ Data Entry Supervisor
25 ☐ Data Entry Operator
26 ☐ Word Processing Supervisor
27 ☐ Word Processing Operator
28 ☐ Other

Do you now perform any of the work for which you earn money in your home (this includes an office in your house)? 9-1 ☐ Yes 2 ☐ No
(If your answer is no but you would like to work at home, please go to SECTION V and complete the rest of the questionnaire)

Do you now earn money from work that you do in your home (this includes an office in your house)? 9-1 ☐ Yes 2 ☐ No
(If your answer is NO but you would like to work at home, please go to SECTION V and complete the rest of the questionnaire)

When you are working at home, are you: (Check only one.)

10-1 ☐ employed by a company or another person, and on their payroll?
2 ☐ self-employed?
3 ☐ other (please specify): _____

How are you paid for the work that you do at home? (Check only one.)

11-1 ☐ by salary
2 ☐ by day
3 ☐ by hour
4 ☐ by piece-rate
5 ☐ by commission, consignment, contract
6 ☐ by profits
7 ☐ other (please specify): _____

How much of your income is provided by your work at home?

12-1 ☐ 100%
2 ☐ 75%-99%
3 ☐ 50%-74%
4 ☐ 25%-49%
5 ☐ Less than 25%

Are you covered by health insurance? (Check only one.)

13-1 ☐ yes, from individual, self-paid program
2 ☐ yes, from my employer's program
3 ☐ yes, from a plan provided by my own business
4 ☐ yes, from my spouse's health insurance policy
5 ☐ no health insurance
6 ☐ other (please specify): _____

SECTION II

How many hours do you work in an average week? 14 _____ hours

How many of those hours do you work at home? 16 _____ hours

Where in your home do you most often work? (Check only one.)

18-1 ☐ office in my home
2 ☐ kitchen
3 ☐ dining room/living room
4 ☐ family room
5 ☐ bedroom
6 ☐ basement
7 ☐ other (please specify): _____

Are the hours you work at home: (Check only one.)

19-1 ☐ all the paid work you do?
2 ☐ in addition to regular work hours?
3 ☐ as a regular substitute for working at another location?
4 ☐ as an occasional substitute for working at another location?

How many employees do you have? 20 _____

SECTION III

Why did you first decide to work at home? (Check all that apply.)

26 ☐ Spouse objected to my working outside the home
27 ☐ to take care of my family
28 ☐ to save time commuting
29 ☐ to cut commuting/clothes costs
30 ☐ to avoid office politics
31 ☐ to ease conflicts between work and family care
32 ☐ to work in my way, at my pace
33 ☐ to increase my productivity
34 ☐ to earn extra money
35 ☐ low overhead
36 ☐ physical handicap
37 ☐ tax benefits
38 ☐ other (please specify): _____

Circle the box in the above list most important to you. 39-40

What are the advantages of working at home? (Check all that apply.)

41 ☐ more time to myself
42 ☐ more time with my family
43 ☐ increased career or job opportunities
44 ☐ more money
45 ☐ less personal conflict
46 ☐ more productivity in my work
47 ☐ less isolation
48 ☐ spouse pleased
49 ☐ no advantages
50 ☐ other (please specify): _____

What are the disadvantages of working at home? (Check all that apply.)

51 ☐ less time to myself
52 ☐ no opportunity for career advancement or promotion
53 ☐ less time with my family
54 ☐ lack of interaction with co-workers
55 ☐ earn too little money
56 ☐ less productivity in my work
57 ☐ resentment of my spouse
58 ☐ increased stress
59 ☐ work too much
60 ☐ no disadvantages
61 ☐ other (please specify): _____

If you have children under age 5, do you care for them yourself while you work? 62-1 ☐ Yes 2 ☐ No

If no, what kind of help do you most often use? (Check only one.)

63-1 ☐ baby sitter
2 ☐ live-in help
3 ☐ child care outside home
4 ☐ help from spouse
5 ☐ help by other relatives, unpaid
6 ☐ other (please specify): _____

What would be your ideal working arrangement? (Check only one.)

64-1 ☐ work only in my home
2 ☐ to work part-time in my home, and part-time outside of my home
3 ☐ to work entirely outside of my home
4 ☐ other (please specify): _____

Overall, how satisfied are you working at home? (Check only one.)

65-1 ☐ very satisfied
2 ☐ somewhat satisfied
3 ☐ somewhat dissatisfied
4 ☐ very dissatisfied

(If you do not use computer equipment in your work at home, please go to Section V and complete the rest of the questionnaire)

SECTION IV

Which type of computer equipment do you have at home for work-related use? (Check all that apply.)

66 ☐ terminal, hooked up to a mainframe computer
66 ☐ word processor
68 ☐ personal computer
69 ☐ modem
70 ☐ other—please specify: _____

Who owns the equipment? (Check only one.)

71-1 ☐ my family or I do
2 ☐ employer or client
3 ☐ other (please specify): _____

What work-related tasks do you use your equipment for? (Check all that apply.)

72 ☐ word processing
73 ☐ budgeting
74 ☐ business, planning and forecasting
75 ☐ communication (electronic mail)
76 ☐ data entry
77 ☐ research and writing
78 ☐ business correspondence
79 ☐ other (please specify): _____

SECTION V

Are you: 80-1 ☐ female? 2 ☐ male?

How old are you? 71 _____ years

Are you currently:

83-1 ☐ married, living with spouse?
2 ☐ separated?
3 ☐ divorced?
4 ☐ widow(er)?
5 ☐ single (never married)?
6 ☐ single, living with partner?

What is your household income?

84-1 ☐ under $15,000
2 ☐ $15,000-$29,999
3 ☐ $30,000-$44,999
4 ☐ $45,000-$59,999
5 ☐ $60,000-$74,999
6 ☐ $75,000 and over

How many children do you have? 85 _____
How many live with you?

87 ☐ _____ under 5 years of age
88 ☐ _____ 5-13 years old
89 ☐ _____ 14-17 years old
90 ☐ 18 years or older

What is your ethnic or racial background?

91-1 ☐ White
2 ☐ Black
3 ☐ Hispanic
4 ☐ Asian
5 ☐ American Indian
6 ☐ other (please specify):

If you do not currently work at home, would you like to?

92-1 ☐ yes, as a regular substitute for working at another location
2 ☐ yes, as an occasional substitute for working at another location
3 ☐ no, not at all

In order to contribute to a better understanding of who works at home and why, would you be willing to complete a more detailed questionnaire regarding your experience of working at home? If so, please give us your name and address. All information will be strictly confidential and anonymous.

Name _____

Address _____

_____

_____

(PLEASE PRI