Telecommuting Centers and Related Concepts:

A Review of Practice

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ABSTRACT

Telecommuting centers have been in existence for more than a decade in countries outside the United States. More recently, in the U.S. the potential for these telecenters to relieve urban congestion, to contribute to air quality improvement, and to encourage local economic growth has been recognized. This growing awareness has brought about the need to understand better those pioneering experiences with telecommuting centers, both in the U.S. and elsewhere. This report collects and analyzes information on established telecommuting centers and related concepts for the purpose of providing input to the planning and operation stages of the Residential-Area-Based Offices (RABO) Project, sponsored by the Federal Highway Administration (FHWA) and the California Department of Transportation (Caltrans).

These remote work centers are found on five continents, in at least twenty countries including the U.S., and in a variety of functional forms. Few of these existing centers are consistent with the emphasis of the RABO project on residential proximity with primary access being via walking, bicycling, transit and neighborhood clean fuel vehicles. Despite these differences, this review still has important lessons for the RABO and other telecommuting center projects.

Our findings suggest that the most persistent of these remote work center forms at this point are the rural telecottage and the single-employer satellite office. The multiple-employer telecenter has had mixed success in demonstrations to date, possibly due to the complexity involved in implementing and operating this type of facility.

It was found that early, extensive marketing efforts are crucial to center success, as is close attention to the elements of site selection. Critical barriers to the adoption of multiple-employer telecommuting centers include reluctance of employers to bear the cost of two workspaces per telecommuting employee, managerial resistance to supervising remote employees, and concern over the security of proprietary information. In general, the concept of a multiple-use center (rather than a "pure" telecommuting center) appears to be a robust model for success in remote work facilities.

HOW TO OBTAIN THIS REPORT

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if on a UNIX-based account:	**anonymous** (then press enter)
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7)   Have the ASCII <u>or</u> WordPerfect 5.1 for Windows compressed files of this report sent to your local computer account; do this by typing the following:

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in addition, VMS users need to type:	**Tcenter.exe** again (then press enter)
to name the file into their accounts (UNIX users do not).	

if you want WordPerfect files:	**get TcnterWP.exe** (then press enter);
in addition, VMS users need to type:	**TcnterWP.exe** again (then press enter).

8) You have just downloaded to your computer account directory the ASCII or WordPerfect file that makes up this report. Now you will exit the FTP site; do this by typing the following:

        quit (then press enter)

9) Now you need local instructions on how to download files from your account to your personal computer (if desired). **Please note** that you need to set up a binary file transfer when downloading either the **WP** or **ASCII** files; step 10 will not work if you forget this step. **Set file type binary** is a typical command to achieve this.

10) Once you have the file downloaded to your computer you need to convert the file to an uncompressed (regular) file. The file is presently in compressed form: a file form that transfers faster than a regular file, but is not readable. In order to "explode" the file and bring it to a readable state, please type:

    if you have the *ASCII* file: **Tcenter** (then press enter);

    if you have the *WP* file: **TcnterWP** (then press enter).

Finally, the resulting "uncompressed", useable file is called **Telecntr.** It will be 500-600 Kbytes if it is the ASCII file, and 800-900 Kbytes if it is the WP file.

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LIST OF ACRONYMS

ABB	Asea Brown Boveri
AT&T	American Telephone and Telegraph
BATDP	Bay Area Telecommuting Development Program
BC TEL	British Columbia Telephone
BOON	Business on Open Network
Caltrans	California Department of Transportation
CASU	Cooperative Administration Support Unit
CATI	Colorado Advanced Technology Institute
CBD	Central Business District
CCTA	Contra Costa Transit Authority
CTS	Commuter Transportation Services
CTSC	Community Tele-service Centre
DATAR	French acronym for Board for National and Regional Development
EDP	Economic Development Partnership
ETC	Employee Transportation Coordinator
FAWC	Federal Alternative Worksite Center
FEA	Federal Energy Administration
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTP	File Transfer Protocol
GTE	General Telephone and Electric
IEEC	Inland Empire Economic Council
IEEP	Inland Empire Economic Partnership
ILSG	Institute for Local Self Government
ISDN	Integrated Services Digital Network
ITS	Institute of Transportation Studies
JDI	Jamaica Digiport International
JTPA	Job Training Partnership Act
KSP	Kanagawa Science Park
KSTC	Kentucky Science and Technology Council

LAN	Local Area Network
MANTO	Meusch Angebof Nachfrage Transport und Telecommunikation Oekonomie und Oekologie
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSCS	Market Street Computer Systems
MTC	Metropolitan Transportation Commission
NORDPLAN	Nordic Institute for Studies in Urban and Regional Planning
NTT	Nippon Telephone and Telegraph
NVQ	National Vocational Qualification
OLNC	Open Learning Network Centers
PIT	The post and telecommunications service of Switzerland
PVEA	Petroleum Violation Escrow Account
RABO	Residential-Area-Based Offices
RCTC	Riverside County Transportation Commission
SanBAG	San Bernardino Association of Governments
SBC	Small Business Centre
SCAC	South Coast Advisory Council
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SSORG	Shiki Satellite Office Research Group
STR	Standard Telefon und Radio
TAC	Telecommuting Advisory Committee
TCA	Telecommunications for Clean Air
TCO	Telecommuting Office
TDM	Transportation Demand Management
TMA	Transportation Management Association
UCD	University of California at Davis
UKTI	United Kingdom Telenetworking Initiative
US DOT	United States Department of Transportation
VMT	Vehicle-Miles Travelled
WSEO	Washington State Energy Office

EXECUTIVE SUMMARY

TELECOMMUTING CENTERS AND RELATED CONCEPTS:
A REVIEW OF PRACTICE

EXECUTIVE SUMMARY

Introduction and Concept Development

Remote work centers are found in many parts of the world. Widespread interest is one important indicator of the perceived potential benefits of remote work centers to individuals, employers and society, as well as a hopeful sign that such centers in some configuration will prove to be financially viable. The purpose of this report is to collect and analyze information about already-established telecommuting centers and other closely related concepts. This report is intended as input to the planning and operation stages of the Residential-Area-Based Offices (RABO) Project, known informally as the Neighborhood Telecenters Project, a three-year program underway at the Institute of Transportation Studies (ITS), University of California, Davis. This research program is sponsored by the Federal Highway Administration and the California Department of Transportation (Caltrans) and involves implementing several residential-area-based telecenters and evaluating their effectiveness as a work environment and as a transportation demand management strategy. The program is unique both in its scope and in its residential-area emphasis.

There are two fundamental types of telecommuting, home-based and center-based. For home-based telecommuting, the commute trip is eliminated and no contribution is made to traffic congestion or air pollution. However, working from a telecommuting center offers a number of potential advantages for both the employee and the employer, including: separation of home and work, interaction with other people, shared equipment, a professional atmosphere, increased security of confidential information and greater confidence in employee productivity. It is likely that both types of telecommuting will co-exist in the future, each serving different market segments.

Telecenters are further categorized as single-employer or multiple-employer. Single-employer centers may be well-suited to large organizations, especially those that already have multiple locations. Multiple-employer centers present additional coordination and security challenges, but offer low-risk opportunities for employers to try the concept, cost-effective ways for small employers to participate, and potentially greater commute reduction. A variety of related concepts were studied for this report, including the telecottage, the urban executive office suite, the resort office, the creative office, the office train, the floating office, and "off-shore" facilities. While they are not all telecommuting centers by strict definition, these remote work concepts share common attributes and define markets for telecenter services that could be developed in the future. The small rural telecottage is one of the most common types of remote work facilities. The telecottage concept combines more than one goal, including telecommunication and data-link provisions, job training, brokerage of remote work services, small business formation, and remote learning facilities. In general, the concept of a multiple-use center (rather than a "pure" telecommuting center) appears to be a robust model for success in remote work facilities.

Case Studies of Existing Telecenters

Case studies for eight telecommuting centers are presented as part of this analysis: the Hawaii Telework Center in Mililani, Hawaii; the Ballard Neighborhood Telework Center and the Washington State Telework Center in the Puget Sound area of Washington State; the Pacific Bell San Francisco Satellite Center in Northern California; the Apple Valley Telebusiness Workcenter, the Ontario Telebusiness Workcenter and the Telecommuting WorkCenter of Riverside County in Southern California; and a multiple-employer facility in Nykvarn, Sweden. These include all known U.S. multiple-employer centers in operation at the time of this study.

Goals and objectives varied among centers, but they can be placed into three general categories: improving transportation, stimulating local business, and serving as a basis for research. The amount of time taken to establish a functioning center ranged from six weeks to three years, with the mean for U.S. telecenters being a little less than six months. In retrospect, most respondents would have preferred to spend less time on facility development and more time on critical marketing tasks to achieve higher center utilization and improved center success.

Most respondents felt that more training was needed to prepare telecommuters for successful participation in a center. For the centers studied here, lack of in-depth training did not appear to be a serious problem. As telecommuting moves to the mainstream, however, it is likely that more attention will need to be paid to this aspect of implementation.

A key factor in the successful development of a telecenter is an aggressive and comprehensive marketing approach, including attention to product development, design, positioning, and pricing as well as promotion. The following marketing guidelines emerge: be serious about marketing; hire professional consultants if in-house expertise is not available; market early in the planning process and continue throughout the project; and use every available tool to promote the telecenter -- mass media, phone calls, speeches, direct mailings, newspaper articles, flyers, e-mail, electronic bulletin boards, and so on. While there have been some encouraging marketing successes, the implementation barriers identified below suggest that marketing will continue to be a formidable challenge for some time to come.

Site selection will depend in part on the goals of the particular project, however, local zoning ordinances may restrict the proximity of businesses and residences and should be researched carefully. Siting decisions must include careful consideration of local surroundings. The availability of restaurants, convenience outlets such as post office branches, and shopping opportunities within walking distance can be important if travel reduction and air quality improvement are among the goals for implementing a telecenter. The availability of such opportunities may also make the center more attractive to potential telecommuters.

Nearly all telecommuting centers studied had an equipment room, a reception desk, a site administrator office, a conference room, and a lunch room. The only feature that all eight centers had in common was a conference room. Most of the centers studied had a full-time site administrator. He or she fulfills an important role of representing the center to the media and the public and providing long-term continuity and stability for the center.

The security of proprietary information is an important issue for multi-employer centers, with some employers declining to use facilities that did not have private offices. Computer passwords, security codes, and lockable individual storage space can be used to address this concern; however, it appears that only private offices will convince the most security-minded employers to utilize the facility.

A complete breakdown of income and costs was seldom available. Multiple-employer telecenters that involved a separate facility (as opposed to space within an employer's existing facility) had start-up budgets ranging from $120,000 to $425,000. Employer participants paid from zero to $850 per month to rent a space at the telecommuting centers, with $100/month being the amount charged most often. Rent was held considerably below market values to encourage facility usage. Monthly operating expenses for the centers reporting this information varied widely, from about $6,600 to $18,900. None of the telecommuting centers studied are financially self-supporting at this time.

Among the telecenters studied in depth, users were most often male (two-thirds) and in highly skilled positions. It is recommended that future telecenter demonstrations make an effort to redress this imbalance. It is desirable to extend the personal and societal benefits of telecommuting to as large a segment of the workforce as possible.

Workspace utilization is the percentage of time a workspace is occupied, and is calculated by dividing the average number of spaces used per day by the number of spaces available. The mean utilization was 34 percent for the centers studied in depth, but varied from as low as 13 percent to as high as 90 percent. Identifying an optimum occupancy level for a particular telecenter should take into consideration the amount of rental income needed to offset overhead costs.

Reducing commute travel was an important objective behind the establishment of many of the telecommuting centers studied here, although detailed *post hoc* evaluations of transportation impacts were not always conducted (or at least published). Data based on a total of 163 telecommuters, from seven centers, support the hypothesis of significant reductions in vehicle-miles traveled from telecenter use. Some of the key findings include an average savings of 93.4 commute miles and 2.8 commute hours per person per center usage. The normal commute for these telecenter users is not only long but slow; they live more than four times as far from their normal workplace as the average commuter, and face average commute speeds of 35 mph.

Conclusions

Several barriers to telecenter success have been identified in this report. One of the most important is a disinclination on the part of the tenant employers to pay rents approaching market rate, or indeed, any rent at all. As long as telecommuters retain a desk at their conventional office and telecommute on average only one day a week, this barrier may be extremely difficult to overcome. Claiming hard-to-quantify benefits, such as increased productivity, to offset the added cost is not yet convincing to prospective tenant employers. However, recent experiments with non-territorial offices provide some evidence of a trend toward more efficient space utilization. Another barrier is the discomfort felt by managers faced with the task of effectively

supervising remote workers. Currently, this seems to have resulted in the restriction of candidate telecommuters to those workers with jobs traditionally seen as independent and professional.

In general, the differential distribution of the costs and benefits associated with telecenter operation is a barrier to wider implementation. Benefits accrue to employees, employers, and the region. However, direct costs are incurred by the employers of telecommuters. The employer must bear the costs of telecenter rent, reorganizing how office space is used, reorganizing work groups to accommodate telecommuting employees, and training managers to properly supervise remotely working employees. Changes in the traditional form of employee-supervisor relations seem to be leading to a greater acceptance of flexible work options. This, combined with federal and state legislative requirements to reduce congestion and improve air quality, may result in this barrier becoming less significant.

The remote work concept of telecommuting arose from a background of tremendous innovation in communication and data processing technology, and growing concerns in several public policy arenas. Remote work centers will continue to evolve in response to new technology, changing demographics and work practices, and evolving public concerns. As implementation barriers are addressed and resolved, new telecenter forms and variations of those that currently exist will undoubtedly emerge. Success, for at least some variations of telecommuting centers, seems assured.

SUMMARY

TELECOMMUTING CENTERS AND RELATED CONCEPTS:
A REVIEW OF PRACTICE
SUMMARY

Introduction

Remote work centers are found in many parts of the world. Experimentation with forms adapted to local conditions is being conducted on five continents in at least twenty countries. This widespread interest is one important indicator of the perceived potential benefits of remote work centers to individuals, employers, and society, as well as a hopeful sign that telecommuting centers in some configuration will prove to be financially viable. Potential personal benefits include increased flexibility (which may enhance one's ability to manage family and job demands), improved mobility, savings in commute time, reduced stress, and cost savings. Potential employer benefits include increased employee productivity, flexible space planning, cost savings, staffing flexibility, and improved recruitment and retention. Potential societal benefits include a reduction in urban traffic congestion, energy conservation, air quality improvement, revitalization of urban areas, and economic growth for rural areas.

The purpose of this report is to collect and analyze as much information as possible about already-established telecommuting centers, or telecenters, and other closely related concepts. This report is intended as input to the planning and operation stages of the Residential-Area-Based Offices (RABO) Project, known informally as the Neighborhood Telecenters Project. While its primary purpose is to aid in the conduct of the demonstration project, it is anticipated that this document will be of value to a broader range of individuals and organizations in the areas of telecommuting, telecenters, transportation demand management, and economic development.

The Neighborhood Telecenters Project is a three-year program underway at the Institute of Transportation Studies (ITS), University of California, Davis. This research program is sponsored by the Federal Highway Administration and the California Department of Transportation (Caltrans), and is designed to evaluate the feasibility of residential-area-based telecenters as a transportation demand management strategy. The program will establish up to 12 telecenters in or near residential areas in several metropolitan regions of California, from which workers of

multiple organizations can telecommute one or more days each week. The residential area-based location is intended to increase the likelihood of commuting to the telecenter by walking, bicycling, transit, and neighborhood clean fuel vehicles instead of by automobile. This program is unique both in its scope and in its residential-area emphasis.

Concept Development

Early Foundations

The concept of telecommunications replacing physical travel is not new. It has appeared in speculative fiction as early as the 19th century. The potential of telecommunications to substitute for physical travel began to receive serious research attention from the 1960s on. Although implementation of telecommuting to date has been almost exclusively home-based, the concept of telecommuting centers has been present in the academic literature as long as the concept of telecommuting itself. Telecenters have been established for demonstration purposes since at least 1981 when a multiple-employer, neighborhood work center was opened in Marne-la-Vallé, France. In the United States, Pacific Bell was among the first to open a single-employer telecenter, in 1985. The State of Hawaii opened the first known U.S. multiple-employer center in 1989.

There is currently little uniformity in remote work-related (especially remote work center) terminology around the world. Different terms are used to mean the same thing, and the same terms are used to mean different things. As shown in Table S.1, two criteria have been suggested for distinguishing telecommuting from other types of remote work: remote management and commute reduction. Thus, employees work at a conventional office because that is where their job is, regardless of where they live. By contrast, telecommuters work at a telecommuting center because they live closer to it than to the regular office, regardless of what their job is (or where their manager is). By these criteria, some of the facilities described in this report are remote work facilities, but may not be, strictly speaking, telecommuting centers. In many cases they are branch offices or decentralized functions with on-site management; in other cases they support self-employed individuals rather than salaried employees of an organization.

However, examples of such facilities are included because they are closely related to telecommuting centers, with many of the same benefits (such as trip reduction and local economic development). Much can be learned from these types of facilities that will be transferable to telecommuting centers *per se.*

Table S.1

Classification of Selected Work Concepts

	Remote Management	**Commute Reduction**
conventional office	no	no
telecommuting center	yes	yes
branch office	no[1]	not necessarily
decentralized function	no[1]	not necessarily
self-employed	no[2]	maybe[3]

[1] Except for the branch manager or department head.
[2] Although the self-employed person typically works remotely from the client.
[3] "Yes" if alternative to self-employment is working as a salaried employee at a more distant location; "no" if the alternative is not working at all.

Telecommuting from Home versus from a Center

At first glance, working from home may appear to be the ideal form of telecommuting. However, telecenters have a number of potential advantages over working from home. For the employee, some boundaries between work and home may be desirable. The commute trip may provide useful transition time between one's job and domestic roles. The home may not be a desirable place to work in some cases: there may not be adequate space, there may be distractions, there may be unpleasant conflicts among household members, and it may be more difficult to resist destructive behaviors such as overeating, smoking, and substance abuse. And

telecommuting centers generally offer greater opportunities for social and possibly professional interaction than the home.

There are potential advantages of telecenters for the employer as well. The center can provide the facilities (such as conference rooms), equipment, and sometimes staffing support of a full-service office. Management may believe that working from a center provides a more professional image than working from home. A supervisor may feel more confident that the employee is actually working from a center. The job may require specialized equipment that is too expensive to place in individual homes, but that is cost effective when shared among several workers. It may be easier to protect confidential data in the relatively controllable environment of a center. And the employer's worker and property liability may be better defined and controlled at a center than at home.

There may also be transportation advantages to the widespread use of telecommuting centers. It is true that for any individual occasion, the reduction in commute travel would be smaller for a telecenter than it would be for home-based telecommuting. However, center-based employees may telecommute more often on average than home-based workers. Furthermore, some people may be able or willing to telecommute from a center who would not work from home at all. Thus, if well-planned, the transportation benefits of telecommuting centers should complement those of home-based telecommuting, not detract from them.

Another societal concern is the equity issue associated with having telecommuting available only to those who are able and willing to work from home. Affluent professional workers are likely to have adequate space in the home, and to be able to afford their own personal computer and other costs associated with home-based telecommuting. But it is desirable to extend the personal and societal advantages of telecommuting to a broader segment of the workforce, and telecommuting centers may be able to do that.

Experts agree that full-time work at home will be the least popular form of telecommuting. However, predicting what proportions of telecommuting will eventually be home-based (including part-time) versus center-based is more speculative. While some people see an evolution from

mostly home-based to mostly center-based telecommuting, others see the opposite path. That is, they envision telecommuting centers as an interim phase between conventional work and the ultimate outcome of working at home. In practice, both home- and center-based telecommuting may persist in the future, each serving different market segments.

Remote Work Facility Concepts

Sections 3 and 4 of this report describe more than 60 remote work facilities and concepts in practice around the world. Three major types of remote work facilities are the telecottage, the single-employer telecenter, and the multi-employer telecenter. Findings for each of those facility types are summarized below.

Telecottages

The most successful types of remote work facilities, as defined by continued operation past the first one or two years, are the single-employer satellite office and the small rural telecottage. While telecottages, as distinct from rural branch offices or functionally decentralized offices, are rare in the U.S., they are the dominant remote work center concept in other countries. Most successful telecottages in other countries are started with at least some public-sector funding. The amount and longevity of this funding may have determined the apparent success of these centers by allowing the concept to be tested past the initial demonstration stages. There are reports that some of the early telecottages have already achieved or expect to achieve financial independence from governmental subsidization.

A key element of the telecottage concept is that it combines more than one goal. These goals include provision of telecommunication and data links to other regions, skills training on telecommunications equipment and computers, job training for center- or home-based remote work, brokerage of remote work services to clients in other regions, small business formation, provision of business services to local home-based businesses and remote learning facilities. This combination of services is consistent with the primary focus of these facilities: encouragement of economic development in depressed rural areas. A strategy of longer-term funding plus

multiple roles for these facilities may be equally fruitful for rural, suburban and urban telecenters in this country. Various rural remote work centers in parts of the U.S. appear to be following this path in their planning stages. The stated objectives of telecenter demonstrations in urban areas in the U.S. have also included the encouragement of local economic development.

Single-Employer Telecenters

As with telecottages, single-employer telecommuting centers also appear to be a robust remote work center form, although there are relatively few examples of these compared to the more conventional branch office and functionally decentralized forms of remote work facilities. In each of these scenarios, large organizations take advantage of advances in telecommunication and information technologies to assume a more decentralized structure. The prime motives in this decentralization seem to be: a desire to achieve reduced office space costs, the need to expand into new labor markets, stemming ongoing migrations of rural populations into already overcrowded urban centers, and in some cases, the desire to retain highly-skilled employees. Single-employer telecommuting centers are distinguished from branch offices and decentralization of specific functions in that they possess the twin characteristics of commute travel reduction and remote supervision. The single-employer telecenter is a natural form of the telecommuting center concept for large organizations which already have multiple facilities with space available to develop. To the extent that it occurs, this form will be implemented largely without public subsidy.

Multiple-Employer Telecenters

In terms of utilization and longevity, success of the multiple-employer telecenter is mixed at the time of this writing. Almost all early demonstrations of this kind of center were not extended beyond the pilot phase. These facilities either closed outright or were transformed into a single-employer telecenter (Hawaii) or an entirely different business (Shiki). Typical barriers to success include managerial resistance to remote work (common to all forms of telecommuting) and the cost of maintaining two office spaces for each telecommuting employee (common to single- and multi-employer centers). In addition to these barriers, the multi-employer telecenter

must face issues such as the concern for security of proprietary information, and the need for intricate coordination among telecenter organizers, tenants and telecommuters. Though arguably the most difficult form of telecommuting to implement, multi-employer facilities may offer certain advantages over single-employer telecenters. Potential advantages include:

1) *Higher marketability to small and medium-sized businesses*: these businesses do not need and could not afford to support stand-alone satellite work centers, but could take advantage of the economies of scale offered by a shared facility.

2) *Low-risk opportunity for large employers to test the concept*: Multi-employer centers enable large employers to test the concept of center-based telecommuting without the financial and organizational commitment that would be required to establish their own telecenters. If an employer samples telecenters with real world trials and finds that the concept works in practice with its employees, the employer could then proceed to develop its own telecenters which may more closely meet its particular needs. Thus, multi-employer telecenters could serve as single-employer telecenter incubators.

3) *Greater potential for reducing commute travel*: other things being equal, the closer the telecenter is to the employee's home, the greater the amount of commute travel that will be reduced. But the smaller the telecenter's employee recruitment area, the more likely that it will need to be a shared facility, since it may require a number of employers to provide enough telecommuters to make the center economically feasible.

It is quite possible that these centers will eventually prove sustainable, although due to their complexity, they may require a greater number of trials to determine a useful implementation and operational methodology. As the results of early demonstrations become more widely known, lessons learned and knowledge gained may be applied to improve the success of multiple-employer telecenters.

Other Remote Work Concepts

Other successful concepts that share attributes in common with telecenters include urban executive office suites and measures such as the use of non-territorial offices to reduce office space costs. Both of these concepts seem financially viable, and both depend on the increased substitution of work settings other than the traditional main office. Remote work facilities also include the local business service center, the resort office, the creative office, the office train, the floating office, and "off-shore" facilities (firms that relocate data and information processing jobs from areas or countries with high wage rates to areas or countries with lower wages for the same work). The latter type of facility most often contains a decentralized function with on-site supervision, and hence may not be telecommuting in the strictest sense. However, it is illustrative of the fact that much information work is location-independent (unlike off-shore manufacturing, for which the transportation costs of raw materials and finished products are still key location factors), and can be done anywhere in the world that has adequate telecommunication linkage to the head office. As a remote work concept, an off-shore information processing facility is related to a telecommuting center. Indeed, "true" telecommuting and off-shore data processing with an on-site supervisor may be combined in the same rural telecottage.

These concepts suggest markets for telecenter services that could be developed in the future. In general, the concept of a multiple-use center (rather than a "pure" telecommuting center) appears to be a robust model for success in remote work facilities. The presence of multiple uses within the same center could encourage increased private-sector provision of a broader range of remote work facilities.

Case Studies of Existing Telecenters

Introduction

To obtain and analyze in-depth information about existing telecommuting centers, primarily in the United States, a set of questions was developed to elicit key facts. Respondents were telecommuting center administrators, or other knowledgeable people connected to the center. The

questionnaire was sent out in the summer of 1992 and responses were received from September 1992 through February 1993. Case studies for eight telecommuting centers are included as part of this analysis: seven in the western U.S. and one in Sweden (Nykvarn). Of the U.S. telecenters, the Hawaii Telework Center is located in Mililani, Hawaii, the Ballard Neighborhood Telework Center and the Washington State Telework Center are or were located in the Puget Sound area of Washington State, the Pacific Bell San Francisco Satellite Center is located in Northern California, and the Apple Valley Telebusiness Workcenter, the Ontario Telebusiness Workcenter and the Telecommuting WorkCenter of Riverside County are all located in Southern California. The Pacific Bell center was always a single-employer facility, six of the centers were always occupied by multiple employers, and the Hawaii center began as a multi-employer facility but now serves only one employer (the State of Hawaii). The seven existing or former U.S. telecenters chosen for this in-depth study include all known multiple-employer centers operating prior to Fall 1992 and one single-employer center. In addition, the Nykvarn, Sweden center was a multi-employer facility for which comparable and useful information was available.

Findings from the analysis are organized below into twelve key areas: goals and objectives, time required to plan and implement a telecommuting center, training, marketing/promotion, telecommuting center location, center management, center features, concern for security of proprietary information, financing and costs, participant description, center utilization and transportation-related impacts.

Goals and Objectives

Goals and objectives varied among centers, but they can be placed into three general categories: transportation, business, and research. While many center organizers incorporated all three of these categories into their planning and implementation, some focused on a specific purpose. Transportation goals and objectives primarily focused on reducing regional air pollution, energy consumption, and traffic congestion by reducing the length of the commute trip. Planners working in regions with high levels of congestion and poor air quality generally had transportation goals in mind when designing a telecommuting center. Business goals and objectives of increasing efficiency, promoting local business, and making profits were ideas that

some telecommuting center planners focused on. A business goal that was frequently teamed with transportation goals was local economic development, resulting from telecommuters staying in their communities during the day and spending money locally. Most of the centers studied had research-related objectives, either implicitly or explicitly. As telecenters are still a novel concept, research is required to determine their effectiveness in meeting the transportation and business goals and objectives discussed above. Establishment of a telecommuting center allowed the operation of such a facility to be analyzed. The knowledge gained from such an analysis may be used to implement more successful centers in the future.

Time Required

Responses for the amount of time taken to establish a functioning center ranged from six weeks to three years, with the mean for U.S. telecenters being a little less than six months. Funding requirements, the choice of using an existing building versus new construction, the number of people working on the project, complexity of site location criteria, telecenter purpose, and marketing goals were the primary factors reported to affect the length of time taken. In retrospect, respondents would have preferred to spend less time on facility development and more time on the more critical marketing tasks associated with opening a center. They felt that this approach would lead to higher center utilization and improved center success. Almost everyone interviewed believed that more time was needed to develop that particular center -- generally around 12 to 16 months. This would allow time for a careful search for the ideal site to be made, marketing research to be done, a marketing program to be developed and implemented, and creation of sound telecommuting center policy to take place.

Training

All involved in running the centers felt that some training was needed to prepare telecommuters for successful participation in a center. However, the training actually conducted did not typically involve in-depth seminars on how to work successfully from a remote center, but consisted of simple orientations to help the participant become familiar with telecenter "house rules" and equipment. Typically, the telecommuter would be given a tour of the building that included a

description of the house rules and an introduction to the equipment and features available at the center. Information packets containing telecommuting tips were also normally given out to telecommuters and supervisors. Tips included advice such as: bring more work than normal because it is not uncommon to finish more tasks in a shorter period of time due to fewer distractions at the center; and plan what work is best-suited to telecommuting, such as reading and critical thinking. For the centers studied here, lack of in-depth training did not appear to be a serious problem. As telecommuting moves to the mainstream, however, it is likely that more attention will need to be paid to this aspect of implementation.

Marketing/Promotion

A key factor in the successful development of a telecenter is an aggressive marketing approach. In the broadest sense, marketing includes product development, design, positioning, and pricing as well as promotion. Many of these aspects of marketing were implicitly or explicitly addressed in the planning process and are discussed in specific terms in other sections (such as Section 5.2.5, Telecommuting Center Location; Section 5.2.7, Center Features; and Section 5.2.9, Financing and Costs). This section makes some general observations about marketing and some specific observations about promotion. In general, current promotion strategies include: public speaking to service groups, word-of-mouth, and mass media attention. Direct mailings to candidate organizations and residents located near the center have not been emphasized. However, site administrators who included a direct mailing component in their promotion program achieved positive results, and they recommend that this approach be used more. When undertaken, public speaking engagements proved fruitful for some of the telecommuting center marketers, arousing interest in the telecenter concept and helping to recruit new tenants. When utilized effectively, marketing has made a difference in the amount of participation at telecommuting centers. For example, the Antelope Valley Telebusiness Center (see Section 3.2.2.1), which placed a strong emphasis on marketing, had more than half of its workspaces contracted out to telecommuters prior to its opening. This level of tenant participation is higher than many of the telecommuting centers that have been open for more than a year and is attributable primarily to differences in the level of marketing efforts undertaken. Pooling information from the eight telecenters studied, the following marketing guidelines are offered:

be serious about marketing; hire professional consultants if in-house expertise is not available; market early in the planning process and continue throughout the project; and use every available tool to promote the telecenter -- mass media, phone calls, speeches, direct mailings, newspaper articles, flyers, e-mail, electronic bulletin boards, and so on. While there have been some encouraging marketing successes, the implementation barriers identified below suggest that marketing will continue to be a formidable challenge for some time to come.

Telecommuting Center Location

A preference for tenant-ready office space rather than ground-up construction was expressed by case study participants. Site selection will depend in part on the goals of the particular project. For example, if it is important to eliminate auto commuting entirely, then the center should be easily accessible by walk, bike, or transit to a number of potential telecommuters. However, local zoning ordinances may restrict the proximity of businesses and residences, preventing the location of office space within residential areas. If, on the other hand, the goal is to achieve some economies of scale by providing a large facility to draw telecommuters from within a ten-mile radius, then freeway and transit accessibility are important criteria. It is recommended that siting decisions include careful consideration of activities located nearby. The availability of restaurants, convenience outlets such as post office branches, and shopping opportunities within walking distance can be important if travel reduction and air quality improvement are among the goals for implementing a telecenter. The availability of such opportunities may also make the center more attractive to potential telecommuters.

Center Management

Many respondents expressed the importance of a full-time site manager. Most of the centers studied did have site administrators. Those that did not had on-site technical support and/or off-site managers. Site management duties included: keeping services and equipment in good working order, monitoring operation of the center, creating reports on financial status and overall center evaluation, and hosting tours of the facility. Site managers also provide other key services that are not at first apparent. They provide site security by monitoring who is using the center

and noticing if anything out of the ordinary is occurring. They also provide social and professional interaction for the telecommuters: most of the managers interviewed knew many of the center telecommuters by name. They represent the center to the media and the public. Site managers can also provide technical support, such as helping with the copy machines and computers.

A very small facility within a residential development (for example, the Greystone Apartments discussed in Section 3.6.1) may not need a full-time administrator. But for most facilities, it is recommended to have a full-time site manager who is friendly and helpful, and to have someone to provide technical support on the operation of equipment (like modems). Because there will be turnover among telecommuters, a permanent site manager can provide long-term continuity and stability for the center.

Center Features

Nearly all telecommuting centers studied had these features: equipment room, reception desk, site administrator office, conference room, and lunch room. The only feature that all eight centers had in common was a conference room, which indicates the importance of this particular item. The conference room could be used for private meetings, which was especially valuable since most of the centers had open office cubicles rather than private offices. A typical workspace in a center included a desk, adjustable chair, phone, and computer. Workspaces in some centers had extra furnishings such as guest chairs and file cabinets. The computers did not have to be state-of-the-art, but did need to be up-to-date and equipped with typically-used software (such as word processing programs and spreadsheets). Not all centers provided computers; at least one felt that the tenant employers were best able to decide what equipment was needed for their particular telecommuters. Having a local area network (LAN) is another desirable telecenter feature. Computer networking permits sharing software, other files, and peripherals such as printers. Thus, a LAN can potentially provide operational cost savings. It may also facilitate telecommuting in the case that center users from the same organization need to share common software and data files in order to work effectively.

Security

Although five of the eight telecommuting centers included in the case studies reported that there has not been a concern about proprietary information security, it is still an important issue. One rule developed by the telecommuters at Nykvarn (see Section 5.1.8) was that there had to be "joint approval" of any new participants in the center pilot project, due to the desire to avoid housing direct competitors on the same premises. Some companies that initially expressed interest in using particular telecommuting centers did not follow through due to major concerns over the security of proprietary information. Private offices were a requirement for such firms and few of the telecommuting centers were able adequately to accommodate this requirement. There were no private offices in the Nykvarn center and consequently employers did not allow their staff to use the center on days when they were dealing with "confidential" information. It is interesting to note that even for the single-employer facility studied, security of proprietary information was an issue. Computer passwords and security codes were used to address this concern. While providing lockable individual storage space may also be a partial solution, it appears that only private offices will convince the most security-minded employers to utilize the facility. Thus, it is recommended that planners address the issue of information security when designing any telecommuting center, to increase the pool of potential facility tenants.

Financing

A complete breakdown of income and costs was seldom available. However, some key facts provided are shown in Table S.2. Multiple-employer telecenters that involved a separate facility (as opposed to space within an employer's existing facility) had start-up budgets ranging from $120,000 to $425,000. The proportion of start-up costs provided by the public sector ranged from around 30% to 100%. Most commonly, about 30-40% seed money would be supplied by one government agency, with matching funds coming from other public agencies and the private sector. Many private-sector companies donated start-up cash, furniture, and office equipment. Most of the telecommuting centers were open for a demonstration period only; however, centers that are not demonstrations could remain open indefinitely. Employer participants paid from zero to $850 per month to rent a space at the telecommuting centers, with $100/month being the

Table S.2
Telecenter Financing and Costs[1]

Telecenter	Number of Workspaces Available	Total Monthly Expenses	Monthly Expenses per Workspace	Other Information
Hawaii Telework Center	17	$15,500	$912	$125,000 grant from State; $300,000 in donations from private industry.
Pacific Bell Satellite Center	12			
Ballard Neighborhood Telework Center	6	$12,500 pro-forma; includes all expenses, not just direct operating costs	$2,083	$80,000 donated in equipment and furniture; offers made to donate computers and software.
Washington State Telework Center	13	$6,569	$505	Total cost of setting up space estimated at $119,000; State grant of $135,000
Apple Valley Telebusiness Workcenter	12	$7,565	$630	Cash donations split between centers:
Ontario Telebusiness Workcenter	24			$100,000 PVEA, $100,000 SanBAG, $550,000 private
Riverside County Telecommuting WorkCenter	70	$18,860	$269	Fourteen-month income: $264,038 for 9/91-10/92
Nykvarn Neighborhood Work Center	9			Bank of Sweden Tercentenary research grant.

[1] A complete breakdown of income and costs was seldom available, and blanks within the table indicate unknown values.

amount charged most often. Rent was held considerably below market values to encourage facility usage. Monthly operating expenses for the centers reporting this information varied widely, from about $6600 to $18,900. There appear to be strong economies of scale associated with larger centers, as the center with the largest total costs had the lowest cost per workstation: $270 a month. However, this is partly due to the relatively low utilization of that center (see discussion below and in Section 5.2.11), as some costs are proportional to the number of occupants. The high estimated per workspace cost associated with the Ballard facility is due to the fact that its pro-forma budget accounts for all costs (such as equipment amortization and full labor costs for the center organizers), whereas the other facilities typically report only direct operating expenses and omit some costs such as the value of donated labor. It is possible that if all the centers completely accounted for their expenses, their cost figures would be comparable. None of the telecommuting centers studied are financially self-supporting at this time. In the long run, however, as employers begin to include telecenters in their office space planning, permanently-assigned space at the parent office might be eliminated for certain employees. The telecenter may become a cost effective alternative location, along with floating offices, client's offices, the home, and even the vehicle.

Participant Description

Most users of the telecenters studied in depth are male professionals. A ratio of approximately two males to one female was found among telecenter users. Their jobs varied, but almost all were highly skilled positions. Engineers, programmers, and managers were common jobs held by telecommuters, while clerical/ secretarial positions were seldom reported. Management has been less likely to allow administrative support workers to telecommute since their jobs often involve frequent face-to-face interaction. But part-time telecommuting can often be arranged where there is mutual cooperation and a willingness to explore creative ways of getting the job done (how and when). It is desirable to extend the personal and societal benefits of telecommuting to as large a segment of the workforce as possible. Thus, it is hoped that future telecenter demonstrations can make an effort to redress this imbalance, although who is allowed to telecommute is ultimately a matter of internal employer policy.

Center Utilization

In this report, a workspace is roughly equivalent to an area in which one person works, and may be an open office cubicle, a partitioned workstation, or in a private office (which may have more than one workspace). Workspace utilization is the percentage of workdays that a space is occupied, and is calculated by dividing the average number of spaces used on a normal workday by the number of spaces available. The mean utilization was 34 percent for the centers studied in depth, but varied from as low as 13 percent to as high as 90 percent (see Table S.3). Occupancy level is only one measure of telecenter success. If the main objective of the project is to research the use of technologies supporting remote work, a low occupancy rate may be less of a concern. However, if the main objective of a center is to evaluate the viability of telecommuting centers as transportation or business strategies, then identifying the factors contributing to low occupancy levels (such as those discussed below) will be very much a concern. Another major objective needed for telecenter success is financial viability. Identifying an optimum occupancy level for a particular telecenter should take into consideration the amount of rental income needed to offset overhead costs.

Transportation-Related Findings

Reducing commute travel was an important objective behind the establishment of many of the telecommuting centers studied here, although detailed *post hoc* evaluations of transportation impacts were not always conducted (or at least published). The data summarized in Table S.4 are either drawn directly from project reports, provided through conversations with site administrators, or calculated from one or both of those two sources. In the second case, it is believed that the numbers provided by site administrators are at least loosely based on attendance logs kept by the center; however they may not represent precise calculations. The tabulations in Table S.4 constitute the first known compilation of transportation impact data across multiple telecenters. They are based on a total of 163 telecommuters. These data support the hypothesis of significant reductions in vehicle-miles traveled from telecenter use. Some of the key findings include an average savings of 93.4 commute miles and 2.8 commute hours per person per center usage. The normal commute for these telecenter users is not only long but slow: they live more

Table S.3
Telecenter Workspace Utilization

Telecenter	(1) Average Number of Spaces Used on a Normal Workday	(2) Number of Spaces Available	(3) % Utilization [(1)/(2)]
Hawaii Telework Center	15.3	17	90
Pacific Bell Satellite Center	4.1	12	34
Ballard Neighborhood Telework Center	0.9	6	15
Washington State Telework Center	8.4	13	65
Apple Valley Telebusiness Workcenter	4.7	12	39
Ontario Telebusiness Workcenter	7.4	24	31
Riverside County Telecommuting WorkCenter	8.9	70	13
Nykvarn Neighborhood Work Center	5.0	9	56
TOTAL	54.7	163	34

* The values presented in this table are based on estimates taken from survey responses, telephone interviews, and literature. Utilization values can vary greatly over time, and thus this table should be interpreted as a "snapshot" in time of telecenter usage.

Table S.4
Estimated Transportation-Related Impacts of Telecenter Use

Telecenter	# of Telecom- muters[1]	Center Usage (Days/Week/ Person)	Commute Miles Saved[2]	Commute Hours Saved[2]	Other Information Given/Used
Hawaii Telework Center	17	4.5	38.46[4]	1.77[4]	Avg. user saves: •$2,500/yr •9,000 mi/yr •350 gal/yr
Washington State Telework Center	22	1.57	50	1.11[5]	•Reduces travel by 60,000 miles annually.
Apple Valley Telebusiness Workcenter	17	1.5	108	2.33	•Saved 50,000 miles in 1992.
Ontario Telebusiness Workcenter	32	1[6]	100[6]	3.5[6]	Avg. user saves: •100 mi/round trip •3-4 hr/trip
Riverside County Telecommuting WorkCenter	40	1[6]	100[6]	3.5[6]	Avg. user saves: •100 mi/round trip •3-4 hr/trip
East Highlands Ranch Telebusiness Center	5	2	150[7]	4[7]	Avg. user saves: •300 mi/week •8 commute hrs/week
Antelope Valley Telebusiness Center	30	1.9	122.6[7]	2.79[7]	Avg. user saves: •233 mi/wk •5.3 hrs/wk
AVERAGE	23.3	1.69[3]	93.36[3]	2.76[3]	

[1]   The number of telecommuters on which the transportation findings are based may differ from numbers shown elsewhere.
[2]   Round trip savings per center usage.
[3]   Averages are weighted by the number of telecommuters at each center.
[4]   Calculated from provided yearly totals.
[5]   Calculated from data provided, assuming an average speed of 45 mph.
[6]   Combined estimate for both Ontario and Riverside centers (provided by IEEP staff).
[7]   Calculated from provided weekly totals.

than four times as far from their normal workplace as the average commuter, and face average commute speeds of 35 mph. A more detailed study of the transportation, energy, and air quality impacts of telecommuting centers is needed, to analyze effects on local congestion, mode choice, non-commute travel, fuel consumption, and emissions.

Implementation Barriers

Cost to Employers

Several barriers to telecenter success have been identified in this report. One of the most important was a disinclination on the part of the tenant employers to pay rents approaching market rate, or indeed, any rent at all. As long as telecommuters retain a desk at their conventional office and telecommute on average only one day a week, this barrier may be extremely difficult to overcome. Claiming hard-to-quantify benefits, such as increased productivity, to offset the added cost is not yet convincing to prospective tenant employers. One idea to address these difficulties would be the institution of full-time telecenter use by designated employees. This would allow the elimination of the main office desk, but might exacerbate the problems of isolation reported in early European experiments with multiple-employer telecommuting centers. Another trend that may make even part-time telecenter use more attractive to employers is the recent interest in the non-territorial office concept. If an employer eliminates a permanent workspace for certain groups of employees, it may be more advantageous to rent space in a telecenter for use on a reservation basis for employees who are in the vicinity. The inclusion of teleconferencing capability at telecenters may make this more viable.

Discomfort with Remote Supervision

Another implementation barrier is discomfort felt by managers faced with the task of effectively supervising remote workers. This seems to have resulted in the restriction of candidate telecommuters to those workers with jobs traditionally seen as independent and professional. In the early stages of the telecenter adoption process this may be acceptable, but unless employer acceptance of telecommuting increases, insufficient market demand for telecenters may not allow

economic viability to be realized. Changes in the traditional form of employee-supervisor relations seem to be leading to a greater acceptance of flexible work options. This, combined with federal and state legislative requirements to reduce congestion and improve air quality, may result in this barrier becoming less significant.

Security of Confidential Information

Concerns have been raised among potential telecenter tenants about the capability of ensuring the confidentiality of organizational information. Housing the employees of competing organizations in the same facility especially brings this fear, since the future of a business can depend on a product idea. Thus, the provision of private offices will be very important in attracting employers of telecommuters, especially full-time telecommuters.

Short-Term Nature of Demonstration Telecenters

It may not be possible to judge the true financial stability of a multiple-employer telecenter (where the center charges market rents that pay for costs) unless there is a commitment to maintaining the facility for a reasonably long period of time, perhaps five to seven years. Only if the telecenter can offer leasable space over the same multi-year periods as competing office facilities, would significant numbers of employers be induced to seriously consider the use of telecenter space as a vital part of their office space requirements.

Distribution of Costs and Benefits

One thread drawing many facets of this study together is an apparent disparity in the distribution of the costs and benefits associated with telecenter operation. In many ways, the primary beneficiaries of a well-functioning multiple-employer urban telecenter are the telecommuters. They exchange long commutes and workplaces that are sometimes not conducive to full productivity for shorter commutes, less supervision, more independence, on-site technical support for computer hardware and software, and quite often, superior workspaces.

Benefits accrue to the population of a region as a whole to the extent that congestion, energy consumption, and air pollution are reduced by a change in telecommuters' travel behavior. However, part-time telecommuting on a large scale does pose several potential problems. It may disrupt existing shared-ride commute arrangements to the parent office such as carpooling, vanpooling and regular use of mass transit facilities, thus leading to an increase in single-occupancy-vehicle commuting. Also, potential congestion, energy, and air quality benefits may be seriously diminished if telecommuters drive to the telecenter. The likelihood of that outcome is reduced by ensuring that easy pedestrian, bicycle or transit access is available to a telecenter.

Direct costs, on the other hand, are incurred by the employers of telecommuters. In the short term, unless rents are completely subsidized for a demonstration telecommuting center, the employer must bear the cost of maintaining two workspaces per telecommuting employee. This puts extreme downward pressure on the rent that telecenters may charge. Employers must also bear the cost of reorganizing work groups to accommodate telecommuting employees and the cost of training managers to properly supervise remotely working employees. In the long term, they will also often be required to pay for the reorganization of space in the primary office.

These are all immediate barriers to employer participation. It may be that multiple-employer telecenters are strongly attractive only in the presence of serious cost drivers like high office space costs that are found in prime locations in downtown business districts. Another driving factor might be a difficult commute which is so unpleasant by any mode of transportation that organizations lose valuable employees. Finally, the presence of stringent employer-based commute trip reduction requirements in federal, state and local legislation may force employers to consider telecommuting.

Summary

The remote work concept of telecommuting arose from a background of tremendous innovation in communication and data processing technology, and growing concerns in several public policy arenas. It is quite likely that both home- and center-based forms of telecommuting and remote

work will co-exist, as they serve different needs with differing degrees of success. Remote work centers will continue to evolve in response to new technology, changing demographics and work practices, and evolving public concerns.

Several recommendations for planning and implementing multiple-employer telecenters are offered as a result of this study. It is believed that these represent key factors that will greatly enhance the prospects for a successful operation. These suggestions are:

1. Define a clear, realistic, and consistent set of goals and objectives to guide project development and to provide a standard against which telecenter success or failure can be measured.

2. Include a thorough and aggressive plan of market research and center promotion, beginning in the implementation phase and continuing through the life of the demonstration.

3. Allow one year to 18 months to plan and implement the telecenter.

4. When long-term viability of the center is an objective (as opposed to short-term market research or demonstration), secure long-term financial commitments up front. Funding over five to seven years, with a business plan to achieve self-sufficiency before the end of that period, is desirable.

5. Spend time on site selection. The criteria should be in accordance with the center goals and objectives and should seek to balance high-quality center features and nearby amenities with cost considerations.

6. Provide private offices for permanent, security-minded tenant-employers. Semi-private workspaces should be acceptable to drop-in users since they will take their work home with them at the end of the day.

7. A full-time, on-site manager should be available to handle administrative, technical support and promotional activities for the center.

8. Combine multiple uses of a single facility, for example as is being done with telecottages in other countries. This combined use should make the telecenter a more viable entity and have favorable community impacts.

9. Develop information, training and possibly incentives to help enable non-professional and non-managerial employees to take advantage of the telecommuting work option.

10. Document and evaluate each new generation of telecenter demonstration. Much has been learned, but much remains to be discovered regarding the successful implementation of multiple-employer telecenters. It is important to determine what factors are important to all center operations and which are key only in certain situations and under certain circumstances.

In conclusion, this report gathers information on remote work center planning, implementation and operation from many sources. It is a review of *current* practice. The different forms that telecenters and related concepts take are adaptations to the environments in which they operate and the goals which they must serve. Given the continued rapid pace of technological and demographic changes that affect the implementation of remote work concepts, new telecenter forms and variations on those that currently exist will undoubtedly emerge. Running through the data from which this report was compiled was a strong note of apparent promise for the future of remote work concepts. In the near term, barriers and many questions regarding optimal implementation and operational strategies remain, but success, for at least some variations on the telecommuting center theme, seems assured.

SECTION 1

INTRODUCTION

1.   INTRODUCTION

The Residential-Area-Based Offices (RABO) Project, which is known informally as the Neighborhood Telecenters Project, is a three-year program underway at the Institute of Transportation Studies (ITS), University of California, Davis. This research program is funded by the Federal Highway Administration (FHWA) and the California Department of Transportation (Caltrans) and is designed to evaluate the value of residential-area-based telecommuting centers as a transportation demand management strategy.

The telecommuting centers, or telecenters, will be offices located in or near residential areas. These offices will be closer to telecommuters' homes than the conventional work site, thereby allowing a shortened, less stressful commute one or more days each week. The residential area-based location is intended to increase the likelihood of commuting to the telecenter by walking or bicycling instead of by automobile.

Caltrans contracted with ITS to plan, develop, operate and evaluate as many as 12 telecenters throughout California. The telecenters for this project will typically be small offices furnished with telephones, computers, facsimile machines, photocopying machines, and possibly receptionists.

The purpose of this report is to collect and analyze as much information as possible about already-established telecenters and other closely related concepts. This report is intended as input to the planning and operation stages of the Neighborhood Telecenters Project. While its primary purpose is to aid in the conduct of the demonstration project, it is anticipated that this document will be of value to a broader range of individuals and organizations in the areas of telecommuting, telecenters, transportation demand management, and economic development.

Table 1.1 lists the opening dates of some key telecommuting centers in the U.S. and abroad. Telecenters have been established for demonstration purposes since at least 1981 when a multiple-employer, neighborhood work center was opened in Marne-la-Vallé, France. The French facility was followed by two other multi-employer telecenters, in Sweden (1982) and Switzerland

Table 1.1
Opening Dates of Key
Telecommuting Centers

Name (Country, if not U.S.)	International	United States
Marne-la-Vallée Neighborhood Work Center (France)	January 1981	
Nykvarn Neighborhood Work Center (Sweden)	November 1982	
Benglen Neighborhood Work Center (Switzerland)	1985	
Pacific Bell Satellite Work Centers		1985 1989
Selecta Contact AB Telecottage (Sweden)	1986	
Jamaica Digiport International (Jamaica)	1988	
Rosenbluth Travel, North Dakota satellite office		1988
Shiki Satellite Office (Japan)	1988	
United Healthcare, Minnesota satellite offices		1988 1989
Kumamoto Resort Office (Japan)	September 1988	
Mitsubishi Materials Ohmiya Satellite Office (Japan)	December 1988	
Hawaii Telework Center		May 1989
Hokkaido Niseko Resort Office (Japan)	Fall 1989	
Azumino Resort Office (Japan)	October 1989	
Moorlands Telecottage (United Kingdom)	December 1989	
Umeå Telecottage (Sweden)	1990	
Ballard Neighborhood Telework Center		Fall 1990
Washington State Telework Center		January 1991
KSP Creative Satellite Office (Japan)	June 1991	
NTT Ageo Satellite Office (Japan)	June 1991	
NTT Kamakura Satellite Office (Japan)	June 1991	

(continued)

**Table 1.1
Opening Dates of Key
Telecommuting Centers
(continued)**

Name (Country, if not United States)	International	United States
NTT Kunabashi Satellite Office (Japan)	June 1991	
Apple Valley Telebusiness Workcenter		October 1991
Ontario Telebusiness Workcenter		October 1991
BC TEL/Bentall Development Satellite Office (Canada)	October 1991	
Riverside County Telecommuting WorkCenter		November 1991
Shonan Creative Office (Japan)	June 1992	
Walcha Telecottage (Australia)	July 1992	
East Highlands Ranch Telebusiness Center		December 1992
Antelope Valley Telebusiness Center		January 1993
New York Telephone Telecommuting Work Center		March 1993

(1985). In the U.S., the first known single-employer telecommuting center was opened by Pacific Bell in 1985, and the first multiple-employer telework center was established by the State of Hawaii in 1989. Table 1.1 is not an exhaustive list. For example, scores of telecottages have sprung up in continental Europe, the United Kingdom, and Australia since the first ones opened in Sweden in the mid-1980s. However, the table does contain all known multiple-employer urban telecommuting centers open prior to Spring 1993, the concept which is the primary focus of the RABO Project.

There is a clear acceleration in the implementation of telecommuting centers and related concepts in the late 1980s and early 1990s. Telecenter starts peaked in 1991 with the opening of nine facilities. The recessionary economy has probably contributed to a short-term lull in activity, but at least in the U.S., planning is underway for a large number of new telecommuting centers to be opened in late 1993 and early 1994.

Despite almost a decade of experimentation world-wide and, in some cases, quite successful operation, the concept of a telecenter remains relatively obscure. This lack of awareness is slowly changing. A greater problem, and one which this report seeks to address, is the absence of any substantial compendium and analysis of information about those telecenters which have been established. The fact that this information has not been previously compiled does not mean that it does not exist. Indeed, a plethora of sources are available and have been examined for the creation of this report -- from glossy public relations brochures and articles in local and national newspapers and magazines, to detailed project reports and articles in scholarly journals.

This report presents information on telecenters and other closely-related concepts both in the U.S. and in other countries. It is organized into 8 major sections. Following this introduction, Section 2 provides information on the development of the telecenter concept and on telecommuting center-related terms and definitions; Section 3 presents short descriptions of telecenters and related concepts in the United States; Section 4 describes remote work center experience and demonstrations in other countries; Section 5 presents and analyzes case studies of eight telecenters; Section 6 provides an analysis of information collected in this report, conclusions and recommendations for future implementation and long term focus; Section 7 contains a list of individuals and organizations involved in the development of remote work centers and related concepts; and Section 8 is the bibliography of references used in the compilation of this report. Two appendices contain reproduced floor plans for several of the facilities described herein, and tabulated responses to the case study questionnaire.

SECTION 2

DEVELOPMENT OF THE
TELECOMMUTING CENTER CONCEPT

2.   DEVELOPMENT OF THE TELECOMMUTING CENTER CONCEPT

"...the civilization ... had mistaken the functions of the system, and had used it for bringing people to things, instead of for bringing things to people."

- "The Machine Stops", E.M. Forster (1909)

Despite a century of revolutionary change in telecommunications and information technologies, we still primarily use our transportation system to "bring people to things" (work, stores, school, etc.) rather than using our present technology to bring the needed things to us. However, this may be changing. The substitution of telecommunications for travel is taking place gradually in many ways. The terms teleshopping, video-dating, telelearning, e-mail, telework, voice mail, telecommuting, just-in-time inventory and telebusiness reflect a growing interdependence in all areas between telecommunications technology and human activities. In many cases, electronic communications are replacing face-to-face visits and the concomitant travel.

The telecommuting center concept has risen out of the on-going evolution of telecommunications technology and the expanding potential for substitution of that technology for travel. The idea of substituting telecommunications for travel is not new. It existed in speculative fiction long before becoming the subject of study and implementation by the public and private sectors. The telecommuting center, or telecenter, is one of the more recent variations on a theme that has been "playing" for the better part of a century.

2.1   Literary Antecedents

Turn of the century utopian speculative prose, from which the science fiction genre arose, occasionally addressed the substitution of telecommunications for travel. As early as 1899, H.G. Wells envisioned the use of teleconferencing (both audio and video) to substitute for the travel of thousands of people in the story "When the Sleeper Wakes". These people did not travel to see the heroic protagonist who, like Rip Van Winkle, awoke after many years of sleep, but watched and listened near an oval disc:

"...the picture on the oval disc paled and vanished as the light jerked back again. These are kineto-tele-photographs. As you bow to the people here -- all over the world myriads of people, packed and still in darkened halls, will see you also. In black and white of course -- and you will hear their shouts."

While H.G. Wells had foreseen a future possibility where telecommunications could replace the need for travel, he did not (at that time) envision transmission of images in full color.

In his 1909 story "The Machine Stops", E.M. Forster introduced teleconferencing as a means of home-based telecommuting. The main character, a female lecturer, gave lectures primarily from home rather than at a university, to an audience also dispersed in homes. More recent science fiction is often based on a society with highly advanced telecommunications and information technologies which allows the protagonists to accomplish a great deal without physical travel.

2.2   Early Scholarly Treatment

While implementation of telecommuting to date has been almost exclusively home-based, the concept of telecommuting centers has been present in the academic literature as long as the concept of telecommuting itself.   For example, Memmott (1963) used the term "suburban workcenter" to describe a location closer to home than to the main workplace, from which a "business executive" could work effectively using telecommunications technology to stay in touch with associates. Healy (1968) used the term "neighborhood remote work center" to refer to a telecommuting facility "within walking distance of the employee's home." Healy notes that such centers have some advantages over working from home, including "greater efficiency through sharing of facilities, isolation from the home environment, and contact with fellow employees." It is unclear whether Healy intended "sharing of facilities" to mean multiple employers sharing a building or various users, possibly from the same company, sharing equipment such as printers and photocopiers within the same building. If the former, then this represents one of the first allusions to a multi-employer telecommuting center.

In the 1970s, researchers performed a number of studies on the use of telecommunications to reduce travel and save energy. For example, Harkness (1977) conducted a technology assessment

for the Stanford Research Institute that examined the potential impact on energy consumption of working at home or in "neighborhood office centers near home." While acknowledging the need for a great deal of further study, Harkness tentatively estimated that almost half the workforce could "telework" in this fashion. At that level, he projected that in 1985, 320,000 barrels of oil per day could be saved by working from home, or 238,000 barrels per day could be saved using neighborhood office centers. These figures represent 1.40% or 1.02%, respectively, of the total estimated petroleum consumption in 1985, a fairly modest savings from a dramatic change in work style for half the labor force. On the other hand, Harkness notes "the FEA [Federal Energy Administration, predecessor to the U.S. Department of Energy] estimates that a capital investment of $8.6 billion in conservation technology would be justified by every 100,000 barrels per day saved" (1977, p. xi).

Another landmark study was conducted by Nilles, Carlson, Gray and Hanneman (1976). They proposed four evolutionary phases or forms of organizational structures as related to the potential applications of telecommunications technology. These phases, illustrated in Figure 2.1, are centralization, fragmentation, dispersion, and diffusion. While Nilles, *et al.* focused their attention specifically on firms in the information industry, their ideas are more broadly applicable.

Centralization: In 1976, this phase represented the form of most industries. In this phase, all administrative operations are located at a single site, with workers divided into functional groups such as data processing, accounting, human resources, strategic planning, and so on.

Fragmentation: In this phase, sub-units of a central organization break off and relocate elsewhere. The company units maintain contact via telecommunications technology. A variation of fragmentation commonly seen is the branch office (such as in banks, where the fragmented unit is a miniature replica of the parent). The branch office should not be confused with a single-employer telecommuting office. Fragmentation may actually increase the amount of commuting, at least in the short-term, since some existing employees are likely to have to travel farther to work than before the sub-unit moved.

Figure 2.1

Four Stages of Organizational Evolution

Centralization

Fragmentation

Dispersion

Diffusion

◎   Corporate headquarters

○   Local work centers

■   Telecommunications switching centers

○   Individual employees of specialized service organizations

———   Two—way telecommunications links

SOURCE: Nilles *et al.* (1976)   2-4
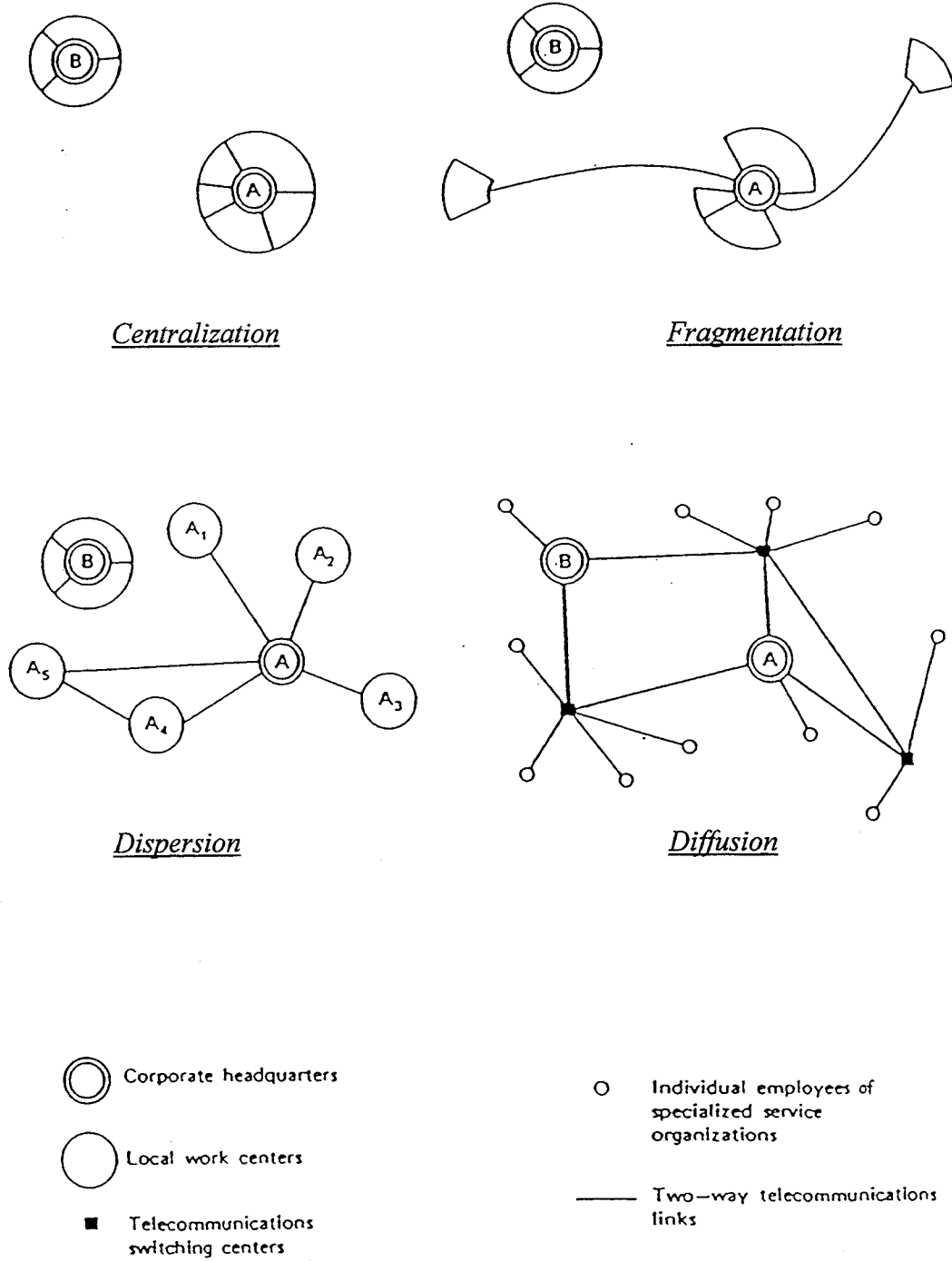
Dispersion: In the third stage of decentralization, a firm establishes a number of work locations throughout a city. However, employees now work at the location closest to their homes, thus reducing the commute distance for all employees. The workers obtain instructions through a "central" computer instead of face-to-face communication with a manager at the main office. The single-employer telecommuting center stems from this concept of dispersion. That is, employees travel shorter distances to work than they would if they were commuting to the central office. Supervisors manage by use of telecommunications rather than line-of-sight.

Diffusion: In the final stage of the evolutionary process, a firm maintains a relatively small core staff, either dispersed or at a single location. Special types of work and/or peaks in work load are handled by individual, independently-contracted workers who provide their services through a telecommunications network to several different firms or clients (see corporations A and B in Figure 2.1). This type of work arrangement is common in the legal and medical professions. Working at home represents the extreme case of diffusion. However, these independent contractors could also be located together in an office environment which would represent a form of telecommuting center catering to multiple but very small employers.

2.3 Telecommuting Center-Related Terms and Definitions

2.3.1 Some Common Terminology; Terminology Used in this Report

It has already been seen that a variety of terms are used to refer to the telecommuting center concept. Nilles (1988) offers one useful set of definitions. He first distinguishes "regional center telecommuting" from home-based telecommuting, and then further classifies the former type into "satellite center", "local center," and "neighborhood center" telecommuting. Satellite centers are defined as "facilities set up by large organizations to house only their own telecommuting staff." Users of the satellite center would generally have a much shorter commute to work since the center is located closer to their homes than the main office. Local centers are described as "facilities that house a number of telecommuters from different organizations ... in a single structure." Except for serving multiple employers instead of a single employer, these centers are

the same as satellite centers. Neighborhood centers are smaller facilities that provide space for only a few telecommuters. They act as mini-satellite or local centers. This type of center is located within walking distance of the telecommuter's home.

These distinctions have not been uniformly observed. For example, the terms "local work center" and "satellite office" have often been used generically to refer to telecommuting centers, without distinguishing whether they are single- or multiple-employer facilities and how close they are to the telecommuter's home. Other terms are also employed. In particular, "teleworking" is commonly used as a synonym for telecommuting, especially in Europe and Japan, but also in the United States. Consequently, the phrase "telework center" has appeared in the names of facilities in Hawaii (see Sections 3.2.3 and 5.1.1) and Washington State (see Sections 3.2.5, 5.1.2, and 5.1.3), and was at one point being used in the planning of facilities in Kentucky (see Section 3.5.3; Gordon, 1991a).

In 1991, however, the telecommuting community was informed that the words "telework" and "telework center" had been trademarked by a California consulting firm, and that use of those words without acknowledgement of the trademark could bring about legal action. This announcement brought a storm of protest, both in the U.S. and abroad, since there was believed to be ample evidence that the terms in question were in the public domain (Gordon, 1991a; Gordon 1991b; Gordon 1991c). While the costs of litigation to fight the trademark were considered prohibitive, the terms have continued to surface in the popular press and elsewhere, and it appears that the trademark is not currently being defended. Nevertheless, until recently, newer telecommuting facilities in the U.S. have avoided using the word telework in their names, giving rise to titles such as "Telebusiness Workcenter" (see Section 3.2.2) and "Alternative Worksite Center" (see Section 3.2.4).

The telecommuting center concept is dynamic and, as this report shows, is being implemented in a variety of ways. Hence, the terminology will likely continue to evolve as well. With a few more years of implementation experience, it may be possible to develop a robust typology of variations on the telecommuting center idea. In the meantime, however, we have chosen in this

report simply to use the generic phrase "telecommuting center", modified as appropriate with adjectives such as "single-employer", "multi-employer", "neighborhood", and "rural".

For brevity, we often abridge the phrase "telecommuting center" to "telecenter". The word telecenter is achieving widespread circulation in the U.S. and internationally, apparently having been invented more or less independently in a number of places (Gordon, 1992b; Gordon, 1992f; Gordon, 1993c; Henricks, 1993). And while UC Davis' use of "telecenter" has also been challenged by a recently-incorporated California firm whose name contains the word (Harris, 1993), the challenge is considered to be without legal merit (MacDonald, 1993).

2.3.2 International Terminology

It is apparent that there is no standard terminology within the U.S. for referring to telecommuting centers. Broadening the scope internationally only complicates the picture further. Around the world, numerous terms are used to denote telecommuting centers and related concepts. However, this diversity actually reflects a diversity of application of the idea of remote work facilities, in which variations in terminology are developed to label different variations on the theme. Some of these terms are defined below, and examples are given later in this report in Sections 3 and 4.

Community TeleService Centre (CTSC): A remote work center having advanced telecommunications and computing equipment, which is able to link to other regions in order to promote local employment and business prospects. Such centers are also called telecottages.

Creative Office: A small business incubator focusing on the creative arts. Rather than a facility to which an employer would send workers, the creative office is used primarily by individual entrepreneurs for personal goals. The facility, predominantly funded by individual rather than corporate investors, is intended to encourage the use of human resources that might otherwise be lost: the senior citizen, the homemaker, the disabled. Currently, the creative office concept in this particular form is unique to Japan.

Floating Office: Includes a variety of practices in which an employer does not have a long-term, permanently-assigned office space for all workers (see Section 3.7).

Non-Territorial Office: Same as floating office.

Resort Office: An office located in a resort area with telecommunications links to primary offices elsewhere. Users visit the resort office for short periods of a few days or weeks, either alone or with a work team. Family members sometimes accompany workers on their visit. Currently found only in Japan, it offers the worker a short-term balance between work and play.

Satellite Office: Often used generically to mean telecommuting center, whether for single or multiple employers. The term is in common use in Japan.

Telecottage: A small center, typically located in a rural area, that provides work spaces with advanced telecommunications and data links for use by the local population. Job training, tele-services brokering and other services are often offered by a telecottage. This concept is similar to that of the rural telecenter in the U.S. (see Section 3.5). Telecottages originated in Scandinavia in 1985 and are spreading rapidly to other parts of the globe.

Unassigned Office: Same as floating office.

2.3.3   Distinctions Among Related Concepts

How is a telecommuting center different from an ordinary branch office? Are all remote workers telecommuters? While in many contexts the answers to these types of questions may rightfully be, "Who cares?", in other situations certain distinctions are consequential. For example, in developing policy to promote telecommuting as a trip reduction strategy, it is important to determine whether commuting will actually be reduced by the intended policy.

This was a concern of the South Coast (California) Air Quality Management District (SCAQMD) in 1990, when it was weighing amendments to its commute trip reduction Regulation 15

(SCAQMD, 1992), that would give trip reduction credit for telecommuting centers. The SCAQMD did not want a company to claim that a conventional branch office or decentralized function (such as data processing or accounting) was a telecommuting center, nor did it want an employer to assert that all its field workers should automatically be considered telecommuters.

SCAQMD requested input on these issues from the Telecommuting Advisory Council (TAC), an international organization (based in Los Angeles) that promotes the exchange of information about telecommuting. Mokhtarian (1991) reported on the TAC's recommendations, together with additional discussion about defining telecommuting. She proposed two criteria for distinguishing telecommuting from other types of remote work: *remote management* and *commute reduction*. Some forms of work may involve remote management but not necessarily reduce the commute, and vice versa. For example, field work involves remote management, but if workers must still physically report to a conventional office at the beginning and end of the workday, commute travel is not eliminated. Conversely, establishing a new branch office in an area and staffing it mostly with nearby residents *may* reduce commute travel (if the new employees were previously employed farther away), but would entail on-site supervision.

In many cases, the question of whether the commute is reduced cannot be answered unequivocally for a specific work type. Rather, it depends on what the alternative is for each individual involved: working at a more distant location (in which case the new choice reduces commute travel), or not working at all (in which case the new choice increases travel).

On the question of defining telecommuting centers specifically, two criteria are especially relevant here. The first criterion, *location-independence*, further distinguishes telecommuting from field work:

> "Work done at a telecommuting center should be capable of being performed anywhere there are, at most, the same facilities available as in the primary office. It should not have to be performed at a specific location because of properties intrinsic to that location" (Mokhtarian, 1991, p.16).

The second criterion, relating to *organizational structure*, distinguishes a telecenter from a branch office or decentralized function:

> "A telecommuting center is characterized by the absence of a self-contained pyramidal organizational structure. Telecommuting staff should report to off-site managers (except in the case where both manager and staff reduce their commutes by working at the same telecommuting center), and telecommuting managers should have at least one off-site staff person reporting to them" (Mokhtarian, 1991, p.17).

This distinction is illustrated in Figure 2.2 where "on-site" in the lower half refers to the telecommuting center, not the primary worksite.

Thus, employees work at a conventional office because that is where their job is, regardless of where they live. Telecommuters work at a telecommuting center because they live closer to it than to the regular office, regardless of what their job is (or where their manager is).

As with telecommuting terminology generally, the distinctions described above have not been universally observed. For example, the decentralization of a functional unit such as data processing to a remote area (or even off-shore) has sometimes been referred to as a telecommuting center, despite the presence of an on-site supervisor and the fact that commute reduction may not occur. In other cases, occupants of a "telecommuting center" are more likely to be self-employed than salaried employees of a distant organization. Several of these types of cases are described in this report. These variations on the theme of telecommuting may offer a number of benefits, such as travel reduction and economic development for remote areas. A great deal can and should be learned from them, regardless of how they are classified.

Figure 2.2

Comparison of Conventional
and Telecommuting Center Organizations

Conventional Organization (including branch
office and decentralized function)
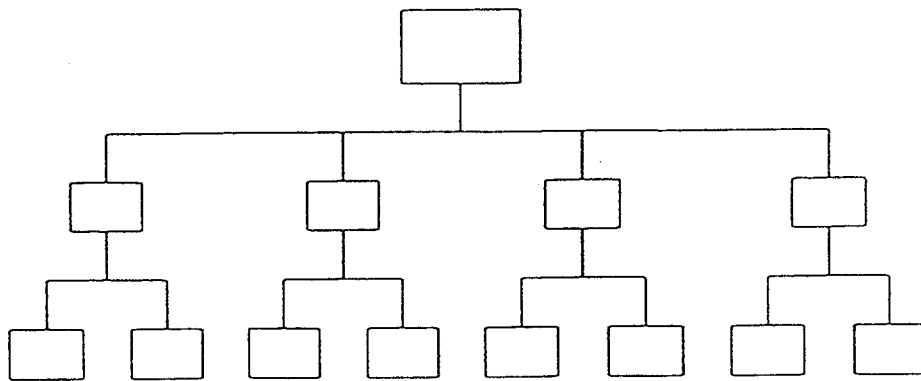
Telecommuting Center Organization
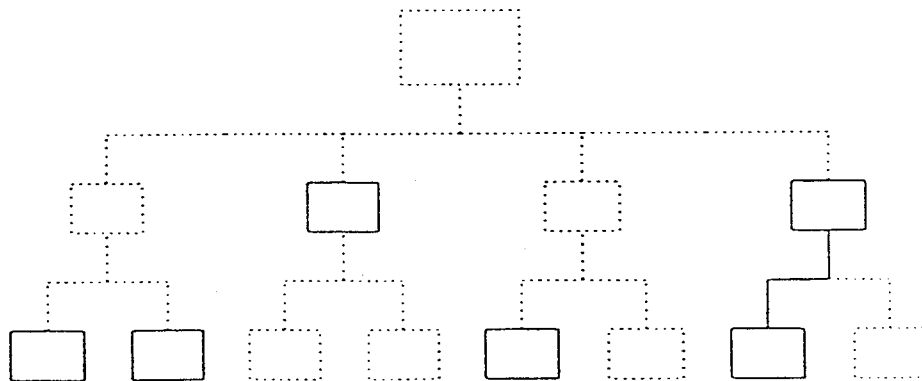
☐ on-site   ⬚ off-site

2.4   Telecommuting from Home versus from a Center

At first glance, working from home may appear to be the ideal form of telecommuting. For the employee, potential advantages include zero commute time, not having to dress up, control over the work environment, and greater ability to deal with family responsibilities. For the employer, home-based telecommuting is typically rent-free and lower-cost (even supplying a computer may not be necessary as many employees are willing to furnish their own), is easier to organize than a telecommuting center, and requires no long-term commitment. From a transportation planning standpoint, complete elimination of the commute trip (at least a vehicular trip) offers the greatest benefit to society.

So, why go to the trouble to set up telecommuting centers? The reason is that telecenters have a number of potential advantages over working from home, some of which have been identified above (Healy, 1968; Mokhtarian, 1991). For many situations, telecommuting centers may be the optimum balance -- offering most of the benefits of telecommuting without most of the disadvantages of working from home.

For the employee, some boundaries between work and home may be desirable (Richter, 1990; Shamir, 1991). The commute trip may provide useful transition time between one's job and domestic roles (Salomon, 1985). The home may not be a desirable place to work in some cases: there may not be adequate space, there may be distractions (TV, chores, pets, other household members), there may be unpleasant conflicts among household members, and there may be more temptations to commit destructive behaviors such as overeating, smoking, and substance abuse. And telecommuting centers generally offer greater opportunities for social and possibly professional interaction than the home.

There are potential advantages of telecenters for the employer as well. Management may believe that working from a center provides a more professional image than working from home. The job may require specialized equipment that is too expensive to place in individual homes, but that is cost-effective when shared among several workers. A supervisor may feel more confident that the employee is actually working when at the center. It may be easier to protect confidential data

in the relatively controllable environment of a center. And the employer's worker and property liability may be better defined and controlled at a center than at home.

There may also be transportation advantages to the widespread use of telecommuting centers. It is true that for any individual occasion, the reduction in commute travel would be smaller for a telecenter than it would be for home-based telecommuting. However, center-based employees may telecommute more often on average than home-based workers (because isolation is less of a factor and because the center is better-equipped). Furthermore, some people who would not work from home may be able or willing to telecommute from a center. Thus, if well-planned, the transportation benefits of telecommuting centers should complement those of home-based telecommuting, not detract from them.

Another societal concern is the equity issue associated with having telecommuting available only to those who are able and willing to work from home. Affluent professional workers are likely to have adequate space in the home and be able to afford equipment (such as a personal computer) and other costs associated with telecommuting. But to the extent that telecommuting has positive net benefits, it is desirable to extend those benefits to as broad a segment of the workforce as possible. Telecommuting centers appear to be a logical way for the advantages of telecommuting to be realized by workers whose ability to telecommute from home may be inhibited by financial constraints.

It was mentioned earlier that virtually all telecommuting to date has been home-based, albeit mostly part-time. Experts agree that full-time work at home will be the least popular form of telecommuting. However, predicting what proportions of telecommuting will eventually be home-based (including part-time) versus center-based is more speculative. Nilles (1988) poses three scenarios for the future adoption of telecommuting. In his "low-acceptance" scenario, part-time work-at-home predominates, with low levels overall (7.7 million telecommuters by the year 2005). His "nominal" and "landslide" scenarios are predicated on the widespread adoption of telecommuting centers, making telecommuting accessible to greater numbers of workers (41.6 and 76.8 million total telecommuters by 2005, respectively).

While some people see an evolution from mostly home-based to mostly center-based telecommuting, others see the opposite path. That is, they envision telecommuting centers as an interim phase between conventional work and the ultimate outcome of working at home -- "training wheels for homebased telecommuters", as Kevin Ham of the Coronado Transportation Management Association expressed it (Brydolf, 1993). It is believed that once employers get used to the less-threatening idea of telecommuting from centers, they will be willing to take the more radical step of letting employees work from home. Although this view does not reflect the bulk of current experience, it may well be the case for many employers in the future.

SECTION 3

TELECENTERS AND RELATED CONCEPTS

IN THE UNITED STATES

3. TELECENTERS AND RELATED CONCEPTS IN THE UNITED STATES

There is a growing interest in telecommuting and telecenters in all parts of the United States. This is fueled in part by new transportation and air quality legislation that encourages innovative alternatives to the single-occupancy vehicle commute, that places requirements on employers to attempt to reduce their employees' use of the automobile for commuting, and that emphasizes new approaches to highway congestion management. It is also fueled by the increasing sophistication and integration of new information and telecommunication technologies.

The prospects for successful remote work facilities like telecenters are intriguing. While there is sufficient evidence that the technical requirements of such facilities can be met today, the record on financial viability is much less clear. On one hand, the involvement of the private sector as documented in several sections of this report lends credence to the idea that financial viability can be obtained. On the other, it is too early to make definitive pronouncements as to the organizational structures best suited to promoting the long-term existence of telecenters or the best institutional forms for capturing desirable social benefits.

There is a growing interest in telecenters within the public sector. The first multiple-employer telecenter was established in Hawaii in 1985 as a public-sector-initiated demonstration. Since then, at least twenty additional facilities have been established or are planned with public-sector sponsorship, including the 12 facilities currently under consideration as part of the RABO Program described in Section 1.

This section documents the increasing number of telecenters and related activities. A variety of both public- and private-sector ventures are identified. This portion of the report is organized into the following subsections: a brief description of the types of remote work facilities encountered; multi-employer telecenters in California, Hawaii, the Washington D.C. area and the Puget Sound region of Washington State; single-employer facilities in California, Illinois and New York; urban executive office suites in California; rural telecenters in Colorado, Kansas, Kentucky, Minnesota, North Dakota and Washington State; related concepts of residential and

mixed-use developments in the Sacramento, California area; and non-territorial and other office concepts related to telecenters.

The material in this section was obtained through a variety of sources, including questionnaires sent to telecommuting center site administrators and project managers, telephone interviews, on-site visits, newspaper, magazine, and newsletter articles, research reports, and academic journal articles. Note that many of these sources reflect the viewpoints of project managers and consultants associated with a particular project, and as such may contain a certain amount of bias.

3.1 Types of Remote Work Facilities in the United States

Telecenters and related remote work concepts come in a variety of institutional forms. A facility can serve the employees of one or more employers. They can be targeted at executives and entrepreneurs, or at non-supervisory professional, technical and clerical employees. Telecenters are found in urban, suburban and rural settings. The funding for these facilities can be from the public and/or private sectors, and runs the gamut from outright monetary awards and matching grants to in-kind donations of staff time, office furniture, equipment and space. Developers of residential and mixed-use projects are beginning to specifically incorporate technological and other facility design features that make remote work, from home or a nearby center, possible. And organizations are experimenting with non-territorial offices and other telecenter-related office concepts like "hoteling", mobile offices, and marketing surplus workspaces to other employers for use as telecommuting offices.

For the purposes of this report, telecenters and related concepts in the U.S. have been arranged into several classifications. There is some overlap between the categories so that certain facilities could be assigned elsewhere with little difficulty. However, the assignments made are consistent and provide a means of organizing an otherwise unwieldy mass of information. The six categories into which the telecenters and their cousins have been placed are described below.

Urban telecenters: multi-employer telecommuting centers - A facility of this type provides office space to employees of more than one employer. Tenant employers can be from the public sector, the private sector, or both. These centers house from six to one-hundred workspaces which can be occupied by telecommuters on a full-time or part-time basis.

Urban telecenters: single-employer satellite work centers - This type of telecenter is similar to the multi-employer telecenter except that only workers from one organization are located at the facility. For the purposes of this report, a center used exclusively by employees of one governmental entity (e.g., the State of California) is considered a single-employer satellite work center, even though telecommuters may come from many branches or agencies. These satellite centers typically provide between fifteen and twenty workspaces for use, often on a drop-in basis. However, much larger regional facilities (100 or more workspaces) have been discussed, and seem likely to appear in the future.

Urban executive office suites - Executive office suites are closely related to neighborhood telecenters. In both facilities, tenants from many companies share office space, equipment and support staff. The differences between the two concepts are important, however. Executive suites are owned and operated solely in the private sector and tend to cater to an upscale clientele of travelling executives, regional sales staff, and entrepreneurs rather than to non-supervisory employees. The suites are also typically found on prime commercial real estate rather than adjacent to residential areas.

Rural remote work centers - The purpose of a rural remote work center is not so much to reduce travel or improve air quality, as it is to promote economic growth in areas away from urban centers. These facilities often contain more than just a worksite. A mixture of community activity and economic development services are often provided. Some of these ancillary services include skills training for successful remote working and facilities for remote education. These centers are similar to the telecottage and the community teleservice centre concepts found in other countries and described in Section 4. Rural remote work centers are typically fairly small facilities, although some can accommodate more than one hundred local workers.

Residential and mixed-use developments - There is growing interest by developers of residential and mixed-use communities in including the telecommunications infrastructure and physical space required to facilitate remote work. Of particular relevance to this report are planned communities and apartment complexes that are experimenting (or planning to experiment) with the provision of a small business center. Similar to neighborhood telecenters, they can provide workstations for the occasional drop-in user, or business support services to those residents who work or telecommute from home.

Non-territorial offices and other related concepts - Another class of telecenter-like facilities is the non-territorial office and other innovative office concepts. These concepts are all some form of non-home-based remote work. Some companies are reporting substantial savings by consolidating conventional office space used by mobile workers like field workers and sales staff. Mobile workers are being asked to use "unassigned offices", offices which are not permanently assigned to any one employee but are reserved on an as-needed basis for times when the worker must come into the parent office.

3.2 Urban Telecenters: Multi-Employer Telecommuting Centers

Multiple-employer telecommuting centers are arguably the most difficult form of telecommuting to implement. They involve not only the perceived managerial risks of remote work (an issue shared with other forms of telecommuting) and the cost of an additional facility besides the primary office (an issue shared with single-employer telecenters), but also intricate coordination among a number of employers and other parties. Thus, it is at first glance rather astonishing that so many multi-employer facilities have been opened or are in advanced stages of planning. However, it is important to understand that all of these facilities are demonstration projects, heavily subsidized by public-sector, and usually private-sector, funding. It is perhaps precisely because the multi-employer facility is difficult to implement that numerous demonstrations are needed before the concept will take root on its own (if, indeed, it ever does).

The potential advantages of telecenters in general over home-based telecommuting have been discussed in Section 2. But one might ask why multi-employer telecenters are worth the bother, if the single-employer satellite work center is so much simpler to implement. Potential advantages of multi-employer facilities include:

1) *Higher marketability to small and medium-sized businesses*: These businesses do not need and could not afford to support stand-alone satellite work centers, but could take advantage of the economies of scale offered by a shared facility.

2) *Low-risk opportunity for large employers to test the concept*: Multi-employer centers enable large employers to test the concept of center-based telecommuting without the financial and organizational commitment that would be required to establish their own telecenters. If an employer samples telecenters with real world trials and finds that the concept works in practice with its employees, the employer could then proceed to develop its own telecenters which may more closely meet its particular needs. Thus, multi-employer telecenters could serve as single-employer telecenter incubators.

3) *Greater potential for reducing commute travel*: Other things being equal, the closer the telecenter is to the employee's home, the greater the amount of commute travel that will be reduced. But the smaller the telecenter's employee recruitment area, the more likely that it will need to be a shared facility, since it may require a number of employers to provide enough telecommuters to make the center economically feasible.

There is a boundary case between single- and multi-employer telecenters: the situation in which the tenants of a center are different departments of the same large employer (e.g., State or Federal government). On one hand, there may be certain administrative economies to dealing with a single employer, however large. On the other hand, the multiple agencies of a given large employer can be as varied as completely different organizations. David Fleming, former director of the State of California telecommuting program, notes:

"On the surface one might assume working with a large employer, such as the State of California, would yield some economies. Beneath that surface we found that organizational cultures are just as diverse as you might find among all employers, large and small. Organizational diversity was found even within the smallest unit levels of California's government. That diversity included an array of management mindsets, leadership styles, and personnel and equipment policies. The lesson learned is to expect, honor and appreciate this diversity. Having experienced these differences, I am convinced that it would be almost as complex to run a single-employer telecenter as it is a multi-employer telecenter" (Fleming, 1993).

In this report, telecenters whose tenants are all units of the same organization are discussed under Section 3.3. The exception is the Hawaii Telework Center. While it is currently a state-only facility, it was initially a public-private joint venture, and hence is described in Section 3.2.3 below. The Mineola, New York, facility, on the other hand, is planned eventually to be a multi-employer telecenter, but since initially it will have only a single employer, it is presented in Section 3.3.4.

The descriptions below provide general information on multi-employer telecommuting centers operating and planned in the United States. Sections 3.2.1 - 3.2.5 discuss former, current, and planned telecenters in Northern California, Southern California, Hawaii, the Washington D.C. area, and Washington State, respectively. A more comprehensive description of some of these centers can be found among the case studies in Section 5 of this report.

3.2.1 California, San Francisco Bay Area

The Metropolitan Transportation Commission (MTC), in partnership with the 680/580 Corridor Transportation Association (a private, non-profit corporation and Transportation Management Association), the Contra Costa Transportation Authority (CCTA), FHWA, the Federal Transit Administration (FTA), the State of California, and other public agencies and private sector interests, is implementing two prototype telecenters as part of the Bay Area Telecommuting Development Program (BATDP) (680/580 Corridor Transportation Association, 1991). The purpose and ultimate goal of BATDP is to work with area employers, developers, and various government agencies to promote telecommuting through development of a series of regional

telecommuting centers as well as some home-based telecommuting arrangements. Success with BATDP could lead to the establishment of financially independent telecommuting centers and to an increase in home-based telecommuting. However, if the goal of self-sustaining, financial independence proves impossible to attain, BATDP will attempt to estimate the public subsidy required for efficient telecenter operation. BATDP will also analyze the costs and benefits of telecommuting centers compared to other Transportation Demand Management (TDM) strategies. Program design, the first phase of BATDP, has many components including: design of a comprehensive program, development of an implementation strategy, development of a funding plan, and design of evaluation methodology. Phase 1 was completed in the summer of 1993 (Hirsch, 1993).

The goal of the second phase of BATDP, initial center deployment, is to implement and operate two prototype telecenters. San Jose and Concord have been chosen as the sites for the two centers, which opened in September 1993 and are expected to operate for at least one year (Hirsch, 1993). It costs $600 a month to rent a private office and $400 to rent a cubicle in each of these centers. Child care referral services are offered at the centers, and videoconferencing will be made available if there is sufficient demand for it.

The prototype telecenters are expected to act as "incubators" that will encourage private sector development of additional telework centers (Phase 3) with little or no public subsidy. Information and experience gained from implementing and operating the prototype centers will be valuable when Phase 3 of BATDP is undertaken. Experience with the prototype centers may help create interest and momentum for the full deployment effort with Bay Area employers, developers, and elected officials.

The 680/580 Corridor Transportation Association, in cooperation with its membership, Pacific Bell, Chevron USA, Sunset Development Company, Prudential, Windemere, and Shapell Industries, developed a proposed budget of about $1 million for Phases 1 and 2 of BATDP (680/580 Corridor Transportation Association, 1991). This includes an appropriation of $150,000

from the state Petroleum Violation Escrow Account (PVEA) to Contra Costa County for the initial phase of the Bay Area Telecommuting Center Development Program (California, 1991).

3.2.2   California, Southern

In 1990, the California Department of General Services, in coordination with the California Department of Transportation (Caltrans), was authorized to conduct a telecommuting center pilot project in Southern California (California, 1990 and 1991). The purpose of the project was to provide private sector employees in Orange, Riverside and designated portions of San Bernardino Counties with an alternative to commuting between home and their usual place of work. Thus, the goals of this project were to reduce the number of commuter trips (which total approximately 460,000 trips per work day) from Riverside and San Bernardino Counties into Los Angeles and Orange Counties, and to demonstrate telecommuting as a work place alternative (SCAQMD, 1992).

The demonstration program was implemented as a partnership between state and local governments and private business. The partners include the State of California, Riverside County Transportation Commission, San Bernardino Associated Governments (SanBAG), Pacific Bell, GTE, IBM and many other businesses and public sector organizations. Funding for the pilot project came from several sources. The State Petroleum Violation Escrow Account provided $100,000 for each of three telecenters. For the two San Bernardino County centers (Ontario and Apple Valley), SanBAG donated $100,000, and the Inland Empire Economic Council, Centremark/One Lakeshore Center, Commuter Transportation Services Inc., Contel of California, GTE, Haworth, IBM, San Bernardino County Air Pollution Control District, South Coast Air Quality Management District, and Southern California Edison each contributed more than $50,000 (Atwood, 1991).

One telecenter was located in Riverside County and two were located in San Bernardino County. The two telecommuting centers in San Bernardino County, the Apple Valley and the Ontario Telebusiness Work Centers, opened in October 1991. They were managed by the Inland Empire

Economic Council (IEEC) in San Bernardino County (Atwood, 1991). The Riverside County telecommuting center opened in November 1991 and was managed by the Economic Development Partnership (EDP).

At each center, a workspace in an office environment was rented to employers for $100/month, compared to a market rate of $800/month. The rent included use of common equipment, conference areas and other office facilities twenty-four hours/day (South Coast AQMD, 1992). These services were provided below cost to encourage adoption of the telecommuting work option by the private sector.

The three "Inland Empire" (a local term referring to the Riverside and San Bernardino County areas) telecenters are still in operation. The Riverside and Ontario centers are now under the leadership of the Inland Empire Economic Partnership (IEEP, an economic development council formed January 1, 1993 by the merger of IEEC and EDP). The Apple Valley center is now managed by the Mojave Desert Air Quality Management District (Peterson, 1993d). A fourth telecommuting center, initially under the management of the IEEP, opened in East Highlands (San Bernardino County) in December 1992. As discussed below and in Section 5, these four facilities comprise a variety of sizes and locations (rural strip commercial, light industrial, residential).

The four Inland Empire facilities have benefited from shared resources, including routine information exchange among site administrators, loaned technical support among sites, and common marketing programs. The latter includes a recently-completed marketing video and a seminar for employers expressing interest in telecommuting as a strategy for satisfying the requirements of air quality Regulation XV.

An additional center, managed by the County of Los Angeles, opened in Lancaster (the Antelope Valley area of Los Angeles County) in January 1993. Figure 3.1 shows the locations of the five Southern California telecenters. Planning for several additional Southern California telecenters is also underway. For example, demand for telecommuting space is perceived to be so strong in Santa Clarita Valley that local officials are expecting to open a telecommuting center there in the

Lancaster

Apple Valley

Ventura County

Los Angeles County

San Bernardino County

Simi Valley

East Highlands

Los Angeles CBD

Ontario

Riverside

Orange County

Riverside County
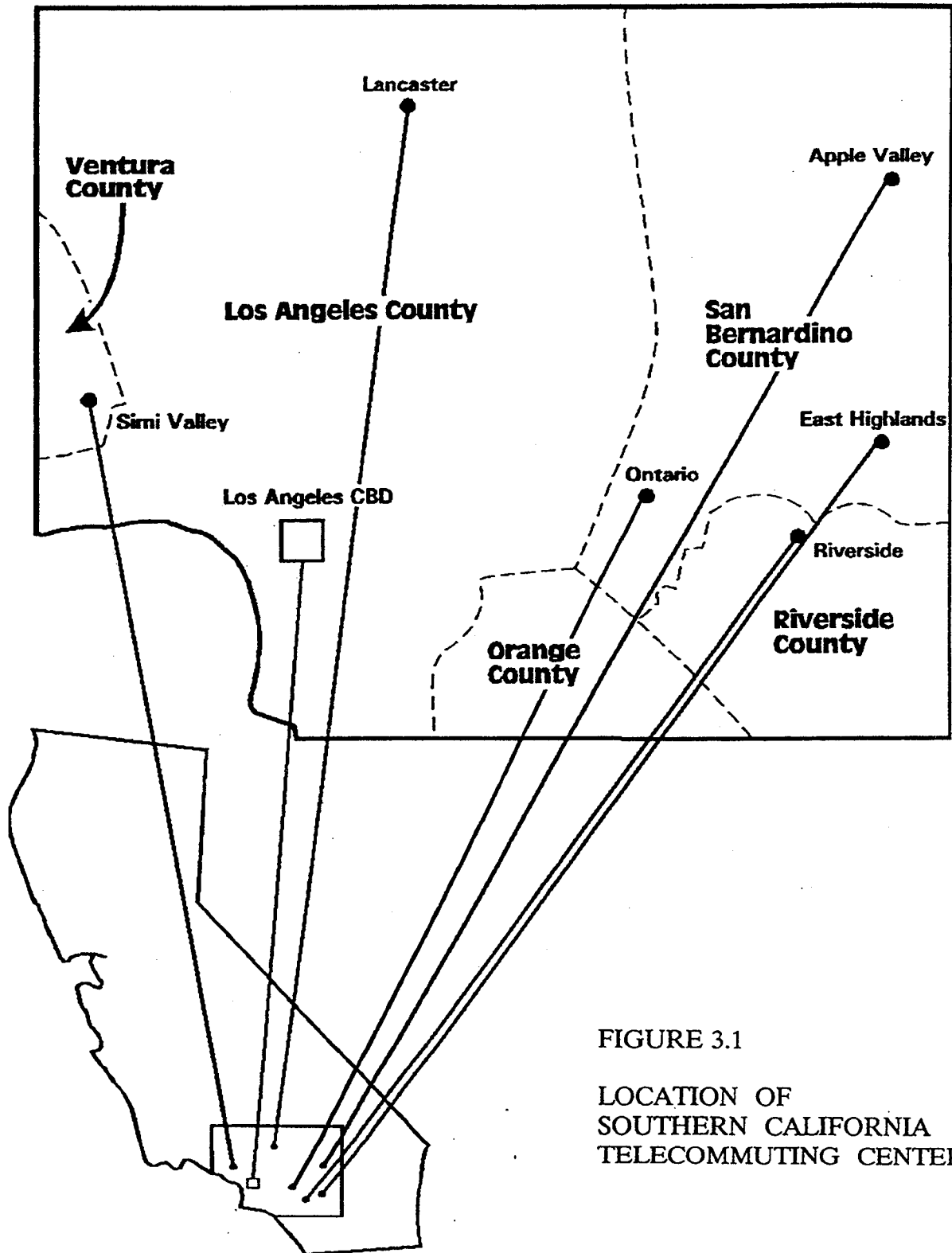
FIGURE 3.1

LOCATION OF
SOUTHERN CALIFORNIA
TELECOMMUTING CENTERS

next year (Apeles-Eiser, 1993b). Centers are also being planned for Pomona, Long Beach, Rancho Palos Verdes, Torrance, and Anaheim.

3.2.2.1   Antelope Valley Telebusiness Center

The Antelope Valley Telebusiness Center, a three-year pilot program, opened in the City of Lancaster (a city 70 miles north of downtown Los Angeles) on January 27, 1993. More than half of the center's workspaces were contracted out to public- and private-sector telecommuters prior to the opening (Apeles-Eiser, 1993a).

This telecenter has many advantages because of its location in a business park. A local government center is located around the corner from the center. It is near the freeway and a bus line. The facility has twenty state-of-the-art workspaces with many of the most advanced telecommunications options. Five closed offices are provided to address potential concerns about the privacy of information. A Pacific Bell videoconferencing system, which allows simultaneous video, audio, and data transmissions, has been installed at the center. Currently, the system is connected to County departments in downtown Los Angeles, but efforts are underway also to connect to other companies who have telecommuters using the Antelope Valley facility (Wilson, 1993). This may decrease the need of telecommuters to travel away from the center to attend meetings.

Initial projections indicated that the center would cost around $223,000 to open and operate the first year. It is estimated that $60,000/year will be required for operation in subsequent years (Talalay, 1992). Primary funding for this project was provided by grants from the South Coast Air Quality Management District (SCAQMD) and the Metropolitan Transportation Authority. However, numerous donations from well over 20 different sources have also aided establishment of the center. Financial contributions, as well as equipment and time, have been received.

Marketing for the telecommuting center included press releases to local and Los Angeles media, television news coverage, and letters and telephone calls to prospective companies. In addition,

incentives, such as free use of the telecenter and all equipment for the first year of tenancy, are being given to participating organizations as part of a public awareness campaign to promote the center as an effective strategy to reduce traffic congestion and improve air quality. Interest in this telecommuting center is high. The Los Angeles County Chief Administrative Office has reported receiving numerous telephone inquiries from people asking for additional information about the Antelope Valley center.

The Antelope Valley center was designed to provide a local business center for Antelope Valley residents who commute to downtown Los Angeles, Burbank/Glendale, San Fernando Valley, Pasadena and Santa Clarita. The project seeks to use telecommuting to increase worker productivity, reduce traffic congestion, improve air quality and promote business competitiveness.

As of July 1993, the Antelope Valley center had 73 percent of its "workspace-days" committed to telecommuters, although that does not mean that a telecommuter is always present on his or her appointed day. The committed workspace-days were actually being used 65 percent of the time. (There are 100 workspace-days to be filled over the course of a work week: 20 workspaces available a day, times 5 days a week). The 30 employees using the center work there 1.9 days/week on average. Center users save an average of 5.3 hours and 233 miles commuting per week (Wilson, 1993).

A spokesperson for the center attributes its success to marketing. Experience gained from the previous telecommuting centers showed that marketing was vital to the success of a center. The planners for the Antelope Valley center took that lesson seriously, and as a result marketing was done vigorously and continuously. Many press releases led to large amounts of newspaper publicity. A ribbon-cutting opening ceremony brought more newspaper press, and was broadcast by the local cable company. Letters were sent to city managers and private employers describing the benefits and opportunities afforded by the center. A marketing packet that contained brochures listing the features of the center (as well as the amenities near the center, such as restaurants) was prepared and made available to interested parties. Presentations were given to area transportation management associations (TMAs) and company employee transportation

coordinators (ETCs) on the benefits of telecommuting. These presentations created a domino effect, with a presentation to one group resulting in additional requests for presentations by other groups. Many follow-up calls were made to companies, agencies, and individuals who requested more information, and to those who did not reply to the first round of letters that were sent out (Apeles-Eiser, 1993a).

3.2.2.2   Apple Valley Telebusiness Workcenter

The Apple Valley Telebusiness Workcenter opened on October 1, 1991. This center is still in operation with funding authorized through March 1994. It was created primarily to determine the feasibility of telecommuting for commuters normally traveling into Los Angeles and Orange Counties from the largely rural high desert area of San Bernardino County (Peterson, 1993d).

A full-time manager is on site at the Apple Valley center to take care of day-to-day functioning. The manager reports to the Mojave Desert Air Quality Management District. An attendance log is maintained at the Apple Valley facility to track daily center usage by the 17 telecommuters. Thirteen telecommuters are employed in the private sector, and four are employed in the public sector. The center is in a strip commercial development on a major transportation route. It is accessible 24-hours/day, and contains twelve, 48 sq. ft. workspaces in a common area and a conference room (Gordon, 1991d). Currently, the cost to the employer is $100/month per workspace. Prior to January 1, 1993, no rent was charged to participating organizations (Peterson, 1993b). A layout of the telecommuting center is included in Appendix A.

Among other lessons learned, the Apple Valley center management believes that marketing is critical to the success of a telecommuting center. Initially, very little marketing was undertaken. At present there is some activity, including the marketing video and seminar mentioned earlier. (Note: a detailed case study on the Apple Valley center can be found in Section 5.1.5).

3.2.2.3   East Highlands Ranch Telebusiness Center

On December 15, 1992, the East Highlands Ranch Telebusiness Center opened in Highland, California (a suburb of San Bernardino), on the corner of a large, upscale, single-family residential development. As with the Apple Valley and Ontario Telebusiness Workcenters, employers of telecommuters pay $100/month for a workspace in a center equipped with telephones, fax machines and computers. As of July 1993, the facility had six operational workspaces with the capacity to add an additional six. Five telecommuters (two of which walked or biked to the center) were using the facility at that time, with an average daily occupancy of two people (Judy, 1993). Site administrator Chris Judy estimates that these telecommuters are saving about 300 miles each on average per week, with a corresponding commute time savings of approximately eight hours. The center has benefitted from various in-kind contributions. For example, the 386/486 personal computers installed at the workspaces were donated by Hewlett-Packard (Wild, 1993b). A layout of this facility is included in Appendix A.

Promotion of the center included attending a barbecue hosted by the residential developer, mailings, conducting an open house when the center opened, and cable TV programs and advertisements. As with all the Inland Empire telecommuting centers, East Highlands also participated both in a promotional video and in a workshop at SCAQMD for Employee Transportation Coordinators of companies in Los Angeles County.

In June 1993, the California Department of Transportation and the City of Highland entered a $100,000 cooperative agreement which will enable the East Highlands Ranch Telebusiness Center to stay open for at least two more years. The agreement reflects a reorientation of the center to a residential-area-based emphasis, and supports an increased marketing effort. In January 1994, the center will move from its original location to a shopping center across the street; the new location will have similar office space and equipment but a much lower lease cost. Site manager Chris Judy has noted increased interest in the telecenter recently, which he attributes to newspaper publicity. He anticipates doubling the number of telecommuters occupying the center within the

next couple of months. Also, the East Highlands Ranch Telebusiness Center has access to the videoconferencing units owned by the Riverside and Ontario telecommuting centers (Judy, 1993).

3.2.2.4   Ontario Telebusiness Workcenter

The Ontario Telebusiness Workcenter is in a mid-rise building located in an office park near the Ontario (California) International Airport. It opened on October 1, 1991, and is still in operation under the Inland Empire Economic Partnership. The $300,000 demonstration project was created primarily to foster business growth and employment opportunities while helping to reduce regional air pollution and traffic congestion (Wild, 1993d). The center was designed to serve long-distance commuters who live in Ontario, Upland, Rancho Cucamonga and Alta Loma (Mullen, 1991).

The 4,300 sq. ft. telecenter has a full-time site manager and is equipped with twenty-four, 48 sq. ft. workspaces. Telecommuters have 24-hour access to the center which has the following features: computers, an equipment room, seating areas, audioconferencing capability, punch-pad building security, two conference rooms, and a lunch room. No private offices are available (Atwood, 1991). Location and layout sketches for the Ontario center are provided in Appendix A.

An attendance log is maintained at the Ontario center to monitor daily center usage by the 32 public- and private-sector telecommuters. Most participants use the center one or two days a week. Workspace rental, paid by the employer, is $100/month.

The center management believes that marketing to potential employers early in the planning stages is very important to center success (Wild, 1993d). (Note: a detailed case study on the Ontario center can be found in Section 5.1.6).

3.2.2.5   Telecommuting WorkCenter of Riverside County

A telecommuting center, founded by the State of California, Riverside County Transportation Commission, Pacific Bell, and the Economic Development Partnership, opened November 1991 in Riverside, California.   Start-up contributions and donations were made by the four above-mentioned organizations, as well as by Southern California Edison, Stockwell & Binney, IBM, South Coast Air Quality Management District, Southern California Gas Company, Thomas Luebs & Mort, Xerox, the City of Riverside and PacTel Business Systems (Bankole, 1991). Although the center was initially planned as a one-year demonstration project, it remains open today. Reasons for opening the center included reducing both traffic congestion and vehicle emissions in the region (Morton, 1993a).

The 8,100 sq. ft. center is accessible to telecommuters 24 hours/day and offers the following features: audioconferencing capability, a videoconference room, another conference room, access to a nearby exercise room, lunch room, reception area, site administrator office, 19 private offices (most with multiple workspaces) and space for 24 cubicles in an open area. Computers are not provided. Videoconferencing is free of charge to tenants, and offered at a discounted rate to Inland Empire Economic Partnership (IEEP) members (Morton, 1993b). A layout of the Riverside center is provided in Appendix A.

Maximum occupancy, approximately 70 telecommuters, has yet to be reached. An attendance log kept at the center indicates that approximately 40 telecommuters use the center. Thirty-seven telecommute about once per week, and three telecommuters use the center two to three days/week. It costs $100/month to rent a private office at the Riverside center, while cubicles can be used free of charge. The cubicles are not used, suggesting a firm preference for the advantages of a closed office (privacy, security, quiet, and status).

At 8,100 square feet, this center is the largest operational one studied in this report. The center founders did not specifically desire such a large facility, but felt that this particular site offered the best match to their overall requirements (Morton, 1993a). The size of the site may have an

unfortunate impact on perceptions: while it appears relatively empty on any given day, more telecommuters use this facility than any other United States multi-employer telecenter studied. A smaller facility would have appeared full with the same number of users.

Nevertheless, increasing usage even to current levels has taken time. The site management recommends hiring a professional firm to institute a complete marketing campaign prior to opening a telecommuting center (Morton, 1993b). (Note: a detailed case study on the Riverside center can be found in Section 5.1.7).

3.2.3 Hawaii Telework Center

The Hawaii Telework Center is considered to be the first joint public/private telecenter in the U.S. It is located 20 miles from downtown Honolulu in the suburban community of Mililani, Oahu. The Hawaii Department of Transportation (DOT) implemented the telecenter pilot project to test the feasibility of telework centers as a means of reducing commute, business and client travel. The telecommuters consisted of 17 employees from the Mililani area: seven from six different Hawaii state government agencies and the other ten from five private sector companies. SMS Research Company conducted the project evaluation for a one year period beginning in July 1989 and ending in June 1990 (Hirata and Uchida, 1991).

The goal of the telecommuting project was to test the feasibility and effectiveness of telework as a means of reducing congestion and air pollution. However, the project did not limit itself to transportation issues, but also engaged in the study of employee/employer satisfaction and productivity, and local and state funding support. Thus, it enabled an analysis of telecommuting center costs and benefits, and served as a model for others interested in telecenters as a transportation strategy.

Traffic congestion and office space availability and cost are major problems for employers and employees in downtown Honolulu. Long and stressful commutes to work in the downtown area are typical for large numbers of Honolulu workers. Development of the Hawaii Telework Center

was partly motivated by the desire to give workers a chance to spend more time with their friends and family, by locating work closer to home. Cost of space was another concern that spurred telecommuting center implementation. In downtown Honolulu a 2,000 sq. ft. office for 17 employees costs $4,600 - 7,300/month, compared with $3,800/month in outlying areas (such as where the telework center is situated). Since telecommuters use this center nearly full time and typically do not have a second office downtown, employers save money on rental costs (Eiting, 1993). While cost savings is a frequently-cited hypothetical benefit of telecommuting centers, it is interesting to note that this is the only telecenter studied that reported actual rental cost savings. Most of the telecommuters at other centers retained a desk at the main office while telecommuting only one to two days per week. Without a subsidy for the center, this would result in the employer paying for two office spaces for each telecommuter.

The project was strongly supported by both the private and public sectors. The State government administered the center through the DOT and provided $125,000 in seed money. Private industry was asked to match government funds, resulting in donations of construction, equipment and services totaling $300,000. Throughout the project, support was always in excess of what was requested or expected (SMS Research, 1991).

The 2,000 sq. ft. telecenter has 17 workspaces and the features of a typical office, including fax and copy machines, computers, voice and data telecommunications links, a lunch room, controller room, reception area, and scattered seating areas for visitors and workers. A layout of the site is provided in Appendix A. Rent was free for users of the center.

After the first year of operation, teleworkers were enthusiastic, supervisors supportive and employers satisfied with the telecenter experience. A majority of employees and supervisors indicated that teleworker productivity improved or remained the same during the first year of the pilot project (SMS Research, 1991). Due to the administrative and accounting burden that would have been associated with starting to operate the center on a for-rent basis to the private sector, the Hawaii DOT decided to continue to operate the Hawaii Telework Center as a state-only

telecommuting facility at the close of the demonstration period. Public-sector demand has been more than high enough to fill the center (Uchida, 1993).

Appropriations have been made for the development of a new and larger telecommuting facility in Kapolei, a region in south-western Oahu. Only government employees will be allowed to use the center, which will be constructed from the ground up. In the meantime, office space in that area will be rented by the Hawaii DOT which telecommuters will be able to use at no charge (Uchida, 1993).

3.2.4   Washington, D.C. Metropolitan Area

More than 16,000 civilian federal employees currently commute 75 miles or more each way on congested highways in the Washington, D.C. metropolitan area. To improve federal employee quality of life and to remove commuters from congested area highways, Congress appropriated six million dollars for the planning and implementation of four Federal Alternative Worksite Centers (FAWCs). Each FAWC will be a telecommuting center used by employees of various federal agencies (and potentially other employers) in Washington, D.C. and nearby areas (Woodley, 1993).

An important issue for the planners of the FAWCs is the impact on local economies of having workers staying in their suburban communities all day rather than commuting to a distant CBD. There is presumed to be a benefit to local businesses (such as restaurants), but this aspect of center-based telecommuting will be carefully evaluated (Joice, 1993).

The new telecommuting centers are being organized and implemented in southern Maryland and Virginia. A spokesperson for the Cooperative Administrative Support Unit (CASU) Program estimates that each center will have 100 or more workspaces when fully developed (Hazelett, 1993). (Note: A CASU is a collaborative group of government agencies in a region that forms partnerships to obtain economies of scale in the acquisition of supplies and services). Currently, the CASU is marketing these telecenters to federal agency managers in hopes of creating high

demand for space in the centers even before they open (Hazelett, 1993). Federal employees will have first priority in receiving telecommuting spaces at the centers, but state, local and private-sector workers are also envisioned to be using the facilities in the future (Woodley, 1993).

A FAWC opened October 1993 in Winchester, Virginia, while a second FAWC in Fredericksburg, Virginia is projected to open by Spring 1994. In addition, development of two other sites is underway in Maryland, both expected to open early in 1994. One site is in Hagerstown, a small city 75 miles north west of Washington D.C.; the other site is in Waldorf, about 30 miles south of D.C. (Woodley, 1994). The Hagerstown (local) CASU will administer the center in its city, taking responsibility for space billing, copier management, consolidated paper purchasing, temporary staff support service, recycling coordinating, and the training of telecommuters in widely used computer applications. The Hagerstown telecenter will be the first telecommuting center administered by a local CASU and the first time that all three levels of government (federal, state and local) have organized a local CASU.

Since federal funding is being used for the Hagerstown telecenter, space within the center will be offered first to federal employees. However, there are no formal restrictions on who can use the site, and if there is still space available after federal employees have been tapped, then workers from local and state governments, as well as the private sector, may utilize the facility. Rental fees for the telecommuting spaces will be negotiable (Woodley, 1993).

Research has indicated that within a 30-mile radius of Hagerstown there are more than 5,000 federal workers, thus ensuring the availability of telecommuters for the center. Marsha Fuller, a consultant to the project, envisions that the program will attract between 50 and 100 telecommuters when the center opens. She believes that a small start is necessary to "get the kinks out", but that expansion, up to 1,000-plus participating telecommuters, may be rapid once the center is operating smoothly (Fuller, 1993).

Financing and support of the Hagerstown telecenter has been requested from the Appalachian Regional Commission, the Economic Development Administration and the Federal Job Training

Partnership Act (JTPA). JTPA provides training for displaced workers and then places these workers in internships where their new skills can be more fully developed at no cost to the employer. Fuller indicated that both clerical and construction workers from this program could be used to help in the renovation and early implementation stages of the telecenter.

3.2.5 Washington State, Puget Sound Area

The Puget Sound Telecommuting Demonstration was a research project managed by the Washington State Energy Office. Twenty-three organizations and approximately 250 individuals were involved in the project which examined the potential use of home-based and telecenter-based telecommuting by employees in the public and private sector. Project objectives included assessing the impact of telecommuting on the environment, on energy use, and on telecommuters, their families and employing organizations. Project planning began in 1989. Demonstrations of telecommuting from home and from a center began between October 1990 and March 1991, and were evaluated after about one year of operation (Quaid, *et al.,* 1992).

Funding of the demonstration project came from Power Washington Oil Overcharge Fund, Washington State Departments of Information Services and Transportation, the Transportation Northwest Regional Center (TransNow), GTE Northwest, Northwest Area Foundation, U.S. Department of Energy, U.S. West Communications and the Medina Foundation.

Three telecommuting facilities, the Washington State Telework Center, the Ballard Neighborhood Telework Center and the Redmond telecommuting center, were planned and/or implemented as a result of the telecommuting demonstration project, and are briefly described below. (Note: Detailed case studies on the Ballard and Washington State telecommuting centers are included in Section 5.)

3.2.5.1   Ballard Neighborhood Telework Center

One telecenter in the Demonstration, the Ballard Neighborhood Telework Center, remains in operation. The Ballard center is a joint venture of Market Street Computer Systems, Inc. and Global Telematics (WSEO, 1991c). The facility is located in the City of Seattle, several miles northwest of the downtown area. Its development was influenced by the Hawaii Telework Center. Objectives for the demonstration included research and development, and promotion of telework (Niles, 1991a).

The Ballard center contains seven workspaces and a conference room in a 1,600 sq. ft. facility (Rutledge, 1991). It was first occupied in April 1991 by a self-employed business owner who used the center as her main office (Niles, 1991a). Self-employed workers are not generally considered telecommuters since they are likely neither to be reducing their commute travel nor working under remote management (Mokhtarian, 1991). However, they can benefit from the services and equipment found in a telecommuting center.

Market Street Computer Systems, Inc. provides center management, space for the telecenter, computer hardware and software, and technical support, while Global Telematics provides research services and telework consulting advice. A real-estate consultant appraised the value of services and space provided by the Ballard Neighborhood Telework Center as being around $1200 per month. Center managers discovered while talking to prospective clients that the market would not bear this high a rent. The charge for space at the center was set at $850 per month, to be competitive with full service executive office space (Niles, 1991a).

Except for the one self-employed worker, no other telecommuters have used the Ballard facility. Explanations for the lack of usage are based on economics. Employers were interested in telecommuting, but did not want to spend additional money for office space for their employees. When costs were very low ($0 - 100 a month) at the Washington State Telework Center, public agencies were willing to let their employees use it. When state funding was ended (and the Washington State Telework Center closed), these agencies did not sign up for the Ballard Center;

not because they did not want their staff to telecommute, but because they were not ready to pay the actual rental costs of additional office space (Farley, 1993).

3.2.5.2   Redmond Telecommuting Center

Richard Petrich and Larry Youngquist of the TeleResources Group consulting firm envisioned that a telecommuting center located in the City of Redmond, a suburb east of Seattle on the State Highway 520 corridor, could reduce commuter demand on the regional transportation network, improve air quality and increase worker productivity.   The Puget Sound Telecommuting Demonstration Project was in favor of developing the Redmond center and considered adding it to the demonstration if it did open.   However, the Redmond telecommuting center never became a reality.   Difficulty in finding adequate funding, as well as insufficient demand for the center, prevented it from opening (Farley, 1993).

Youngquist speculated that a string of satellite offices for telecommuters located throughout the Puget Sound Region would result in higher center use.   One telecenter alone may not be viable, but by creating a series of small offices in different areas, interest may be great enough to make telecenter operation economically feasible.   Youngquist estimated that each satellite office in such a system would cost about $50,000 to establish, and that the Puget Sound Region could support 7-10 offices.   However, funding for this type of telecenter system is not currently available in the state (Youngquist, 1993).

3.2.5.3   Washington State Telework Center

The Washington State Telework Center opened in January 1991 in North Seattle.   WSEO operated the facility, which was used exclusively by telecommuters from the public sector, through January 1992.   Twenty-four employees of nine public agencies (one federal, eight state) participated in the telecenter demonstration.   The State of Washington subsidized the center through a one-year, $135,000 grant.   Participating agencies were billed at an annual rate of $1,500 per workspace (Quaid, *et al.*, 1992).   Since the funding for the Washington State

Telework Center was from a state grant whose purpose was "to increase the efficient use of existing technology for state government", private-sector workers were not able to participate in the center demonstration (Christensen, 1993).

The telework center occupied 2,500 sq. ft. of a commercial office building. The center had thirteen workspaces equipped with computers loaned to the center by R and D Industries, a Hewlett-Packard distributor (WSEO, 1991b). The computers were connected by a local area network (LAN). The telecenter had a conference room with seating for 10-12 people, videoconferencing capability, security, a waiting room, a lunch room and an office equipment room (for the copier and fax).

The center was also close to a child care facility, and had convenient freeway and mass transit accessibility. Site selection criteria for the center specifically included availability of transit service, adequate parking, proximity to residential neighborhoods and retail shops, and a location north of downtown Seattle to capture state employees with the longest commute to Olympia, the state capital (Quaid, *et al.*, 1992).

Even though the center was located near a mass transit station as desired, little benefit was obtained from that proximity. First, a major transportation arterial lay between the transit station and the telecenter, making it unattractive to walk from one location to the other. Second, the bus lines that were available at the station near the Washington State Telework Center generally did not coincide with the bus lines near telecommuters' residences. Thus, very few telecommuters actually used transit when working at the center. In fact, one telecommuter who usually rode the bus to the main office could not use the bus to get to the telecommuting center, and had to use a personal vehicle (Ulberg, 1993); thus negating some of the transportation and air quality benefits of telecommuting.

Telecommuters generally felt the telework center was a useful and desirable work option. Four major reasons for this positive evaluation were:

    1)   substantially reduced time and distance for the commute to work;

2) fewer interruptions at the telework center than at the parent office;

3) high-quality workspaces (in most cases the telecenter provided far better space and equipment than the parent office); and

4) a continuously-available consultant for computer hardware and software problems.

The main problems observed at the telecenter (Spain, 1992) were under-utilization of the facilities and noise (since the half-walls between adjacent workspaces were not effective sound barriers).

The Washington State Telework Center closed February 1992 with the conclusion of the Puget Sound Telecommuting Demonstration Project. It was not continued due to a lack of funding available to subsidize the rent and insufficient demand for space at the center at market rents. However, some of the people who had used the center found other ways to avoid long distance commutes, including home-based telecommuting and using drop-in space at other state facilities (Christensen, 1993).

3.3   Urban Telecenters: Single-Employer Satellite Work Centers

The satellite work center is similar to the multi-employer center except that employees of only one firm or organization are located at the facility.

3.3.1   California - Pacific Bell

Pacific Bell is a major telecommunications company whose venture into telecommuting began as a pilot project in May 1985. The experiment involved 75 home-based telecommuters and 22 satellite office workers. In 1991, Pacific Bell had 590 employees in formal telecommuting work options with around 400 more involved in informal telecommuting. According to the latest information available, the company claims that the number of telecommuting employees is continuing to grow (Moseberry, 1991).

Engineers, computer programmers, planners, sales and marketing staff and financial analysts are among the telecommuters. Tasks performed while telecommuting include reading and writing, computer programming, making phone calls, and devising strategy. Most employees telecommute 1-3 days/week.

Pacific Bell currently operates two satellite telecenters in California: one in North Hollywood, the other in San Francisco. Both facilities contain all necessary equipment for remote work, including computers, photocopiers, and fax machines.

The North Hollywood center has 15 spaces available for telecommuters who generally are permanently assigned at another Pacific Bell office. This workspaces access gives employees the chance to work closer to home even on short notice, when unusual traffic congestion, accidents and/or emergencies make the commute particularly onerous, or when the employee is between visits to clients in the vicinity. This ability to decide to telecommute on a real-time basis, which is currently rather uncommon, could become a significant option as organizations grow more comfortable with telecommuting. The North Hollywood center is not part of a formal telecommuting plan, and nearly all telecommuters are drop-in users (Donner, 1993).

The San Francisco center has 12 work stations and is used daily by a group of telecommuters permanently assigned to the facility. The San Francisco center is marketed to many departments within Pacific Bell, and is managed remotely. Use of this center is being actively promoted with the goal of generating enough demand to require a waiting list of employees wanting to telecommute. Maintenance of a waiting list will help keep facility utilization high. Assignment to the center requires the voluntary agreement of the immediate supervisor and prospective telecommuter (Alvarez, 1993).

3.3.2   California - State Government

Two recent studies carried out by the State of California, the 1988 State of California Sacramento Facilities Plan and a 1990 report by the Auditor General on State office space planning, indicate

that home-based and telecenter-based telecommuting are transportation demand strategies that could have primarily positive effects within the state. Their explicit consideration of the role of telecommuting in facilities planning is unique among government agencies to our knowledge.

Analysis presented in the 1988 facilities plan showed that the proportion of State (California) employees driving alone to work had risen, while the rate of ridesharing and transit use had fallen. The State is far short of reaching its transportation goals set in the Capitol Area Plan for the year 2000, and a sense of the urgency regarding transportation problems can be seen in the 1988 document:

> "If the State fails to meet its goals for transportation, the impacts would be severe. The result would be reduced office and/or housing development on state land along with increased development of parking facilities, all of which would make the state office development program more expensive. In addition, failure to meet the transportation goals would also result in higher levels of energy use, traffic, noise, and air pollution, and may require that the environmental impacts of the Capitol Area Plan be reanalyzed and circulated for public review and comment" (California, 1988, p.39).

The Sacramento Facilities Plan finds that:

1) Centralization of governmental units with active relationships will enhance effective working relationships; thus, the efficiency and effectiveness of State programs will improve.

2) Telecommuting could have an effect on present and projected office space and parking demand, as well as on geographic locations of State office space.

3) State office space demand in the central city area may be reduced and become dispersed to small satellite centers near residential areas.

4) Vehicle miles traveled would be reduced as commutes to work are eliminated or shortened.

5) Demand for on-site child care facilities in downtown State office buildings may be reduced, while demand in satellite centers may increase.

6) From a facilities planning perspective, it might be appropriate to conduct a study of state agencies to establish which must be accommodated downtown and which might be better served at satellite facilities.

Note that the conclusions outlined in the report support both the traditional approach of consolidation of facilities into the urban core, as well as the unconventional idea of decentralization to telecenters. Although the two approaches are complete opposites, they can serve the same purposes: to decrease travel and to increase the efficiency of state agencies. On the one hand, placing people that interact often with each other close together facilitates communication and reduces travel to meetings. On the other hand, creating satellite offices with people that act primarily individually promotes shorter commute distances for those employees.

The plan concludes that if facilities planning is done wisely (i.e., with the proper mix of satellite facilities to reduce commute travel and downtown facilities efficiently serving agencies with close relationship needs) many transportation goals can be met. These goals include reduction in energy consumption, traffic congestion, noise, air pollution and parking demand.

The report by the Auditor General of California was similar in its conclusions regarding facilities planning, but commented on telecommuting in more depth:

> "Telecommuting can allow professionals/workers to work at home, or in satellite offices, as productively as if they came to the capitol area to work. Here is a potential for major savings in: building sizes and cost, commuting time, gasoline and stress (not to mention reduction in employee turn-over). Setting up a workable large-scale telecommuting program (satellite based) entails careful planning and control which has not yet been carried out. Consultants would only stress at this point that telecommuting deserves careful study and inclusion in future plans" (California, Auditor General of, 1990, p.35).

This report also noted that implementation of satellite offices would represent a decentralization of State offices into suburban areas. Decentralization would generate office space construction in the suburbs and a concomitant need for expanded transit service in these areas. The report predicts an increase in parking demand due to limited transit service and lower land costs. Finally, the report discusses the possibility of localized negative traffic impacts around satellite center locations.

3.3.3 Illinois - Continental Bank

In 1981, Continental Bank opened a satellite work center for word processing activities in the Chicago suburb of Woodfield (Pratt, 1991). Data were brought to and from the downtown Chicago office via messenger. The processing staff, all newly-hired, part-time bank employees, consisted of 10 to 13 people who lived nearby plus a supervisor.

The center operated in three four-hour shifts: 9 am - 1 pm, 1 pm - 5 pm, and 5 pm - 9 pm. Employees were housewives and students from a nearby college (Pratt, 1993). Employee isolation from the bank was not felt to be a problem since management occasionally visited the center and employees occasionally visited the bank. No productivity gains, measured in line counts of dictation processed, were reported. However, the bank was able to tap a ready part-time labor supply, and workers could take a position close to home and dress more casually than in many other positions (Pratt, 1991). As of 1991, this center was still in operation (Pratt, 1993).

This facility is technically a functional decentralization rather than a telecommuting center (see Section 2). It is included here because of the fact that it was a newly-established unit with employees hired directly from the surrounding area (see the "gardening" concept, discussed in Section 3.5), rather than requiring the transfer of existing employees from a more distant facility. The criterion of reducing commute travel is met in the former case, but not in the latter.

3.3.4 New York, Mineola

A telecommuting center opened on Long Island in March 1993, in Mineola, New York. New York Telephone will use this center as a one-year pilot program to assess the value of a telecommuting center for employees and employers. Initially, only New York Telephone employees will be allowed to use the facility. However, the desire for participation and investment in the telework center by other companies is strong. Michael Palese of New York Telephone indicated that an assessment could be made as early as six months into the program that would allow and encourage other companies to participate (Palese, 1993).

The site, located in a New York Telephone central office, has been refurbished to provide an office for approximately 100 telecommuting employees, who currently commute to work in Westchester, Brooklyn, Queens and Manhattan. Palese estimated that this facility could reduce an average employee's vehicular travel by 25 percent (USDOT, 1992). Computers, telephones, desks, and other necessary office features are provided at the center. Videoconferencing capability is expected at the center by year end (1993). The center can accommodate a maximum of 20 telecommuters per day. Palese expects the center to be filled mostly with people telecommuting one day per week, although some may use the center two or three days per week.

3.4   Urban Executive Office Suites

Executive office suites are cousins to neighborhood telecommuting centers. In both facilities, tenants from many companies share space, equipment and support staff, on either a regular or an *ad hoc* basis. However, there are differences. Executive office suites tend to be located on prime commercial real estate, rather than adjacent to a residential area. They often house people working for corporate branch offices or regional sales divisions, as well as self-employed entrepreneurs (Vranizan, 1991). The executive office suite image is upscale, with rates and amenities oriented toward the upper management level rather than the rank-and-file worker.

One hybrid example of the office suite concept is the Comm Center. The Comm Center is a type of remote work facility which merges the executive office suite concept with that of the neighborhood work center. Comm Centers are generally sited closer to residential than to commercial areas. They are also characterized by a local area network (LAN), or Integrated Services Digital Network (ISDN) environment, as well as proprietary software facilitating networked communications and common office applications like word-processing and spreadsheets. Floor plans of three centers are included in Appendix A. The name Comm Center, a registered trademark of the Office Technology Group Corporation in Long Beach, California, is slowly being replaced by Executive Center since people tend to interpret "comm" as an abbreviation for community instead of for communications (Smith, 1993).

Tenants of the centers have a variety of rental packages available. For example, the "business identity plan" is a minimum service package costing $225/month and providing staff support, mail box access, and a work station from 8 a.m. to 5 p.m. With this package, the tenant uses whichever workspaces happens to be available on the days he/she is at the Comm Center. At the other end of the scale, a dedicated, private, 300 sq. ft. corner office with staff support, mail box and 24-hour access to the center is available for approximately $2000/month. Staff support, which includes receptionists to greet visitors and phone answering services, is very similar for both the lower and upper priced rental packages. It is the office location and size, and hours of access to the center (24-hour at the upper end versus 9-hour at the lower) that drive package price differences (Smith, 1993).

All Comm Centers have similar features and operational policies. A brief list of basic features that a tenant receives is as follows: corporate identity listing in the building lobby directory, daily mail receipt to be held for tenant pickup, available on-site parking, dictation services, unlimited use of client lounge for brief meetings, and coffee and tea services (Office Technology Group Brochure, 1992b).

Comm Centers specialize in servicing the one- or two-person office (Richmond Chamber of Commerce, 1988). About 20 percent of the Comm Center marketing effort is directed toward telecommuters and this percentage is rising. A recent article in *Success* magazine even referred to these facilities as "telecenters" (Henricks, 1993). However, sources indicate that to make the business work, clients other than telecommuters must be obtained. Non-telecommuting clients targeted include primarily Fortune 1000 branch offices, which comprise about 60 percent of the market, and self-employed accounting and legal professionals. Comm Center promoters claim that a company can send employees here, with all parent office amenities, and save almost 45 per cent on the occupancy costs that would be paid for a similar office with staff downtown. This savings is primarily due to economies of scale that result from sharing the costs of support staff among tenants (Cottle, 1993).

As of Spring 1993, there were eight Comm Centers operational and four in the planning stages in California. Seven of the operational centers are located in Southern California: four in Long Beach, two in Irvine, and one in West Los Angeles. The eighth center is in Sacramento. Los Angeles, Orange County, and San Diego (all in Southern California) are prospective sites for three of the four planned centers, while the fourth planned Comm Center was expected to open September 1993 in San Francisco (Northern California).

Comm Centers are completely private-sector financed, and appear to be commercially successful. To what extent executive office suites will expand into the telecenter market is hard to predict, but they should be watched closely in the upcoming years. Observation of the successes and failures of the Comm Centers and similar facilities may provide knowledge useful in the successful development of telecenters.

3.5   Rural Remote Work Centers

Remote work centers are viewed as a useful tool for encouraging economic development in rural areas. Some benefits include: an expanded labor pool for recruiting skilled labor, creation of more jobs and industry in the rural area, lower overhead costs for employers since office rent and cost of living expenses are lower, and lower employee turn-over rates. Some projects primarily relocate existing jobs to rural areas, while others focus on generating new employment. According to consultant John Niles (1991b), the Center for the New West (a Denver-based think-tank) describes these strategies as "hunting" and "gardening", respectively. In other words, hunting refers to competitive attempts to woo existing businesses to relocate, while gardening is the generation (or cultivation) of indigenous new jobs. From a broad perspective, hunting can lead to an unproductive and duplicate use of funds to attract business, in which the costs of the incentives can virtually negate the expected benefits. But from the purely local perspective, the urgent need to generate employment and income is paramount. From both perspectives, the gardening approach, while perhaps more challenging to implement, seems to be the most productive long-term, overarching strategy for economic improvement.

Projects often include more than just a work site. A mixture of services (training, education, use of telecommunications equipment, etc.) are often available as well to community residents and organizations. These facilities may not be telecenters in the strictest sense since they may be branch offices, and/or they may not directly reduce travel. However, indirectly, they may prevent relocation to urban areas to find work, thereby avoiding future increases in travel in already congested regions. In any case, these centers and other similar facilities can generate positive economic development benefits in rural areas with high rates of unemployment and underemployment and are worth pursuing for that reason.

3.5.1 Colorado

The Colorado Advanced Technology Institute (CATI), Colorado's science and technology development agency, has made grants to six rural Colorado communities and coalitions for planning studies to determine how telecommunications technology can be used to aid community and economic development. The grants were made as part of the CATI Colorado Rural Telecommunications Project. Plans were to have been completed by June 1993, leading to the next step of funding for project implementation. Two rural towns have already received implementation grants and are expected to break ground soon on projects to develop community computing facilities with direct connections to the Internet. CATI expects telecommuting centers to be one strategy considered in the planning studies, especially for communities close to a metropolitan region (Richardson, 1993).

The City and County of Denver and the State Department of Personnel have both recently completed home-based telecommuting pilot projects. Implementation of rurally-located remote work centers is being considered for rural economic development and pollution reduction (CATI, 1992).

3.5.2 Kansas

Oberlin is a small town of about 2200 people in a farming area of Northwest Kansas. As a strategy to stabilize its employment base and improve community vitality, the town has recently spent more than $2.2 million to provide a multipurpose facility with computer and advanced telecommunications capabilities, $2.7 million to upgrade and expand the hospital, and another $1.3 million in community infrastructure improvements (Fear, 1993). Oberlin hopes to attract a modest number of knowledge workers and their families to the area. The goal of the project is to attract 25-50 new families to the area over the next five years. Town officials anticipate that most people attracted to the town will be self-employed, home-based business people.

In addition to building the business center, local elected officials convinced Southwestern Bell to upgrade the telecommunications capability of the town (including the installation of a fiber optic cable into Oberlin), revised zoning ordinances to allow more home-based employment, and planned a magazine-based advertising campaign to market Oberlin to information-based home business owners and others interested in a more rural lifestyle (Gordon, 1993a).

3.5.3 Kentucky

Development of two rural telecenters is being planned in Kentucky. According to Kris Kimel (1992), executive director of the Kentucky Science and Technology Council (KSTC), forty-seven rural "town areas" responded to a Request for Proposal for telecenter site location. After reviewing such criteria as economy, diversity, local leadership, marketability, and concept knowledge (i.e., how well leaders in the town understood the concept of telecommunications), the KSTC chose two very different sites. By choosing sites that have widely varying characteristics, the KSTC hopes to learn more about the telecommuting center concept under different conditions. The first site chosen was the Elizabethtown area, a low-density urbanized region in the central-west part of the state. The second site, the Pikeville town area, is much more rural. It is located in a remote, far eastern part of the state.

Currently, seven-year business plans are being developed for the two sites, with the goal that the telecenters will be self-sustaining by year five. The project is proceeding cautiously. However, optimistically, center construction could start as early as 1993, with the opening in late 1994.

These centers originated as a joint initiative of the KSTC, GTE, South Central Bell and the Kentucky Office of Business and Technology (KSTC, 1992). Many Kentuckians must commute 60-100 miles to work in urban areas if they are to maintain a desired rural lifestyle. The rural telecommuting centers are viewed as a way to reduce vehicle miles of travel, commute time, and urban congestion while providing economic development in rural areas suffering from high rates of unemployment and underemployment (Kelly, 1991). The establishment of rural telecommuting centers is an effort to capitalize on the trend to operational decentralization and use of satellite offices that is evident within organizations and firms (KSTC, 1992). The KSTC believes that telecenters may establish the means for a rural region to capture the information, ideas, human resources, services and markets necessary to grow and remain strong in a globally competitive economy.

Kentucky telecenters are envisioned as mixed-use facilities providing an array of telecommunication and related services to client firms and organizations. The centers would offer services both individually and on a shared-use basis. Clients can be short- or long-term tenants and include both entrepreneurs and larger firms. Potential clients include entrepreneurs, self-employed professionals, satellite offices of urban-based organizations and firms, and individual employees of public and private sector employers. The facilities are expected to have such features as a videoconference room, lunch room, and child care. The centers are expected to allow access during evening hours and on weekends. At these times the telecenters will be available to firms, organizations, and community groups for uses such as training, education, and civic improvement projects. These rural work centers incorporate both telecommuting and community facilities, as part of an underlying regional economic development plan (Gordon, 1992a).

3.5.4 Minnesota

United Healthcare Corporation in Minneapolis, Minnesota has set up three satellite offices. The first center was set up in the rural town of International Falls, next to the Canadian border, on January 25, 1988. The International Falls center, located in the back of a shopping mall, has over one-hundred employees working two shifts. A second center was opened in January 1989 in the city of Hibbing. The city supplied a low interest loan to help promote the center. However, despite this early support, a mismatch of expectations between the community and United Healthcare created problems that eventually led to the closing of the Hibbing Center. The third center was opened September 1989 in Duluth. This office is in a renovated warehouse located about 150 miles from the central office of United Healthcare. The Duluth center is capable of handling up to 250 telecommuters. The arrangements in Duluth and International Falls are considered to be working quite well (Bearman, 1993).

Despite the fact that the Minnesota centers rely heavily on telecommunications technology, they are more accurately defined as branch offices than as telecenters (see Section 2). Either way, the centers are generating positive economic development results in Minnesota.

3.5.5 North Dakota

Rosenbluth Travel, a large Philadelphia-based travel agency with annual revenues in excess of $1.5 billion, has had a satellite office located in the small rural community of Linton, North Dakota since 1988. The Linton office provides data entry, customer services and other support via computer and telecommunication systems to the 550 Rosenbluth branch offices located in the U.S. and abroad. Two hundred people are currently employed at the center. The people fill new jobs required by business growth, not positions relocated from outside the area. Work portability, lower cost of doing business, a strong work ethic, high quality, low absenteeism and low staff turnover are cited as factors contributing to the success of the Linton satellite office (Gordon, 1992d).

3.5.6   Washington State

An effort to generate employment in a rural area near Spokane, Washington, is being undertaken by the Economic Development Leadership of eastern Washington. This effort includes planning for a telecenter. The planned location and architecture are not currently known, but already two large companies strongly support the concept. Many people in the rural, eastern part of Washington State commute long distances to work in Spokane, and thus a telecommuting center that would reduce these commute distances is highly desirable (Niles, 1993b).

3.6   Residential and Mixed-Use Developments in the Sacramento Area

There is interest, perhaps even excitement, among developers of residential and mixed-use communities regarding the prospects of incorporating advanced telecommunications networking capability into the construction of new units. This includes initial installation of computers, digital data/voice/video capability, fiber optics, provision of local remote work centers and the like. These capabilities will facilitate telecommuting.

Several developments in the Sacramento, California area provide examples of such capabilities. These developments are described in this section. The wider-scale adoption of similar arrangements for homes and apartments in the future is very probable due to increasing usage of computers and other telecommunications technology.

3.6.1   Greystone Apartments

Greystone Apartments is a 160-unit apartment complex in Davis, 10 miles west of Sacramento, which was planned and developed with telecommunications in mind. The developers worked with technical experts from both the telephone and computer industries to create a network that allows residents of the complex to communicate with each other via computer.

There is a community center in the complex which has computers for use by residents without machines of their own. The center also has a laser printer and copy machine available for use. These high-tech "perks" are viewed as a good marketing strategy for attracting tenants, many of whom are students at the University of California at Davis (UCD). At least one tenant indicated that the presence of the telecommunications equipment was the factor leading him to lease at Greystone.

The architect and planner for the Greystone complex plans to expand the network in the future by directly linking the community center to the UCD campus. This would allow network users to exchange electronic mail and access information from library catalogues and various other data bases at higher speeds than are normally available on a dial-up basis.

Setting up the computer network at Greystone was not difficult and other newly built apartments and homes could easily follow the example. At Greystone, the circuits for the computer lines were installed with those for the telephone lines during the initial construction (Francisco, 1993).

3.6.2   Sunrise Douglas

The developers of Sunrise Douglas, a proposed residential community located slightly east of Sacramento, plan to install advanced telecommunications technology to create a high-tech community. This development will cover about 1200 acres and contain approximately 6000 dwelling units. Fiber optics will connect residences and businesses to telecommunication networks. Home buyers will have the option of purchasing the installation of packages containing equipment such as computers and fax and photocopying machines. Apartment complexes in this development will have mini-business centers equipped with computers, photocopy machines, and express/overnight delivery service for its residents. They will also have on-site child care. A clean-fuel shuttle to ferry residents to a rail station is also being planned to ease congestion and reduce air pollution (Hoyt, 1993).

3.6.3   Sutter Bay

Sutter Bay, located 12 miles north of downtown Sacramento, is the site for a proposed 25,000-acre planned community. Advanced transportation and technological infrastructure will be an integral part of this community, which is expected to generate over 95,000 new jobs and be home to roughly 140,000 people. Pacific Bell and South Sutter Cable plan a joint project to develop an advanced fiber optic telecommunications and video network for the community. This project would provide high-speed voice, data and video to each home, school, office and work place. The interconnected networks created by this project would have the capability for two-way communications and would provide residents and workers with services such as video-conferencing, telecommuting support, teleshopping and distance learning (Sutter Bay, 1993).

Telecenters have not been mentioned specifically with respect to this development. However, the presence of office and community facilities in close proximity to residences, all served by advanced communications technology, makes such a development a highly desirable candidate for the location of a center.

3.6.4   West Sacramento Expansion

Rancho Cordova-based developer Merwin and Associates has proposed a major expansion of the City of West Sacramento. The proposal is for mixed-use development of 2500 acres of a 6000-acre area, with the rest to be maintained as parks, recreational areas, greenbelts, and 5-acre (minimum) agricultural/residential parcels. The development would include up to 12,000 dwelling units linked by fiber optics (Pifferetti, 1993). An important feature of the proposed development is the establishment of a number of telecommuting facilities in town centers throughout the area, which, together with home-based telecommuting, are intended to reduce commute trips out of the development by at least 20 percent.

The proposed expansion is controversial, however, as it would consume prime agricultural land and potentially have other negative environmental impacts (Steinhauer, 1992). The project is

currently under review by a Local Area Formation Committee, and a spokesman for the developer indicated that if all goes well construction could begin in 1996.

3.6.5 Isleton

The small delta town of Isleton, bordered by the Sacramento River on one side and the Georgianna Slough on another, was planning to annex 950 acres for the development of a set of pedestrian-oriented villages that would be marketed to telecommuters. A primary reason for Isleton's plans to grow more than fourfold (from 210 to 1,160 developed acres) was the need to generate city revenue through property taxes. This income would fund the construction of a new levee to protect the peninsula on which Isleton is located from flooding (McCarthy, 1991).

However, Isleton's delta environment is considered environmentally sensitive. Guarding it requires carefully planned low-impact growth. James Kaufman, a Sacramento architect, and Andres Duany and Elizabeth Plater-Zyberk, land-use planners noted for neo-traditional neighborhood design, were hired to oversee Isleton's new growth. Their ideas included locating telecommuting centers near the newly developed dwelling units. Placing such offices in a pedestrian village would put shops, restaurants, and other amenities within easy walking/biking distance for employees who were telecommuting from home or from a telecenter (McCarthy, 1991).

Isleton hopes that environmentally clean, high-technology companies will want to locate telecommuting facilities in a peaceful, small-town setting. The idea is that such companies, by offering the alternative of living and working in a pleasant, rural area, will be able to attract scarce, valuable employees that might otherwise choose other employers.

The development of these pedestrian-oriented villages has not yet occurred. However, Mayor Leonard Maxey said that the City of Isleton is still thinking seriously about this type of development, and that a new developer in the area might get this economic growth plan started within the next few years (Maxey, 1993).

3.7   Non-Territorial Offices and Other Related Concepts

This section introduces some additional remote-work concepts that are related to, but not quite the same as, the urban telecenters described in Sections 3.2 and 3.3. While most of these concepts are still in the experimental stage, they are gaining recognition as feasible, and often more efficient, substitutes for working at a single main office.

In particular, several variations of the non-territorial, or unassigned, office have taken hold. The International Facilities Management Program at Cornell University defines an "unassigned office" to be an office that is "not assigned on a long-term basis to a specific individual" (International Facilities Management Program, 1993a). The program's glossary of unassigned office terms is reproduced in Table 3.1.

Companies are achieving large cost savings by consolidating conventional office space used by field workers, salespeople and other mobile professionals. This space is vacant as much as 40 percent of the time (Pacelle, 1993). The non-territorial office concept of "hoteling" is described in Section 3.7.1. (A similar idea, the Bank of Montreal "floating office", is described in Section 4.2.2). In Section 3.7.2 the "shared offices" concept recently adopted by IBM and AT&T is discussed. The strategy of creating a telecenter from surplus space in a conventional office is reviewed in Section 3.7.3. Section 3.7.4 presents the idea of providing office facilities (including videoconferencing) on an *ad hoc* basis through commercial business service centers. An example of a mobile office vehicle is provided in Section 3.7.5.

Non-home-based remote work by salaried employees is the common link among these concepts. These ideas were developed as creative responses to the need to maintain worker productivity outside of the central office. These remote work applications have some benefits similar to telecenters, including increased productivity and reduced travel time.

Table 3.1
The Unassigned Office Glossary

Non-Territorial Office: First used by MIT researcher Thomas Allen, refers to any space allocation program that does not assign desks or workstations to specific individuals for any length of time. Originally applied in a team context in which individual offices were replaced with a range of activity zones available for any team member to use.

Free Address: First used by the Japanese to describe a space allocation program in which each individual does not have a personally assigned desk. IBM uses this term more specifically to define an area within a building without assigned desks that can be used by anyone in the company; not just people from a particular group or department. Reservations are not made in advance.

Group Address: IBM uses this term to refer to an area within a building without assigned desks intended for use by employees within a particular group or department.

JIT (Just-in-Time): Andersen Consulting in San Francisco uses this term to describe its program of not assigning offices to specific individuals on a permanent basis. Offices may be assigned on a temporary basis for one half to several days or 1-2 weeks through a reservation system.

Hoteling: Ernst & Young in Chicago coined this term to describe its program of not assigning offices to specific individuals on a permanent basis. Using an automated hotel-like reservation system, offices may be reserved in advance and assigned on a temporary basis.

Shared Assigned: The Cornell University International Facility Management Program coined this term to describe a space allocation program in which 2 or more employees are assigned to use the same desk, office, or workstation but at different times. The assigned employees work out the actual sharing practices.

Hotdesking: This term originated in the Navy to describe bunks used by different sailors on different watches (the bunk being warm from the previous occupant's use). This is a slightly pejorative term for some form of unassigned office use; that is, a shared desk in time.

Desk Sharing: This term refers generically to the situation in which the same desk, office, or workstation is used by different employees over the course of a day or week.

Red Carpet: Hewlett-Packard coined this term to describe its program of not permanently assigning workstations to specific individuals. The intent was to create a positive image for this approach (in contrast to "hotdesking").

Drop-In: Used by a variety of firms to describe unassigned offices that are used for a short period of time (e.g., a few hours) by employees who have not made any advance reservation for a workspace.

Virtual: A generic term used to describe the idea of the workplace as wherever and whenever you are working; that is, the workplace disassociated from a specific place and time.

Source: *Workplace Review*, Cornell University, International Facility Management Program, Ithaca,
New York, May 1993.

3.7.1   Hoteling

A novel, non-territorial approach to office design, called "hoteling", was implemented in June 1992 at the Chicago offices of Ernst and Young, a large accounting and consulting firm. The program was designed to meet the needs of employees who spend much time out of the office at client locations. The hoteling concept may also be a way to accommodate the in-office days of telecommuters who spend several days a week at home or in a telecenter (Gordon, 1992c), but do need suitable work areas for the days they are at the central office. The concept thus envisioned is "hoteling".

There are three key ideas contained in hoteling. First, the type of office space that mobile workers ("hotelers") will use should be identical to that used by non-mobile employees of the same job and experience level. This prevents a mobile assignment from being negatively compared to a non-mobile assignment, at least on space allocation criteria. Next, the hoteling offices and work areas are mixed throughout the company facility, and not isolated into a single "drop-in" area. This enables hotelers to work with their peers as if they were assigned a space full time. Finally, all workspaces should be private (offices or cubicles, depending on employee's job status). Employees did not want to share a workspace while hoteling. However, individual workspaces are used by different employees on different days (Casey, 1993).

Each "hoteler" has a private locker in which working documents, personal papers, and desk items can be stored for use on in-office days. The locker also provides a place where paperwork can be exchanged between mobile workers and their non-mobile coworkers. A "hoteling coordinator" plays a pivotal role in the success of this concept. When a hoteler calls for a reservation, the coordinator searches a computer database and assigns a space. Reservations can be made as little as one day or as much as five days in advance. The coordinator also sends a computer-generated work order to the Office Services staff so that the area assigned to a hoteler is set up, supplied with office materials, and immediately usable on the reserved day. The Office Services staff also programs the office telephone with the hoteler's direct dial extension, so that the mobile worker can be reached with the same phone number regardless of location. A "touch-screen" staff

locator computer system has been installed in the elevators of Ernst and Young office buildings that incorporate the hoteling practice. Entering the first 3 or 4 letters of an employee's last name brings up the workspace address and a floor map showing the employee's location. Clients and/or fellow employees can also use the touch-screen to find the location of hotelers' lockers if they need to deliver some materials to them (Casey, 1993).

Brian Casey, an Ernst and Young partner, said that the company's office design plan theoretically allowed for one office work area for every five people who are hotelers (Pacelle, 1993). In reality, the company has been able to reduce space requirements at its Chicago office from 377,000 to 350,000 square feet, a seven percent savings (Casey, 1993). The firm believes it can ultimately eliminate 2 million of the 7 million square feet of office space it rents nationwide, for cost savings of around $40 million a year (Pacelle, 1993). The increase in Office Services costs is negligible compared to the savings in rent incurred from hoteling (Casey, 1993). Ernst and Young believes it has found a solution to the problem of efficiently providing quality office space for mobile workers.

3.7.2   Shared Offices

Two of the first large U.S. companies to recognize the cost savings potential of shared-space offices are IBM and AT&T. The IBM corporation announced its intent to use the non-territorial, "shared-space" office concept as a way to reduce overhead costs. The marketing and service employees affected typically spend most of their work days at customer sites, with only occasional visits to their IBM office.

Each shared-space office will be used by 2 or 3 IBM employees. According to Ken Sayers of IBM's Real Estate Services group, IBM has twenty to thirty office facilities currently being converted to this concept in the U.S. By the end of 1993 IBM expects to have about 5,000 employees working under this arrangement (Gordon, 1993e).

As part of its downsizing efforts AT&T has adopted a similar shared office arrangement: the "virtual office". The permanent territorial offices of field sales employees have been replaced with laptop PCs, hand-held cellular phones, and access to executive workstations. These shared-space workstations, which are approximately 20-30% smaller and more modestly decorated than other offices, have replaced offices in New York, Connecticut, and Massachusetts. The ratio of mobile employees to workstations at the New York office is 8:1 (Gordon, 1993d).

3.7.3   Use of Surplus Space at Conventional Work Sites

Non-home-based telecommuting need not take place in a dedicated office facility. It may be very cost-effective for an employer to set aside space in an existing conventional facility to be used by telecommuters from its own or other organizations. Two examples of this idea are discussed below: a large-scale space brokering experiment being conducted by the Institute for Local Self Government (ILSG), and a single non-profit agency (the Simi Valley Transportation Management Association) marketing its excess office space as a telecommuting center. The Ballard Neighborhood Telework Center, discussed in Sections 3.2.5.1 and 5.1.2, is also an example of a single organization marketing its excess space to telecommuters.

3.7.3.1   Institute for Local Self-Government/Telecommunications for Clean Air

Commuting to an established telecenter is not the only way telecommuters can experience office-based remote work. Workers can use office space in nearby government or private facilities if employers make agreements with them to do so. The Institute for Local Self Government (ILSG) and its offshoot, Telecommunications for Clean Air (TCA), are exploring the idea of "brokering" telecommuting space. These two organizations have implemented the Telework Facilities Exchange Program to "demonstrate how existing workspaces in government facilities can be shared among local governments, quickly and inexpensively, to create a network of public sector telework centers" (TCA, 1992). In other words, space that is currently unused (or that can be swapped) will be made available for telecommuting purposes to an employee from a different organization. Participating organizations will identify both the space available (along with its

corresponding features such as computers and modems) and the space needed. They will provide this information to a "broker" who will match telecommuters with suitable working arrangements. This is similar to ridesharing matchlists, where those able to offer rides are linked with those seeking a ride.

For this project, public sector organizations eligible to participate are: all cities in the South Coast Air Basin; Los Angeles, Orange, San Bernardino and Riverside Counties; and State of California agencies, regional boards, commissions and special districts with offices in any of the four counties.

The Telework Facilities Exchange program, directed by Walter Siembab, is a two year project in which the first year, 1992, was to be spent structuring and planning the implementation for the following year. In Year One of the demonstration, participating cities were to identify available workspaces and eligible employees for sharing. Also in Year One, possible travel savings from telecommuting were to be analyzed, and policies and procedures for the exchange developed by the South Coast Advisory Committee (SCAC) and the local project managers. Year Two (1993) will see the Telework Facilities Exchange implemented.

Participating telecommuters will use the space free of charge. Furthermore, the telecommuters' organizations could receive many benefits from the telecommuting plan (such as compliance with air quality improvement and trip reduction programs, improved employee morale, and more efficient space utilization), but will be required to perform various tasks in return.

In 1992 each organization was asked to:
    1.   Appoint a local project manager.
    2.   Identify potential facilities for sharing.
    3.   Identify eligible employees.

In 1993 each organization will be requested to:
    1.   Authorize employees to telecommute.

2.   Allocate workspaces to the program.

3.   Participate in training sessions.

4.   Attend evaluation meetings.

.5.   Complete surveys.

The host organization will not be responsible for many of the more difficult aspects of the project, such as developing exchange policies and ensuring privacy in the conduct of business by the host and guests. These tasks will be handled by the SCAC (TCA, 1992).

Experience to date suggests that the brokering approach be re-evaluated. Participation has not yet reached a point that requires large-volume brokering. Instead, a "demand-driven" activity is being explored. That is, as individuals are authorized by their employers to telecommute, space is found for them on a one-to-one basis (Siembab, 1993).

It is clear that the planning and implementation of facility exchanges among participating organizations is a challenging task. In particular, safeguarding the security of confidential information, as well as simply the physical security of equipment such as computers, is likely to be a major hurdle. Despite an initial lack of success, however, the potential benefits of developing networks of public and private sector telework centers remain great. The Telework Facilities Exchange may yet provide a useful and ultimately encouraging example to those interested in utilizing telecenters and other remote work offices.

3.7.3.2   Simi Valley Transportation Management Association

A telecommuting area has been established since 1991 within the office of the Simi Valley Transportation Management Association (TMA). The TMA had more office space available than needed and had an interest in encouraging telecommuting, as well as in defraying the expense of maintaining the office. The TMA office has three work stations available for telecommuter use and the space to add an additional 3-4 stations if demand warrants. There is a storage room with a door that could be used as a private office (Coffey, 1993a). TMA members donated soft-

partition work stations, and the Ventura County Air Pollution District funded the printing of a brochure for the telecommuting space. Rent is nominally $300-400/month although that is negotiable. In addition to a work station, use of a copier, fax machine and telephone is provided. Installation of computers is an option, but users are encouraged to bring their own portable computers (Coffey, 1993b).

Despite expressed interest in the business community, as of February 1993 no space has been rented to telecommuters. This lack of participation is attributed to an economy in recession, companies down-sizing their work force and therefore having surplus space at existing facilities, employee fears of being forgotten if they work remotely, CEO perception that telecommuting requires a substantial effort to implement and competition from nearby executive suites which offer reception and secretarial services that this center does not. Promotion of the telecommuting space included presentations at TMA and other business forums, a table at the Simi Valley Trade Fair, preparation and distribution of a brochure describing the telecommuting facility and publicity from newspaper articles.

3.7.4 Videoconferencing and Other Services at Local Business Service Centers

Business service centers throughout the nation are fulfilling the demand for access to telecommunication technologies (including computers and fax machines) by offering these services to consumers on a rental basis. The latest development in this trend, announced in September 1993, is Kinko's Service Corporation's decision to outfit 100 of its roughly 600 retail stores with videoconferencing equipment. Working closely with Sprint, the national telecommunications conglomerate, Kinko's has developed two types of videoconferencing equipment: (1) a PC-based system used primarily for person-to-person conferencing, and (2) a "PictureTel" unit suitable for groups of up to five people. With Sprint's Meeting Manager Automated Videoconference Dial-Up System, Kinko's customers will be able to connect to other Kinko's stores, or to appropriately equipped public or private conferencing rooms. Together these technologies will allow Kinko's customers to reach approximately 3,000 public and private videoconferencing rooms in 38 countries (Gordon, 1993f).

To encourage participation during the first three months of service, Kinko's will charge only $20 per half-hour. Afterwards, it plans to charge $150 per hour, much less than the going rate of $250 per hour for videoconferencing rental (Gordon, 1993f).

These facilities can already serve telecommuters on an *ad hoc* basis. Whether they eventually attract long-term, regular usage as telecommuting centers (see Section 6.2.7) may depend on the amount and quality of space available at a store for such uses, how such a "product" is marketed (including pricing strategies, properly targeted promotion efforts), and of course the willingness of employers to consider the arrangement.

3.7.5 Mobile Office

An innovative concept that has potential, albeit limited, telecommuting applications is an office contained in a motor vehicle. The stock mobile office sold by the Clarion company, a motor home manufacturer, contains room for two computer work stations, telephones, fax machine, copier and printer, as well as desk space and chairs. These mobile offices are designed for use as technical labs, offices and sales showrooms. The inclusion of the telephones and fax machine allows the mobile office worker to stay in contact with the home office while on-site at a client location or elsewhere. A mobile office floor plan is provided in Appendix A (Cornell University, 1992).

SECTION 4

TELECENTERS AND RELATED CONCEPTS
IN OTHER COUNTRIES

4.   TELECENTERS AND RELATED CONCEPTS IN OTHER COUNTRIES

Most remote work centers in other countries are small. They typically provide work stations for eight to fifteen people. These centers are found in rural, suburban and urban settings. The most common forms are the telecottage and the satellite office.

Most remote work facilities are telecottages: small centers, typically located in rural areas, that provide work stations with advanced telecommunications and data links for use by the local population. Telecottages are being used as a tool to promote economic development in depressed rural areas. They are a promising means of stemming the ongoing migration of rural populations into already overcrowded urban centers. Training in the use of telecommunications and data processing equipment is often provided by the operators of the telecottages, as well as assistance in small business formation and brokerage of services. The telecottage concept originated in Scandinavia in 1985 and is spreading rapidly to other parts of the globe.

The second major type of remote work facility found in other countries is the single-employer center. These offices can be large or small. The term "satellite office" is usually used to describe this type of center. However sometimes, as in Japan, satellite office can also refer to multi-employer remote work facilities.

Another form of remote work facility is the multi-employer telecenter. A number of these facilities have been opened on an experimental basis, providing work stations for a total of 6 to 100 employees drawn from five to twelve employers. The Marne-la-Vallée neighborhood work center in France, the Benglen neighborhood work center in Switzerland, the Nykvarn neighborhood work center in Sweden and the Shiki Satellite Office in Japan all took this form. The planned Atsugi Satellite Business Park in Japan will also be of this type.

Other types of remote work facilities include the resort office, the creative office, the office train, the floating office, and "off-shore" facilities of firms that relocate data and information processing jobs from areas or countries with high wage rates to areas or countries with lower wages for the same work. The latter type of facility most often contains a decentralized function with on-site

supervision, and hence may not be telecommuting in the strictest sense. However, it is illustrative of the fact that much information work is location-independent (unlike off-shore manufacturing, for which the transportation costs of raw materials and finished products are still key location factors), and can be done anywhere in the world that has adequate telecommunication linkage to the head office. As a remote work concept, an off-shore information processing facility is related to a telecommuting center. Indeed, "true" telecommuting and off-shore data processing with an on-site supervisor may be combined in the same rural telecottage.

4.1   Australia

In 1992, the Australian government approved funding over four years for a maximum of 30 telecenters. The program is similar to the Community Tele-Services Centres (CTSC) concept (see Section 4.13) in that its purpose is to provide remote areas with advanced telecommunications and computing equipment and links to services in other regions in order to promote local employment and business prospects (Gordon, 1992f).

Telecommuting in Australia is closely linked with the Open Learning Network Centers (OLNC) program. OLNCs originated as a way to provide distance education for children living in the "outback" (rural Australia). Today OLNCs are found in urban settings as well. Existing governmental policies seek to include work and social welfare activities in these educational centers. OLNCs with these additional functions are referred to as telecottages (Isomura, 1993b).

Telecom Australia is experimenting with a telecottage at Walcha in New South Wales. The small satellite office, located in a rural area, was scheduled to open July 1992 (Wood, 1992).

4.2   Canada

Information from two experiments in Canada is provided in this section. The first, the BC TEL satellite office in Langley, British Columbia, is a fixed location with employees permanently assigned. The second, the Bank of Montreal floating office program, is an example of the non-

territorial office concept (see Section 3.7.1). Participating employees give up a fixed office location and work from home, a branch office or customer premises in return for a more flexible work schedule.

4.2.1 Langley Satellite Office

The BC TEL/Bentall Development Satellite Office in Langley, British Columbia, was opened in October 1991 as a joint public/private-sector venture. It was a trial of full-time telecommuting from a work center located near employee homes. BC Telephone (BC TEL) provided fifteen telecommuting workers, training for the telecommuters, office furniture, computers and telecommunication equipment. Bentall Development Inc. (a real estate development firm) provided 2000 square feet of office space for ten months. The experiment appears to have run through June 1992.

The experience was judged to be successful by BC TEL. The direct cost per person at Langley was comparable to the costs for other corporate facilities, and net costs, accounting for conservatively-estimated productivity gains, were much lower than elsewhere. Benefits to employee morale and interdepartmental communications, due to mixing of employees from different departments at the satellite office, were reported. Employees obtained personal benefits as well, including more personal time, lower stress and commuting costs, and increased job satisfaction.

As a result of the trial, BC TEL decided to continue the Langley satellite office at least until August 1993, with 20 telecommuters and some changes to enhance the satellite office cost structure; to search for additional sites for satellite offices; and, in general, to make remote office telecommuting an option available to employees (Finlay and Rouse, 1992).

4.2.2 Bank of Montreal Floating Office

The Bank of Montreal, one of Canada's largest banks, has begun to expand its "Floating Office" program that was initiated in February 1991 as a pilot project. The floating office, a form of

non-territorial or unassigned office (see Section 3.7), was designed to meet specific objectives for improving customer service and reducing occupancy costs (Working Well, 1991).

Twenty-five business systems professionals and supervisors voluntarily gave up fixed office sites and accepted options of working in a branch office, on customer premises, or at home. Communication among people working on different projects, and in different places, is maintained by an administrative assistant at the central office.

The bank supplies all equipment required, including lap-top computers and proprietary software. All participants must be available by phone or pager during certain core hours, while the balance of their work schedule is flexible.

The program is successful thus far, with many positive results including savings in office occupancy costs of approximately $100,000/year, customer service improvements, higher employee cooperation and morale, and positive customer reaction.

Management under the floating office arrangement has become increasingly results-oriented as direct supervision has decreased. Participating employees have reacted very positively to the floating office program, but the key to continued success is considered to be ensuring that the workers do not become isolated. One solution implemented, after careful study of the problem, is mandatory attendance of all employees at periodic briefings and meetings. This helps maintain social and professional interaction among co-workers.

4.3   Finland

The University of Technology located in Helsinki, Finland was scheduled to open a two-year experimental distance work center in August 1990. The work center was to be established in Kuokkala, a suburb of Jyväskylä. Jyväskylä is located in central Finland and has a high concentration of professionals whose technical expertise would be in great demand in southern Finland. The center was expected to accommodate employees of different companies and

communities. The rent was to include information processing and telecommunications facilities, but participating organizations were required to supply and install their own equipment (Jankanish, 1990).

The University of Turku in Finland is managing a telework project that will run from 1992 to 1994 in the Archipelago region in southwest Finland. The project is concerned with small business formation, as well as providing support for self-employed workers and permanent employees working remotely. Three "information cottages" will serve fifteen local municipalities in the region. Teleworkers will be registered in a skills bank and their services brokered to clients in other regions of Finland. The "information cottages" will provide computers and telecommunications equipment to allow the teleworkers to complete their assignments. The project is funded by various government agencies, but teleworker salaries will be paid by clients contracting for their services (Gordon, 1992e).

4.4 France

Information on two telework arrangements reported in France is provided in this section. One is an experimental neighborhood work center established by the French government. The second is a satellite office arrangement implemented by a private firm in response to a labor shortage in Paris.

4.4.1 Marne-la-Vallée Neighborhood Work Center

The desire for a policy of decentralization and relocation of employment led the Board for National and Regional Development (DATAR) and the Ministries of Employment and Industry to fund the implementation of the first known neighborhood work center, in Marne-la-Vallée, in the early 1980s. It was envisioned to accommodate up to 100 employees from ten to fifteen organizations. The work center, located near a residential area, was equipped with computer terminals and audio/video data links to the offices of participating firms. By January 1981, eight private companies and one public sector administrative office were using the center. A year later there were only 50 teleworkers at the center (Jankanish, 1990).

Employers using the work center found higher productivity and less absenteeism in their workers at the center than at the primary office. However, the Marne-la-Vallée experiment failed to fulfill the goals initially envisioned for it. Several reasons have been connected to the failure of Marne-la-Vallée, including the "varying nature of the companies themselves and their different reasons for being involved; high costs; differences in government sectorial policies; the extent of aid granted by the telecommunications authority; the nature of the site chosen, which was regarded as unattractive by some of the workers; management resistance to teleworking; and problems of supervision and control" (Jankanish, 1990, p.137).

4.4.2 Groupe PBS Telergos Satellite Offices

Groupe PBS Telergos (PBS), a French firm, is headquartered in Paris with satellite offices throughout France. PBS provides high-quality typing service by salaried employees located at the Paris headquarters or in the regional satellite offices. Founded in Paris in 1972, the company started locating offices regionally in 1981 due to a labor shortage in Paris. In 1990, the Paris office employed ten people, and its largest regional satellite, in Demange-aux-Eaux in the Department of Meuse, employed forty. Work is sent from the Paris office to Demange-aux-Eaux and the finished product is transmitted electronically to clients, all of whom are in the Paris area (Jankanish, 1990).

4.5 Ireland

An "off-shore" data-entry operation was established in Ireland by a U.S.-based multinational company that provides information services. The head office is in Limerick with three branch offices in surrounding counties. Material is flown in from the U.S., entered at the head office and branches, and transmitted electronically each evening from Limerick to a computer in the U.S. Other employees are directly linked to the U.S. computer and can access and update the customer services database (Jankanish, 1990).

Also, Travelers Insurance Company has five satellite offices in the northeast U.S. and one in Ireland. The Irish facility is for data-entry and programming (Jankanish, 1990). Lower wage rates in Ireland provide U.S. firms with a substantial economic incentive to relocate this type of work off-shore.

4.6   Jamaica

Jamaica Digiport International (JDI), established in 1988, is a joint venture among American Telephone and Telegraph (AT&T) of the U.S., Cable and Wireless of the U.K. and Telecommunications of Jamaica. JDI is an off-shore provider of advanced telecommunications to information processing firms in Jamaica. These firms use the JDI facilities to do data processing work for U.S. clients. Approximately 600 people are employed at the JDI facility, at wage rates that are 10-20 per cent of the U.S. rate for comparable work (Qvortrup, 1992).

4.7   Japan

In Japan, the need for office decentralization is perceived because of high land prices in urban core areas and difficulties with locating in an urban core area (congestion and long commute times). These difficulties are particularly acute in Tokyo. In addition, a serious labor shortage is predicted for the turn of the century. This has led businesses to consider possibilities for drawing married women with children back into the work force in great numbers. In Japan, women traditionally stop working when they marry or have children. Women are also responsible for elder care, which puts restrictions on their ability to endure long commutes to full-time jobs.

Several alternate office arrangements are being studied as part of the effort to address these pressing issues. Table 4.1 lists some of the types of remote work facilities currently being studied.

Remote work arrangements in Japan are perhaps more diverse than anywhere else in the world. They include conventional decentralization of a particular function (for example, directory

Table 4.1
Remote Work Facilities in Japan

NAME	TYPE	STATUS
Shiki Satellite Office	Multiple-employer center	Converted to other use
Atsugi Satellite Business Park	Multiple-employer center	Planned
Fujisawa Satellite Office	Multiple-employer center	Unknown
Mitsubishi Materials Ohmiya Satellite Office	Single-employer telecommuting center	Unknown
NTT Kamakura Satellite Office	Single-employer telecommuting center	Unknown
NTT Kunabashi Satellite Office	Single-employer telecommuting center	Unknown
NTT Ageo Satellite Office	Single-employer telecommuting center	Unknown
NTT Satellite Ayase	Single-employer, single-function facility	Open September 1990
NTT Satellite Murayama Yamato	Single-employer, single-function facility	Open June 1992
NTT Satellite Kasai	Single-employer, single-function facility	Open August 1992
NTT Satellite Tama Centre	Single-employer, single-function facility	Open October 1992
NTT Satellite Osaka	Single-employer, single-function facility	Planned
NTT Satellite Nagoya	Single-employer, single-function facility	Planned
KSP Creative Satellite Office	Multiple-use center	Unknown
Kumamoto Resort Office	Multiple-employer center	Closed
Hokkaido Niseko Resort Office	Multiple-employer center	Closed
Azumino Resort Office	Multiple-employer center	Closed
Yatsugatake Resort Office	Unknown	Unknown
Shonan Creative Office	Used by independent individuals	Open

assistance), and typical neighborhood and satellite work centers, as well as novel "resort office" and "creative office" concepts.

In Japan, the term "satellite office" is used to refer to remote work centers containing employees of several firms, as well as to centers with employees of a single employer. The satellite office concept in Japan originated with a small research group set up to look into flexwork and new ways of working. It was viewed as an alternative to the conventional office work arrangement that was preferable to home-based work. Japan's culture is in some ways not conducive to at-home work, and homes are often too small to set up a viable home office (Matsuoka, 1991a).

While in the U.S. the public sector has taken the initiative in testing remote work centers (with some private sector support), the reverse is true in Japan. That is, the private sector has taken the initiative, with some public sector support. To date, there is no formal government policy supporting telecommuting in Japan, although it is beginning to be discussed more seriously. Private sector telecenter investors in Japan usually include telecommunications providers, office equipment manufacturers and construction companies. Thus, remote work centers in Japan tend to be more high-tech than their U.S. counterparts, as they are often a testing ground for new technologies or services.

Results reported for three facilities, in Shiki, Mitaka, and Ohmiya, appear to be representative of the Japanese experience. The quantity of work accomplished by workers at the satellite office increased while the quality did not suffer. High interest in part-time work at the satellite offices was found among local housewives (women with children of all ages). Individuals with a more independent life view, including those with well-defined pursuits outside work, were better able to adapt to work in the satellite office than were those whose identity was determined almost solely by their participation in corporate culture. However, being remote from the primary office led to worker anxiety over promotions and performance evaluations by management (Matsuoka, 1991b).

In general then, after several years of operation, evaluations of the success of these facilities have been mixed. Although user companies and employees recognize their benefits, adoption has been

slower than desired, due in part to cultural norms that emphasize the importance of the group. More time will be needed to assess the long-term viability of the telecenter concept for Japan.

Examples of five types of remote offices are described in each of the succeeding sub-sections: multiple-employer centers, single-employer centers, a multiple-use facility, resort offices and a creative office. The descriptions that follow are mainly drawn from secondary sources. However, case studies on a number of these facilities are in progress, using a questionnaire similar to the one employed for the case studies documented in Section 5. A separate English-language report of this parallel effort will be circulated as soon as it is available.

4.7.1   Multiple-Employer Centers

4.7.1.1   Shiki Satellite Office

The Shiki Satellite Office was located just outside Tokyo, near a suburban railway station. It had a floor space of about 3550 square feet which contained eight private rooms, five open-space areas and a conference room (Spinks, 1991). It was a joint private sector venture of the Shiki Satellite Office Research Group (SSORG). SSORG was a consortium, originally of five firms (Kajima Corporation, Fuji Xerox, Sumitomo Trust and Banking, Uchida Yoko and Recruit) and one collaborator (Northern Telecom Japan).

The purpose of the experiment was to examine the social, technological and work impact of the satellite office. SSORG was particularly interested in the decentralization of the Tokyo head office, determination of hardware and software requirements for satellite offices, assessment of the viability of leasing office space in communities outside Tokyo, evaluation of the prospects for joint ventures among businesses in different industries, improvement of worker morale and productivity, and assessment of the viability of offices nearer to worker homes (Jankanish, 1990).

SSORG experimented with two pilot programs. The first (Phase I) started in May 1988 and ended in April 1989. The second (Phase II) started in July 1989 and ended in June 1990. Phase I had 31 telecommuters from the Tokyo head offices of five companies, plus a staff of 22,

recruited locally, to handle office functions. Phase II had 62 telecommuters from six companies. The sixth company, Nippon Telephone and Telegraph (NTT), joined SSORG for Phase II. All costs involved in establishing and running the pilot programs were split equally among the members of SSORG (Shiki, 1989).

After termination of the pilot project, a new company called Shiki Satellite Office Business Center was set up to run the facility. As a result, the focus of activity changed from an alternate work place for Tokyo-based professional workers to an employment center for local women with clerical and secretarial skills. One major accomplishment of the new entity was to register around 500 women from the surrounding area who wanted to work at various tasks. The Business Center has the goal of building a database to foster at-home work by providing a pool of workers who could support small and medium-size firms as tele-secretaries (International Flexwork Forum, 1993a).

4.7.1.2   Atsugi Satellite Business Park

The Atsugi Satellite Business Park is to be part of the 125 acre Atsugi Telecom Town development (Okuhara, 1992). It is located in Kanagawa Prefecture, one hour southwest of Tokyo. The Business Center will include provisions for satellite offices. Currently, the "satellite office" wing of the project has 25 floors plus one underground level. Four types of offices are envisioned for this wing: an industry/government joint research center for the study of advanced telecommunications applications; one or more multiple-employer telecommuting centers; one or more decentralized R & D facilities; and branch sales offices covering the western Tokyo and central Kanagawa areas. A survey of 64 companies headquartered in Tokyo found that 53 were interested in the possibility of establishing a satellite office in the business park (Suzuki, 1992).

4.7.1.3   Fujisawa Satellite Office

The Fujisawa Satellite Office was apparently established some time after April 1991 as a place for local business people to work, and as an initial base of operation for businesses interested in relocating to the area. It occupied 1300 square feet in one portion of the Fujisawa Industrial

Center. The Satellite Office was divided into small rooms each equipped with a telephone and fax. There was also some communal space, including a shared photocopier and coffee/tea area. While initially expecting to rent space to small and medium-size firms, some difficulties arose because the facility had only one phone line. Local residents took an unexpected interest in renting space on an occasional basis in order to pursue hobby activities. There were problems with privacy and noise since the rooms were not partitioned all the way up to the ceiling. The facility lease was due to expire in March 1993 and it is not known if the Satellite Office is still operational (International Flexwork Forum, 1993a).

4.7.2　Single-Employer Centers

4.7.2.1　Mitsubishi Materials Ohmiya Satellite Office

Mitsubishi Materials Corporation experimented with a satellite office as a potential tool in head office decentralization. The satellite was located in Ohmiya, an hour north of Tokyo by train. It was originally to be operational from December 1988 to February 1992. Eleven salaried employees were to participate in this experiment to reduce commuting time and office costs. Day-to-day management of employees at the satellite office was from Tokyo headquarters (Jankanish, 1990).

The Ohmiya office was established originally in conjunction with the rebuilding of the head office in Ohtemachi. To accomplish the reconstruction, the headquarters staff was temporarily relocated to seven different sites, including Ohmiya. The new headquarters was completed in February 1991, so most of the staff has moved back to Ohtemachi. As of December 1992, Mitsubishi intended to keep the Ohmiya Satellite Office open since many workers live in the Ohmiya area. During the first four years of operation, use of the facility was not heavily promoted (International Flexwork Forum, 1993a).

4.7.2.2   NTT: Telecommuting Satellite Offices

In June 1991, Nippon Telegraph and Telephone (NTT) opened three satellite telecommuter facilities in Greater Tokyo, in Kamakura, Kunabashi and Ageo (Mokhtarian, 1993). This pilot program was scheduled to run through March 1993. Its purpose was to reduce commute time and office costs. All participants were volunteers and worked full time from one week to six months at the satellite offices. One criterion for recruitment was that the worker live no more than 30 minutes from the satellite office. No restriction on corporate rank was placed on participants (Takata, 1991).

4.7.2.3   NTT: Decentralized Single-Function Facilities

NTT Satellite Ayase was established in September 1990. Ayase is a branch of Tokyo Directory Center (i.e., directory assistance) with one manager, seven supervisors and 59 part-time workers on-site. Most supervisory staff came from the main Tokyo office, while employees were recruited locally. The Ayase satellite office has 20 switchboards. Additional directory assistance facilities established by NTT include:

- NTT Satellite Murayama Yamato, established June 1992 with 20 switchboards;
- NTT Satellite Kasai, established August 1992 with 30 switchboards; and
- NTT Satellite Tama Centre, established October 1992 with 20 switchboards.

NTT Satellite facilities for Osaka and Nagoya are planned (Isomura, 1993a).

4.7.3   Multiple-Use Center: KSP Creative Satellite Office

The KSP Creative Satellite Office was established in the Kanagawa Science Park in Kawasaki in 1991. It was a joint venture of Fuji Xerox, the Tobishima construction company, NTT Data, the City of Kawasaki and Kanagawa Prefecture. It was scheduled to operate from June 1991 to March 1993. As of September 1992, the facility was under-utilized and it was not certain to remain open after the end of the experimental period (Mokhtarian, 1993).

Unlike other satellite offices which are used exclusively by salaried employees, usually employees of the large organizations which founded them, the KSP Creative Satellite Office is available for use by self-employed individuals as well as by salaried employees. Use can be by individual or by group, on a drop-in or more permanent basis. Facilities include an auditorium seating seventy, smaller conference rooms including a computer-conferencing facility, discussion rooms, "creative offices" designed to resemble a tea room and ordinary offices with work-station cubicles and computing equipment. The Creative Office is adjacent to a hotel and is sometimes used on a drop-in basis by guests.

4.7.4 Resort Offices

Japan also has another type of remote work center called the resort office. It combines the rich natural environment of a resort area with cottages having work stations and telecommunications technology. Employers hope the resort setting will help workers relax and recover from both mental and physical fatigue, while also providing a creative and productive environment for the work they pursue during their assignment to the resort office.

At resort offices, the worker determines the balance of work versus play. These offices seem to be founded on the idea that there is an inherent balance in each person between using the mind for work and the body for leisure. The theory is that after a few days of recuperation upon arrival, workers will naturally find their balance and do very productive work during their stay (Matsuoka, 1991b).

Resort offices are perceived as places for greater creative production for tasks needing a sustained period of high concentration and intellectual productivity. Current stays average less than one week (Spinks, 1991). Pilot projects have been undertaken in Kumamoto, Niseko and elsewhere with good results for short, intensive group work (International Flexwork Forum, 1991).

4.7.4.1   Kumamoto Resort Office

The Kumamoto Resort Office was established in September 1988 as a joint private sector venture with two resort cottages renovated as offices having advanced telecommunications and personal computers. Kumamoto Prefecture is located more than 600 miles from Tokyo on Kyushu Island in south-west Japan. Sixteen employees from four companies headquartered in Tokyo took part in the experiment which lasted until November 1988. The employees worked at their normal jobs during their stay, which averaged two weeks. Job tasks included research, planning and market research. Participating companies (Fuji Xerox, Shimizu Kensetu Technology Institute, Sumi-Shin Institute of Basic Studies and Uchida Yoko) are in the manufacture and sale of office equipment, construction, think-tank, and office machines and furniture trading fields, respectively (Jankanish, 1990).

4.7.4.2   Hokkaido Niseko Resort Office

The Hokkaido Niseko Resort Office pilot project ran from Fall 1989 to Fall 1990. The project was a joint venture of ten organizations: Uchida Yoko, JR Hokkaido, Shimizu Construction, Shin Gakkai, Sumitomo Trust & Banking, Tsuchiya Homes, Fujitsu Research Institute, Hotel Alfa, Hokkaido Intellect Trust for Regional Development, and NTT Hokkaido (collaborator) (Hokkaido Research Office Research Group, 1990). The resort office was used by more than two hundred employees of eleven companies and institutes. The "aim was to test the feasibility of bringing work closer to leisure, thereby liberating workers from daily wear-and-tear and allowing them to work in a highly flexible, creative way" (Yamashige, 1991). Many workers reported a significant improvement in well-being, both mental and physical. Benefits cited by workers included improved creative output, fresh perspectives and self-discovery. The typical stay was one to two weeks for groups of about five people. There were groups containing workers only and some groups containing both employees and their families. The most popular use of the resort office was for team projects (Spinks, 1991).

4.7.4.3   Azumino and Yatsugatake Resort Offices

The Azumino Resort Office was in operation from October 1989 until September 1990. It was a joint private sector project with costs shared equally among participating firms (Spinks, 1991). Participants included seven firms: Hitachi, Izumigo, NTT Shinetsu, Tokyu Construction, Sumitomo Trust & Banking, Shimizu Construction and Uchida Yoko. In addition, four organizations - Azumino Country Club, Hodaka Town, Hodaka Country Club and Thunderbird Lawn Tennis Club - collaborated in the project (Azumino Resort Office Research Group, 1989). A resort office also exists in Yatsugatake. A sketch of the complex is provided in Appendix A (Smith, 1992).

4.7.5   Shonan Creative Office

The Shonan Creative Office was opened in June 1992, in Hayama, an upscale resort community on Sagami Bay. The facility is used by independent individuals: artists, office workers who have a creative idea for a small business opportunity, soon-to-be-retirees needing an office for new interests, frequent travellers in need of an office for mail collection. The creative office can also serve as a focus for social networking related to potential business opportunities. It was established with the goal of preventing the waste of human resources (Mokhtarian, 1993).

Unlike the satellite or resort offices, the creative office is owned primarily by individuals: 35 of 38 stockholders are private citizens. It has little in the way of information technology equipment, but that may change in the future. Stockholders are considering making the office the hub of an area-wide telecommunications network with links to a local university.   As of December 1992, the most common use of the facility was as a meeting and workshop venue (International Flexwork Forum, 1993a).

4.8   Netherlands

In 1978, a satellite office was established in Alphen aan de Rijn by Fokker Aircraft Industries. The satellite office was located in a residential area to attract part-time employees to do data entry. The office employs 22 women part-time. Hard-copy data are brought by courier three times a day, and the finished results are electronically transmitted back to the main office (Jankanish, 1990).

4.9   Sweden

A variety of remote work facilities can be found in Sweden. These include an experimental, multiple-employer, neighborhood work center established in Nykvarn, satellite offices established by public and private sector organizations, a plethora of telecottages in rural locations, and a commute train equipped with telecommunication links and computers.

4.9.1   Nykvarn Neighborhood Work Center

A neighborhood work center was established by the Nordic Institute for Studies in Urban and Regional Planning (Nordplan) in October 1982. The center, the Grannskapscentral, was located in Nykvarn, a small town near the larger cities of Södertälje and Stockholm. The purpose of the Nykvarn experiment was to test the feasibility of performing telework at a neighborhood center for a number of companies at a distance from their usual offices. Nykvarn offered a shorter commute time for employees and a good mix of residential and employment areas (Sahlberg, 1987).

The 1900 square-foot center at Nykvarn had nine offices and was equipped with traditional office equipment as well as more advanced telecommunication and computer services. Eleven people had a more or less permanent office in the center, and an additional five or six used the premises for short periods. Most participants worked partially at the center and partially at their ordinary work place. A variety of information-based tasks were performed at the center (Sahlberg, 1987).

Participating employers were: Nordplan, a pharmaceutical company, a bank, a tele-administration firm, a data-service company, the Södertälje local council and a consulting firm (Sahlberg, 1987). The municipality paid for half the rent, while the Swedish Council for Building Research guaranteed the rest. The internal furnishings and office equipment, including computers, were financed by various sponsors of the experiment. The participating companies had only to pay for miscellaneous costs, such as telephone installation and usage bills (Jankanish, 1990).

There were many differing expectations for the telecenter. Each participating company had its own beliefs on what functions the telecenter should fulfill. This, combined with the fact that the center was not always able to provide anticipated social contacts, resulted in low utilization of the work center: 30 to 40 percent of full-time hours. The administration of the center also proved to be more difficult than expected (Jankanish, 1990).

Nordplan ended its experimentation and research in Nykvarn by April 1984. The center continued to exist for 14 months longer, but by July 1985 the municipality abandoned the whole project and the center was taken over by the bank, which developed it into a service center for small companies (Jankanish, 1990).

The conclusions drawn from the experiment are mixed. Sahlberg indicated that the experiment was generally positive with gains in productivity observed and the additional time flexibility valued by participants. He noted that anticipated difficulties were observed to be less than expected. However, the conclusions of the report of the Swedish Council for Building Research on the project suggested that such work arrangements (neighborhood centers) were not likely to be developed on any major scale in Sweden (Jankanish, 1990). Additional information on the Nykvarn center is contained in the case study in Section 5.1.8.

4.9.2   Lindesberg Satellite Office

OK Petroleum AB, a Swedish oil company with headquarters in Stockholm, established a satellite office 125 miles to the west in the rural forest town of Lindesberg. Three or four of

twelve employees in one department of OK Petroleum are located in Lindesberg. The Lindesberg office is linked electronically to parent-office computers. Documents and other materials are transported via car or fax between Stockholm and Lindesberg (Jankanish, 1990).

4.9.3   Strömsund and Other Telecottages

There are an estimated thirty telecottages in Sweden today, each typically having fewer than ten work stations (Engström, 1993). One such telecottage is Selecta Contact AB, established in Strömsund, a remote central Sweden town in Jämtland County in 1986. The telecottage was established around the business goal of providing remote telemarketing services to clients in southern Sweden. In 1990 a second telecottage was added in Umeå in northern Sweden and an additional two cottages are planned for southern and western Sweden.

In 1990, Selecta had nine employees, six full time. Seven work regularly from the Strömsund office. Telephone and telefax are the primary means of information transmission. Most of the clients for their services are located in Stockholm, Gothenburg and other large southern cities. Start-up financing was provided by local and county government but the enterprise appears to be privately-owned. Selecta is apparently a financial success which implies that governmental subsidy need not be extended indefinitely (Jankanish, 1990).

4.9.4   County of Gotland Satellite Offices

Three separate satellite office projects have been established in the County of Gotland, a Swedish Island in the Baltic Sea. In 1987, the County established a historical data collection project with headquarters in Visby and three satellite offices in the remote villages of Stilt, Hemse and Havdhem. A team of six remote field workers and four headquarters staff handle management by telephone. The remote workers record the data onto personal computers in the remote offices and periodically send the data via floppy disk to the Visby headquarters. The program was to be evaluated in 1990, with database development continuing until 1991. In the future, it was hoped that the information database would not require financial subsidization from the state (Jankanish, 1990).

Swedish Customs began a pilot project in 1989 to transfer office work from Stockholm to Visby. The fifteen people who are employed for the pilot project period process customs declaration forms. Communication is by telephone, but the forms are sent by regular transport methods to and from Stockholm. There are plans to computerize the operation (Jankanish, 1990).

Labor Market Boards of Sweden have been reorganized so that the administration of employment benefits will be done locally rather than centrally. One county office was opened in the Village of Hemse on the island of Gotland in July 1990. Eight people are employed at the center. Initially, the application forms are to be mailed from county offices to Hemse. The applications are processed and the results transmitted by mail to the local insurance fund of the individual applicant. Within several years the operation is to be computerized so that all information will be transmitted electronically from Hemse to the local insurance offices (Jankanish, 1990).

4.9.5　　　Office Train

Asea Brown Boveri (ABB) and the Swedish Railroads Society introduced an experimental "office train" in 1986. A special non-shaking car with 20 work stations, a meeting area and a lounge runs between Stockholm and Västerås as part of a normal commuter train. ABB managers can work for 80 minutes in the morning and again in the afternoon while commuting using cordless telephones, personal computers and fax machines. The managers receive half-pay for work accomplished on the train. ABB expects to receive advertising benefits (since the corporate logo is on the car) as well as improved staff retention among managers living in Stockholm. The office train is also expected to be a positive inducement when recruiting (Kishimoto and Johansson, 1992). While this experiment may be primarily a marketing strategy for the organizations involved, the concept of outfitting workspaces on public transport vehicles may spread more broadly in the future.

4.10   Switzerland

Remote work centers in Switzerland include several satellite offices and an experimental telecenter in Benglen. The Benglen experiment was an early pilot study of the neighborhood work center concept.

4.10.1   Benglen Neighborhood Work Center

Under the direction of the MANTO Project of the Universities of Zurich and Lausanne, a telecommunications working group was set up to launch an experimental telework neighborhood center in Benglen in 1985. The project ended in April 1986, after about four months of operation (Jankanish, 1990).

Five men and one woman participated in the Benglen experiment to examine the effects of decentralization of work, including acceptance of telework by employers and employees, transportation patterns, work patterns, and social behavior. The participants were an electronic data processing project manager, an analyst-programmer, a physicist, a quality management trainer, an advertising consultant and a mathematician. All of the participants retained their original work place in their particular offices and had normal access to them. They spent from 10 to 40 hours a week in the center.

According to *Conditions of Work Digest* (Jankanish, 1990, p.138), the researchers reached the following conclusions about the experiment:

"1)   The future tendency of work arrangements would not be towards the setting up of individual work stations at home.

2)   The quality of life for workers could be improved through the creation of small/medium sized centers spread throughout various neighborhoods.

3)   The ideal number of workers would be between 10 and 20 for a surface space of ...[2700 to 3200 square feet].

4)   Travel time to the center should be no more than 15 to 20 minutes.

5)   Such centers should have a small reference library, a photocopy machine room and a comfortable area for relaxation."

These recommendations constitute an interesting specific vision of the future of telecommuting in general and telecenters in particular, based on one of the earliest telecenter experiences.

4.10.2   Crédit Suisse

Since 1986 the Department for Organization and Computer Science of the Swiss bank Crédit Suisse has offered its computer specialists the possibility of alternative work locations. Previously employed at the Zürich head office, these specialists can now report to a work center in Basle, Lausanne, Lucerne, Lugano, Winterthur, or Zug (Jankanish, 1990). To ensure that there are no restrictions on the tasks assigned to the work centers, each workspace at the centers is equipped with exactly the same resources as those at the head office: computer hardware, software, and modems. As of 1989, there were six such work centers providing jobs for approximately 60 employees (Erzberger and Sonderegger, 1989).

In contrast to typical branch office arrangements, strong links between the work centers and the central office are being maintained. While Crédit Suisse's branch office employees have autonomy from the main office, work center employees are directly accountable to it, receiving task assignments and directives from managers located there.

The principal reason for initiating the work center concept was a shortage of computer specialists in the labor market in Zürich. By promoting the remote work option in several cities outside Zürich, Crédit Suisse hopes to retain those valuable employees who are expressing demands for flexible work hours, shorter commutes, and a higher quality of life.

After several years of operation, experience with the work center arrangement has been mostly positive. Polls and personal interviews were conducted to compare staff opinions about general

work conditions at the head office with those at the work centers. Some benefits of remote work cited by respondents are as follows (Erzberger and Sonderegger, 1989):

1) 88% of the work center employees are "satisfied to very satisfied" with general working conditions, compared with only 52% of workers at the main office. Poor office location, long commute time, and noise were cited as the major problems with the main office.

2) 64% of the work center employees considered the recognition and appraisal of their work as "good to very good", in contrast with 58% of those working at the head office.

3) 100% of the work center staff were "satisfied to very satisfied" with their commuting time, while only 48% at the head office rated their commuting time as "good to very good" and a full 25% considered it "bad to very bad".

Some of the disadvantages of remote work expressed by work center employees and managers include (Erzberger and Sonderegger, 1989):

1) Career advancement opportunities were considered less favorable at the center than at the main office.

2) The scattering of duties and employees among the work centers made maintaining team cohesion among employees very difficult.

3) Some work center employees felt cut off from the informal, yet important, social interaction that occurred at the head office.

4.10.3   Additional Satellite Offices

Standard Telefon und Radio (STR) established a satellite office in 1985 in Aadorf for a team of five highly skilled computer programmers. The program manager for the satellite office commutes to the main office once a week to attend meetings (Jankanish, 1990).

A Swiss printing company established a satellite office in Somvix, a village in the Surselva region of Graubünden Canton in 1987. The printer opened an office for three or four people skilled in text processing. Telephone lines were provided, initially at a reduced rate, by the post

and telecommunications service (PIT). Later PIT moved its telephone information services to Somvix. The project was supported by the Eidgenössische Technische Hochschule, a university in Zurich, which was also a client. In addition, a major Swiss bank decided to establish a satellite office in Surselva in cooperation with the university. The university is also preparing training courses for potential tele-programmers in the area. The purpose of these offices was to gain access to skilled labor (Jankanish, 1990).

4.11 United Kingdom

The telecottage concept is spreading throughout the United Kingdom. The first of these small, rural remote work centers was established in December 1989, and approximately 45 are operational in 1993 (International Flexwork Forum, 1993b). In addition, prefabricated, modular telecenter buildings are being marketed (Gordon, 1993c) and there is interest in franchising the "Telecentre" concept (Beacon Group and Roarke Associates, 1993). While most telecenters are located in rural areas, some are being established in urban areas surrounding London.

4.11.1 The F. I. Group

The F. I. Group was founded in 1962, as F. I. International. The F. I. Group was one of the first teleworking organizations in the world. Its home-based employees provide a variety of data processing and software development services. In 1986, the F. I. Group had 150 salaried employees (full-time and part-time) and 700 self-employed associates that were contracted for specific projects. Since 1988, the F. I. Group has undergone a major transformation. The emphasis on home-based employees has shifted to an emphasis on employment at local work centers. This shift in emphasis was due to a need for teams of people working together on specific contracts (Jankanish, 1990).

4.11.2   Urban Telecommuting Offices and Telecentres

In England, a consortium formed by an architectural firm, Roarke Associates, has proposed a feasibility study and pilot project to establish a network of Telecommuting Offices (TCOs) at British Rail stations on a major rail commuter route into London from South East England (Roarke Associates, 1992a). "A TCO is a building containing many discreet [*sic*] mini offices from which workers are able to electronically communicate with their main offices, colleagues, and files. . .These mini offices are rented by the hour, the day or longer, freeing office workers from the need to commute to the city every day of the week" (Roarke Associates, 1992a). The TCO, or "telecentre" as it is also called, is specifically a facility which houses employees of multiple employers in an urban setting, as distinct from a branch office, a satellite office or a rural telecottage.

The consortium of Roarke Associates and the Beacon Group, a management and telecommunications consulting firm, plans a pilot project of two telecenters along the Channel Tunnel rail line (Love, 1993). If the concept is successful, a franchise package for telecenters will be developed to market the concept further. Categories of potential users include managers, professionals (salaried or free-lance), clerical staff, mobile workers, independent contractors or out-workers, and students (for evening and week-end courses by video-conference) (Beacon Group and Roarke Associates, 1993). Telecenter space will be marketed directly to employers who, according to Beacon and Roarke, can expect to achieve savings on office rental and company car costs and realize substantial benefits in employee productivity.

Roarke Associates (1992b) identify four types of TCOs or telecenters: a remodeled, existing structure; a custom-designed, new structure; prefabricated, modular extensions; and a mobile "Telewagon" - a railway carriage with all TCO services, attached to off-peak commuter trains, including those running between London and Paris. The TCOs are proposed to serve employees of major London corporations and the central government.

Telecenters are seen as an alternative to increasing the capacity of existing rail and road systems in southeast England. The congestion there is so severe during peak commuting hours that it is

viewed as having a significant negative impact on London's cost of living and quality of life, and the consequent ability of employers to attract and keep high-caliber staff. An additional motivation for the implementation of a network of telecenters is to reduce rush-hour rail-commute volumes so that new Eurostar London/Paris trains can be introduced without negatively impacting existing rail commuters (Roarke Associates, 1992a).

The cost of establishing a TCO network to siphon off peak hour commuters compares favorably to the cost of upgrading rail and road infrastructure to relieve existing and projected congestion. Projected employer benefits include savings on central London office rents, relatively inexpensive space to grow for small and medium size firms, increased employee productivity, and a reduction in the "London Weighting" allowance paid to a majority of Central London employees to defray time and monetary expenses of the commute (Roarke Associates, 1992a).

The projected impacts of the proposed TCO network at full build-out are substantial: the elimination of 200,000 daily person trips by rail and 45,000 daily person trips by highway into London. It is unknown how seriously U.K. policy-makers are taking this ambitious vision. However, the specific proposal at hand is modest enough -- simply to conduct feasibility and pilot studies. It will be interesting to follow how much of this vision is realized in years to come.

Oakmoor Telecentres Ltd., a firm located in Devon, England, is offering modular telecenter units for sale. These buildings were specifically designed in conjunction with Digital Equipment Co. Ltd. to accommodate teleworking. They come in three sizes, from 150 to 250 square feet, and can be combined in various ways to form a larger building. Oakmoor offers individual working areas, conference rooms, and service and kitchen areas. Example layouts of several Oakmoor designs are included in Appendix A (Gordon, 1993c).

4.11.3 Assorted Telecottages

Telecottages are located in rural areas to promote regional economic development and small business formation. They are also known by other names including community offices, business

exchanges, telecentres and telecrofts. Funding for telecottages usually comes from a combination of regional or local government and private sector sources, and often comes with the stipulation that the facility be self-supporting within three years. A few telecottages were "self-funded" (International Flexwork Forum, 1993b).

As mentioned previously, in less than four years, approximately 45 telecottages have been established in the United Kingdom. Networks of telecottages are being implemented in Cumbria, Powys, Devon, Dyfed, the Shetland Isles, and Wiltshire (International Flexwork Forum, 1993b), as well as elsewhere. The Telecottage Association was established in April 1993, to provide advice to telecottages and teleworkers in the United Kingdom. The Association is supported by British Telecom, the Rural Development Commission, Apple Computer, and the Gulbenkian Fund, and will seek to create new services that can be provided through telecottages (International Flexwork Forum, 1993c).

Furuya (1993) reports on three telecottages that have been established in rural British areas, one in Moorlands, the second in the Peak District National Park and the third at the National Grain Centre. All three sites are privately managed with public funding from both Great Britain and the European Community (EC). The telecottages provide initial training, equipment leasing, and brokering for business opportunities. They offer exclusively computer-based, information processing services.

The Moorlands Telecottage, which opened in December 1989 north of Birmingham, was the first to be established in Britain. The purpose of the telecottage is to provide local area residents with training in the use of advanced telecommunications and computers, and to assist in small business formation or the sub-contracting of "telework" services throughout business markets in Great Britain and the European Community. As of February 1993, 12 teleworkers have been trained and contracts with three major clients have been obtained. Each operator completing the training receives a National Vocational Qualification diploma, a "Teleworking NVQ" (Hodson, 1993).

Four local operators are employed to provide data and word processing, services for processing direct-mail advertisements and desk-top publishing. The quality and timeliness of the services

are ensured directly by Moorlands Telecottage. The telecottage charges rates for the services it provides that are less than a business would pay to employ someone in-house for the same work. Additional contracts which are expected as a result of the competitive prices will allow the telecottage to expand its work force up to 30 people. Currently, unoccupied work stations are rented to local businesses at a nominal cost. The operating costs of the telecottage are kept to a minimum through leasing space in the village school, use of part-time staff members, and grants of financial and staffing assistance from the EC, Staffordshire Technical Education Center, and Leek College (Hodson, 1993).

Another telecottage facility is located in a rural village, north of Moorlands in the Peak District National Park. The Small Business Centre (SBC) is a cluster of eleven refurbished, previously empty cottages. Cottages are leased to local business people starting up small businesses. The purpose of this telecottage complex is to promote tele-businesses instead of relying on seasonal tourism or new factories for future economic development. Since only four cottages were leased in October 1992, the SBC is not currently considered very successful (Furuya, 1993).

A third telecottage is at the National Grain Centre, south of Birmingham. It provides a child-care center for people in training programs offered at the center. It seeks to promote local business and employment opportunities (Furuya, 1993).

The United Kingdom Telenetworking Initiative (UKTI) has a pilot "teletown" project underway in Totnes, Devon. The purpose of UKTI is to promote rural employment in telework via advanced telecommunication links. The project was initiated by two organizations, Protocol Communications Ltd. and Systems Synthesis Ltd. A skills register for teleworkers is compiled, and their services are brokered to remote employers. Once employed, the teleworkers utilize a local Business Exchange, a work center that provides necessary computer and telecommunications facilities (Jankanish, 1990).

The Mere Telecottage in Wiltshire is considered an example of a successful facility. It is located in a library and is equipped with computers, fax, and a photocopier. The center provides

equipment training. Over 40 regular business users take advantage of the facility, typically as an aid to running a home-based business. Community groups also use the premises. The Codford Telecottage, also in Wiltshire, has a data input contract. The telecottage takes a commission on contract work performed on center computers. These two telecottages are the first of five planned as a network in Wiltshire County (International Flexwork Forum, 1993b).

Experience gained at the Antur Tanat Cain Telebureau in North Wales indicates that the telecottages should not be used solely for training since without local jobs, the trainees must often drive long distances or relocate to take advantage of their new skills (International Flexwork Forum, 1993b).

The Isles Telecroft, located in the Shetland Isles, is one of 6 Highland telecottages. It is currently providing on-the-job training for four female home-based workers who are performing computer-oriented tasks for the Shetland Museum (International Flexwork Forum, 1993b).

Other telecottages include a 2000 sq. ft. facility in Brighton that is shared by executives from several corporations in order to save up to three hours a day commuting, a telecenter in nearby Rye (Hodson, 1993), Rossett Telecottage in Wales which is dedicated to helping people with disabilities find meaningful work, and BOON ("Business on Open Network") telecottage in Dorset which is part of a linked series of telecottages in the area (International Facilities Management Program, 1993b).

Harewood Park has been recently designed as a televillage. This new housing area in Herefordshire will provide shared telecottage facilities for up to 400 families in a village type environment. In addition to locating the telecottages within walking distance of the residences, autos are restricted to outlying parking lots only, which further encourages walking and other non-auto forms of mobility (Hodson, 1993).

4.12   Community Tele-Service Centres

A Community Tele-Service Centre (CTSC) is defined by Qvortrup (1991) as "a center with data processing and telecommunications facilities placed in a local community in a geographically or socially remote region so that these facilities can be used by all people in the community." A CTSC is a local center established to provide information, training, and business support services to small scale industries and businesses by means of telecommunication and data processing equipment (Engvall, 1991). A CTSC is another term for a telecottage.

Services typically available at a CTSC include remote database access, telecommunications services such as fax and electronic mail, data processing services, consultation on use of services, town meeting facilities, distance learning facilities for remotely providing training and education courses (at some CTSCs), video production/editing equipment and facilities, and facilities to assist small business formation for information-based services (Qvortrup, 1991).

Some CTSCs are financed by public authorities, some are run as private enterprises, and some are operated with both public and private sector involvement (CTSC International, 1990). Between $100,000 and $200,000 is required to establish a CTSC. The cost varies by country and locality; by whether the building is constructed or existing and converted; by the amount and type of hardware, software and space included; and by staffing levels. The minimum staffing level is one full-time manager/director and one part-time secretary.

The first fully-equipped CTSC was opened in 1985 in Sweden. As of early 1990 there were 65 CTSCs: 10 in Denmark, 20 in Finland, 10 in Norway and 25 in Sweden (CTSC International, 1990). Outside Scandinavia, CTSCs have been implemented in or are planned for England, Scotland, Ireland, Germany, France, Portugal, Spain, Canada, Benin, Sri Lanka, Brazil and Poland. Interest is high in developing countries since CTSCs have the potential of promoting economic development in rural areas. Such development is seen as a method of stemming large, on-going migrations of people from the countryside into cities. While CTSCs are located

primarily in rural areas, planners envision expansion to suburban and urban locations (Qvortrup, 1991).

A non-governmental organization, the International Association of Community Tele-Service Centres (CTSC International), was created in 1989 to promote the communal use of teleservice centers, or telecottages (CTSC International, 1990).

5.   CASE STUDIES OF SELECTED TELECENTERS

An important part of this study was to obtain and analyze in-depth information about existing telecommuting centers. A review of this experience-to-date may provide useful insight into the dynamics of center implementation to anyone engaged in opening new telecenters. A set of questions was developed to elicit key facts regarding existing telecenters. These questions were intended to be the guideline for a telephone interview, however all respondents chose to complete the questions in writing. Valuable information was obtained through analysis of the responses provided by telecommuting center administrators, or other knowledgeable people connected to the center. The questionnaire was sent out in the summer of 1992 and responses were received from September 1992 through February 1993. The data gathered was used to develop the case studies presented in this section.

The questionnaires contained three sections. Section One requested background information about the role of the respondent, and was used to help make a contact list (phone numbers and addresses) for telecommuting centers. Section Two included questions in five areas: 1) background of the telecommuting center; 2) telecommuting center description; 3) participant description; 4) policy and control of the telecommuting center; and 5) financing and costs. Information taken from Section Two accounts for a majority of the case study material. Section Three requested the views and opinions of the respondent on issues that were critical to the successful operation of a telecommuting center. Tabulated responses to the questionnaire are provided in Appendix B of this document, while the case studies are found in Section 5.1 and Section 5.2 contains an analysis of the case studies considered as a whole.

5.1   Individual Case Descriptions

Case studies for eight telecommuting centers were completed: seven in the western U.S. and one in Sweden (Nykvarn). Of the U.S. telecenters, the Hawaii Telework Center is located in Mililani, Hawaii, the Ballard Neighborhood Telework Center and the Washington State Telework Center are or were located in the Puget Sound area of Washington State, the Pacific Bell San Francisco Satellite Center is located in Northern California, and the Apple Valley Telebusiness Workcenter,

the Ontario Telebusiness Workcenter and the Telecommuting WorkCenter of Riverside County are all located in Southern California. The Pacific Bell center was always a single-employer facility, six of the centers were always occupied by multiple employers, and the Hawaii center began as a multi-employer facility but now serves only one employer. These cases include all known U.S. multi-employer telecenters operating prior to Fall 1992.

All but one of these case studies (the Nykvarn study) are based primarily on the questionnaire discussed above. Supplemental information from other sources was obtained and included in the case studies. Such sources include telephone interviews, on-site visits, articles in local and business newspapers serving the telecenter area, and project reports. Note that much of this information reflects the viewpoints of managers and consultants associated with each project, and as such may contain a certain amount of bias. It should also be noted that some minor details not included in the case studies may be found in the brief descriptions of telecommuting centers contained in Sections 3.2, 3.3 and 4.10.

5.1.1   Hawaii Telework Center

Background - The Hawaii Telework Center, considered to be the first United States multi-employer telecommuting center, was initiated by the State's Department of Transportation as a strategy to reduce travel demand. A task force containing members from the public and private sectors, including University of Hawaii faculty members, was responsible for planning the center.

Of the centers studied, Hawaii took the longest to implement. Planning and implementation required ten months, partly because a substantial marketing effort was undertaken to obtain tenants (Eiting, 1993b).

Center Description - The Hawaii Telework Center is located about 20 miles from downtown Honolulu, in a suburban technology park at 300 Kahelu Avenue, Suite 45, Mililani, HI 96789. Restaurants and a supermarket are nearby amenities, and it is located within walking distance of mass transit. Parking at the center is free in a lot shared by other employers.

Opened in May 1989, the center is still in operation. Daily administrative tasks are handled by a full-time, on-site administrator. Three primary factors were considered in designing the floor plan of the telecommuting center: 1) cost, 2) marketability, and 3) the number of potential telecommuters.

Normal business hours of the center are from 7:45 AM to 4:30 PM Monday through Friday, but telecommuters have 24-hour access to the facility and its equipment. The building is protected by both coded door locks and security guards. The Hawaii Telework Center has 1900 sq. ft. of leased space on one floor of a shared facility. Mail for all telecommuters is delivered to a central location in the telecenter. The telecenter contains a lounge, an equipment room, waiting areas, a conference room, the site administration office, a videoconference room, lunch room, and seventeen workspaces. A maximum of seventeen telecommuters can be accommodated at any one time in two private offices, containing a total of 4 workspaces, plus thirteen open-office cubicles with one workspace each. Telecommuters have indicated that the telecenter is quieter than their regular office. Proximity to employee population was the main criterion for telecenter site selection.

Participant Description - The Hawaii Telework Center had telecommuters from eleven participating organizations, including five from the private sector, when it started as a pilot project in 1988. The pilot phase ended in 1991 with positive results (such as increased employee productivity findings). Due to the administrative and accounting burden associated with operating the center on a for-rent basis to the private sector, Hawaii's DOT decided to continue to operate the Hawaii Telework Center as a state-only telecommuting facility. Public sector demand has been more than high enough to fill the center (Uchida, 1993).

Currently, the center is fully occupied with telecommuters from eight public sector agencies. Approximately fourteen of a total of seventeen telecommuters can be found at the center on any given day. All seventeen telecommuters tend to use the facility four or five days a week, in contrast to one or two days a week, the average frequency of use at other centers. Jobs held by the eleven male and six female telecommuters range from pesticide specialist to tax return preparer.

Simple letters of agreement were executed between participating organizations and the telecenter management. Each participating organization had specific criteria for deciding which employees could telecommute from the center. Organizations were recruited as telecenter tenants via a marketing strategy that included mass media coverage, videos, brochures, public speaking, word-of-mouth description, and direct mail to candidate employers.

Center Policy and Control - The site administrator is responsible for the overall monitoring of telecenter operations, as well as keeping services and equipment in good working order. The administrator markets the telecenter, and is the chief spokesperson for the program at the legislature and the governor's office. The site administrator also develops progress reports on the center for the State Transportation Planning Officer. Cases of conflicting demands on center resources are handled by consensus among the users.

The center administrator and the teleworker managers of participating organizations jointly develop center policy applicable to telecommuting employees. Office sharing is negotiated by individual teleworkers. Only employees from the same agency or company may share the same office area within the telecenter. Security of proprietary information at the center has not been a concern (see Section 5.2.8).

Voluntary telecommuting work training is available. Telecommuters and their managers generally take the training which is paid for by the individual agency or company. Training is done by workers within the telecommuter's organization and takes place at either the regular office or the telecommuting center.

Financing and Costs - The Hawaii Telework Center budget is $90,000/year -- provided entirely by the state. Total annual costs have been about $80,000; thus, to date, no major unforeseen expenses have occurred which required significant budget revisions during any given year. The telecommuting center space has a market value of $1.95 sq. ft./month in loft condition (that is, unfurnished and not subdivided).

Evaluation Study - After one year of operation an evaluation report on the impacts of the Hawaii Telework Center was prepared. The report found that 76% of telecommuters and 48% of their supervisors felt that worker productivity increased at the telecenter compared to the main office. Only 8% of telecommuters and 4% of managers believed that productivity decreased.

Eighty percent of employees felt that their overall quality of life was better when they telecommuted. This was attributed to the lower stress levels, more time for relaxing, and more time with their family. All telecommuters stated a preference for Telework Center employment over their prior work situation. Thirteen of the 14 supervisors felt that telecommuting centers provided a superior alternative to work in the main office.

The overall findings of the evaluation report were very positive. The authors suggest that telework centers are feasible entrepreneurial operations and that the large-scale use of such centers would result in substantial transportation benefits for the State of Hawaii.

Transportation-Related Findings - Based on updated information from the site administrator, a Hawaii Telework Center telecommuter travels 9,000 fewer commute miles per year on average by using the telework facility approximately four to five days a week. By working close to where they live, participants save about eight hours a week of commute time on average (avoiding their average two-hour round trip to the distant main office). Furthermore, each telecommuter saves about $2,500 per year; this takes into account such things as maintenance cost savings, reduced vehicle depreciation, and an average fuel savings of 350 gallons of gas per year (Eiting, 1993b).

Additional Thoughts - John Eiting, site administrator for the Hawaii Telework Center, feels that the most critical factor in the success of the facility is that more time was spent in implementing than in studying. Given the chance to start anew, Eiting emphasizes that he would "follow the same program."

Eiting's recommendations for promoting telecommuting centers are: 1) use news releases when possible; 2) speak to as many service clubs as possible; 3) educate students; 4) offer an

evaluation service to companies or organizations who may consider teleworking options; and 5) have available an operating telecenter that can be visited by prospective teleworkers and their employers. His final thought on implementing a telecommuting center: "Just do it."

Appropriations have been made for the development of a new and larger telecommuting facility in Kapolei, a region in south-western Oahu. Only government employees will be allowed to use the center, which will be constructed from the ground up. In the meantime, office space in that area will be rented by the Hawaii DOT which telecommuters will be able to use at no charge (Uchida, 1993).

5.1.2   Puget Sound - Ballard Neighborhood Telework Center

Background - The Ballard Neighborhood Telework Center in Seattle, Washington, was conceived by private-sector entrepreneurs as a means of serving the community, gaining knowledge of telecenter development, and promoting their respective businesses. Global Telematics, a public policy consulting firm, and Market Street Computer Systems, Inc. (MSCS), a computer consulting firm, were responsible for the development of the center. The primary motivation of the founding partners was to create a physical model of a multi-employer neighborhood work center, and then to offer it at market rates to prospective tenants, including participants in the Washington State Telecommuting Demonstration Project.

Development was initiated in a week-long discussion of the details of creating a telecommuting center. Planning was done continuously throughout the implementation phase and within six months the Ballard Center was open for use.

Center Description - The Ballard Neighborhood Telework Center is located in excess space in a building owned by MSCS. The building is in a neighborhood business district at 5512 17th Ave. NW, Seattle, Washington. It is approximately 15 minutes from the downtown business district. Restaurants, a supermarket, daycare facilities, a post office, dry cleaners, and banks are among the nearby land uses. The telecenter is within walking distance of a bus line, and free parking is available at the center and in the surrounding neighborhood.

The center was opened Fall 1990 and will remain open as long as the building owner has no alternative use for the space. Thus, the life span of the Ballard center may be affected by the growth of MSCS, since the space occupied by the telecenter is subject to reclamation by that company, if required to meet business expansion needs. MSCS employees provide on-site technical advice, and the MSCS receptionist supports telecommuters during business hours. The primary factors considered in designing the floor plan of the telecenter were cost, comparability to other office sites, marketability, and the space needs of 6 telecommuters. Donated workstations were arranged to fit the available space.

Normal operating hours of the center are from 8:00 AM to 6:00 PM Monday through Friday, but telecommuters have 24-hour access to the facility. Security is provided by an electronic alarm system and door keys issued to telecommuters. The telecenter occupies 1600 sq. ft. on one floor of a two-story, 4000 sq. ft building owned by MSCS. Mail is directly distributed to each telecommuter. The center is equipped with six workspaces, each in an open office cubicle, and has the following additional features: a conference room, a reception desk, and a site administration office. One important reason for selection of this particular site was to take advantage of an existing building with a willing owner. This eliminated building construction costs and time, while also providing a private sector partner willing to actively support the telecommuting center concept.

Participant Description - Only one person is using the facility at the time of this study, a self-employed business owner. The center is her main office, and she uses it four to five days a week. Space is still available for five others to telecommute, and the host business, MSCS, is using the vacant space on an as-needed basis.

Marketing strategies for the Ballard center included mass media attention, word-of-mouth description, and written documents. A Memorandum of Agreement (MOA) was signed between the organizers of the Puget Sound Telecommuting Demonstration and the Ballard Telecommuting Center. The Ballard center received no funding from the State of Washington, but did get other benefits from the MOA. These benefits primarily consisted of making the existence of the center known to private-sector participants in the telecommuting demonstration project. The Ballard

center was described in a project newsletter, and WSEO staff mentioned the center to people and firms while recruiting participation in their demonstration project (Niles, 1993a).

Center Policy and Control - The site administrator is responsible for overall monitoring of telecenter operations, as well as keeping services and equipment in good working order, stocking office supplies, and distributing mail. The site administrator reports to the president of the host company, MSCS. The president of MSCS, in consultation with John Niles, president of Global Telematics, develops personnel policy applicable to telecommuters when they are using the telecenter. Individuals from different companies cannot share the same workspace on different days of the week. Sharing an open office may have been a barrier to customer acceptance due to concerns such as the security of proprietary information. Some prospective tenants indicated that they would not share the same office area with their competition.

Optional telecommuting work training is available to telecommuters and their managers. The training would take place at the telecenter. The cost of training is bundled into the telecenter fees paid by the participating company or agency, so no separate expense would be incurred. The trainer would be John Niles of Global Telematics, or a representative of the Washington State Energy Office.

Financing and Costs - The Ballard Neighborhood Telework Center is located within a financially self-sufficient company. It has a pro-forma monthly budget of $12,500. On the income side, $5,100 was projected to come from rental of space ($850 times 6 spaces), and the rest through sponsorship from a company or agency with a strategic interest. Expenses were allocated among a number of categories such as facility rent and amortization of equipment. A real-estate consultant appraised the value of services and space provided by the Ballard Neighborhood Telework Center to be around $1,200/month/workspace. Center managers discovered in talking to prospective users that the market would not bear this high a rent. The charge for space at the center was set at $850/month/workspace, to be competitive with full service executive office space (Niles, 1991a). Rent includes furniture, equipment (including computers and software), telecommuting work training, and various other support services. The managers of the Ballard center have elected to keep the services fully bundled (i.e., differing service options for differing

rents are not offered) to minimize the administrative burden. About $80,000 in equipment and furniture was donated by one company, and agreements were made with computer vendors to donate hardware and software when tenants signed up. The founding partners invested both money and several hundred hours of time to implement the telecenter.

Additional Thoughts - The cost of renting a workspace is a big factor in the use of the Ballard telecenter. Niles believes that public- or private-sector subsidies to reduce the rent to $100/month or less would generate considerably higher usage. He further indicated that lack of a marketing budget (and lack of local media attention) limited the success of the Ballard center. Also, he believed that the telecenter had an image problem: employers viewed it as too expensive, too luxurious, to be a secondary office for telecommuters to use.

If given the chance to start again, the center founders would do little differently. The presence of the Washington State Telework Center only a few miles away (see Section 5.1.3) may have hampered usage of the Ballard facility, since the State center was available at a much lower rent ($125/month compared to $850/month) to public-sector employees. However, even after the State center closed, usage of Ballard did not increase. Even though employees wanted to continue to telecommute from a center, and employers may have been positively disposed toward telecommuting, they were not willing to pay market rents (Farley, 1993).

The Ballard center did generate some media interest, and additional business for the founders' companies. The center founders still receive inquiries about implementing telecenters, and requests for tours of the Ballard facility. Word-of-mouth and tours are currently the primary ways by which the center is promoted (Niles, 1993b).

Niles recommends creating satellite work centers for companies with the desire and funds for telecommuting facilities. This would involve building and/or furnishing a space tailored to the requirements of a single tenant. He believes that multi-employer telework centers are not a viable proposition if market-level rents are charged.

5.1.3 Puget Sound - Washington State Telework Center

Background - The Washington State Telework Center was opened and operated by the Washington State Energy Office as a part of the Puget Sound Telecommuting Demonstration Project. Establishment of the center allowed the State to study the concept of telework centers. It provided telecommuting workspaces for State of Washington employees living far from their Olympia offices in King and Snohomish Counties north of downtown Seattle. The Washington State Energy Office, the Department of Information Services, and the Department of General Administration were the agencies in charge of planning and creating this center (Kunkle, 1992). It took about six months to establish the center: three months to plan and three months to set up. For this project, nearly all aspects of implementation were the responsibility of a single administrator.

Center Description - The Washington State Telework Center was located on the fifth floor of the Norway Square East Building at 2150 North 107th in an office park in Seattle (Puget Sound, 1991). Land uses near the center included restaurants, a supermarket, dry cleaners, a print shop, and a major regional shopping mall. This telecommuting center was located within walking distance of a mass transit system and had free on-site parking.

It is interesting to note that, even though the center was located near a mass transit station as desired, little benefit was obtained from that proximity. First, a major transportation arterial lay between the transit station and the telecenter, making it unattractive to walk from one location to the other. Second, the bus lines that were available at the station near the Washington State Telework Center generally did not coincide with the bus lines near telecommuter's residences. Thus, very few telecommuters actually used transit when working at the center. In fact, one telecommuter who usually rode the bus to the main office could not use the bus to get to the telecommuting center, and had to use a personal vehicle (Ulberg, 1993), thus negating some of the transportation and air quality benefits of telecommuting.

The center was opened January 1991 and remained open for a little more than a year, closing February 1992. Management of the center was handled by an off-site project manager and an

on-site telecommuter who gave technical support (such as assistance with computers). Technical support for the Local Area Network (LAN) was available 40 hours a week. The primary considerations in designing the layout of the telecommuting center were cost, privacy, number of telecommuters, and sufficient space for conference, waiting, lunch, and equipment rooms.

Regular office hours of the center were from 6 AM to 9 PM, Monday through Saturday. Telecommuters had after-hours access to the building, which was secured by an electronic alarm, via key cards. The 2500 sq. ft. of separate leased space for the telecenter occupied about 25 percent of the five story building. The center was equipped with 13 open office cubicles to handle a maximum of 13 telecommuters on-site at any one time. The telecenter also had the following features: conference room, lunch room, equipment room, and seating areas. Despite having no private offices for the telecommuters, users felt that the center was quieter than their regular office. Capturing the long commute from north Seattle to Olympia for many state employees was an important criteria for the site selection of the Washington State Telework Center. The center's location north of downtown Seattle, and its proximity to many state employee residences helped meet this objective. Since the cost of the site fell within the budget and was available at the right time, it was selected over other possible locations.

Participant Description - The telecenter had participating telecommuters from 10 public sector organizations; there was no one dominant tenant. Out of 26 total telecommuters, about 7 were present on any given day. It was estimated that 18 people telecommuted about 1 day a week, 6 people telecommuted 2-3 days a week, and 2 people telecommuted 4-5 days a week from the center. The ratio of men to women at the Washington center was 1 to 3. Employees had jobs involving management, computer consulting, project work, and services to external clients.

Each state agency that contracted for a workspace at the Washington State Telework Center was responsible for the utilization of that space. Deciding which employees to allow to telecommute was primarily a middle management (project management level) responsibility, although in some cases employees requested the assignment. Mass media attention, word-of-mouth, a newsletter article, and public speaking were the primary promotion strategies used to attract telecommuters into the Washington center.

Center Policy and Control - The primary job of the Washington center site administrator was to keep the equipment in good working order and provide technical support. The site manager reported periodically to the project manager (at that time) of the Washington State Telework Center, Michael Farley. There were no cases of conflicting demands on center resources.

The employee's individual organization, along with assistance from the project manager, developed all telecommuting center user policy. Each participating agency was assigned a workspace and allowed to control the usage of that space (e.g., whether it was shared or not). Different individuals from the same organization could occupy the same space on different days of the week, but different organizations did not share the same office spaces. There were no major concerns about the security of proprietary information at the Washington center.

Formal telecommuting training (e.g. using hired consultants) was not available for users of the center, but an orientation meeting and packet, showing the building facilities and the "house rules", were always provided.

Financing and Costs - To implement the Washington State Telework Center, an entirely new office space was developed. The total cost of setting up the space was estimated at $119,000, over half of which was spent on the purchase of new office furniture. Computer costs were not too large since most of the computer equipment for the telework center was donated by R and D Industries, a regional distributor for Hewlett-Packard. A state agency paid $1,500 per year for a workspace in the center. This subsidized rent gave the tenant an open office cubicle and use of the conference room, fax machine, phones, printers, copiers, and computer equipment. It was estimated that for the center to break even financially, it would need to charge about $6,000/year or $500/month for a workspace (Kunkle, 1992).

Evaluation Study - A brief evaluation report on the Washington State Telework Center was prepared by the project organizers (Quaid *et al.*, 1992). The report includes key findings (such as the fact that the telecommuting center typically operated less than 50 percent full); planners' site selection criteria (such as their desire to find a center which would be accessible to those Washington State employees with the longest commute); telework center characteristics (such as

the fact that a security card access system was used); participant characteristics (such as the fact that five telecommuters used the center three or more days per week); costs (such as the fact that administration for the telework center cost $1,500 per month); an analysis of travel and energy impacts (discussed below); and conclusions and recommendations. Appendices to the report contain the orientation materials provided to the telecommuters and the findings of a focus group discussion on the telecenter.

Transportation-Related Findings - An estimated 60,000 commute miles were saved by use of the center (an average of 2,600 miles/telecommuter/year). However, 6 of the 22 telecommuters on which this information is based accounted for 80 percent of the savings. Another interesting finding was that, while only 57% of the telecommuters drove alone to their main office, 83% drove alone to the telecenter (Farley *et al.*, 1992). This is similar to a finding reported in the evaluation of the Apple Valley center (see Section 5.1.5). As argued there, whether this is actually a negative impact of telecommuting centers cannot be determined without a detailed analysis of mode choice for both the access and line haul portions of a commute trip.

Additional Thoughts - Farley felt that the most critical factors to the success of the center were the location of the center, the LAN for the computers, on-site technical support, and public funding to subsidize the rent.

He also felt that the one-year funding duration for the center (considered an unstable commitment) and lack of voice-mail capabilities were factors that limited the success of the telework center. If given the chance to start again, Farley said that he would want to have a five-year budget commitment, a waiting list of employees wanting to use the facility to replace telecommuters who dropped out, and voice mail. Farley recommends corporate/agency management briefings and media attention for strong marketing of a telecommuting center. He believes that a number of questions remain about the financial viability of telecommuting centers, and their efficiency as a public policy option.

Another spokesperson for the Washington State Energy Office indicated that WSEO supports the concept of telecommuting centers, but sees various roadblocks that need to be overcome before

telecommuting centers can be economically self-supporting. These roadblocks include the need for a well-planned and extensive marketing program to ensure that the telecommuting center will have telecommuters, and a way for employers to avoid paying double rents, for a space at the office and at a center (Christensen, 1993).

This program had an interesting perspective on marketing. Although only half of the thirteen workspaces were contracted out prior to opening day, the rest were rented out within three months of opening with minimal marketing effort. The project organizer felt that extensive marketing was not needed since it was a research-oriented demonstration, and even a half-full telecommuting center could provide enough data to analyze. However, it is recommended that more time and effort be spent in recruiting tenants when the main objective is not research, and high occupancy is important (Christensen, 1993).

5.1.4 Northern California - Pacific Bell San Francisco Satellite Work Center

Background - Pacific Bell, the Bell Operating Company for the State of California, decided to create the San Francisco Satellite Work Center to promote more efficient use of existing office facilities. The public affairs, community relations, and corporate communications offices of Pacific Bell had responsibility for planning and creating this center.

It took a little under 6 months to get this facility operational. Planning and marketing (rather than facility development) took most of the time since the telecenter is in an existing company building. During this time, telecommuters within the company were identified (Alvarez, 1993b).

Center Description - The San Francisco Satellite Work Center is located in the central business district at 140 New Montgomery St., Fourth Floor, San Francisco, California. Restaurants are the main nearby amenity for this telecommuting center. A mass transit system is within walking distance, allowing transit-using telecommuters to avoid the parking charge of $7.50/day for use of a public lot. The parking facility is one of the least expensive in the area.

The center was opened in 1989 and is still operating. It is managed by an off-site contact rather than an on-site administrator. Costs, privacy concerns, separation of employees, and comparability to home departments were the main factors considered in the floor plan design for the San Francisco Satellite Work Center. It is a coded-entry protected facility, and telecommuters have 24-hour access to it with their own codes and ID cards.

The building, which is owned by Pacific Bell, has 26 floors with a total area of 356,000 sq. ft. The telecommuting area is on the fourth floor and comprises about 1,200 sq. ft. There is no formal mail delivery for the telecommuters. They have access to a lounge, conference room, and lunch room. There are 11 open-office cubicles and 1 private office used as workspaces. Users of the center feel that the place has about the same noise level as their regular office.

This facility is unique among those studied in depth in that it is located in the central business district of a major metropolitan area. While at first that may seem to be inimical to the goal of reducing travel, there is actually some sound reasoning behind the site selection. The center is located in Pacific Bell's former headquarters building, which was largely vacated when the head office moved to a larger, more efficient, and less costly facility in suburban San Ramon (East Bay). Opening a telecenter in the downtown San Francisco building allowed some workers to partially avoid a longer commute (across the bay) to the new outlying headquarters location, and provided convenient drop-in space for corporate staff with business to conduct downtown (Alvarez, 1993b). Another advantage of this particular location was that it was already equipped with state-of-the-art computing and communication capabilities.

Participant Description - Pacific Bell is the only company that uses the San Francisco Satellite Work Center. About 12 people use the center on a regular basis (9 use it one day a week, 1 uses it 2-3 days a week, and 2 use it 4-5 days a week), but many more employees can take advantage of the telecommuting center since there is drop-in user space. No attendance log is kept at the telecommuting center, but all telecommuting time is reported on employee payroll records. Thus, the extent of telecenter use by participating employees is known fairly accurately. Participating telecommuters have jobs as systems analysts and managers, and the ratio of men to women is about 10 to 1.

The San Francisco facility has been highlighted in company publications and is encouraged by the firm as a strategy for reducing travel. Participating departments within Pacific Bell are recruited partly by these company publications. Other promotion strategies such as voice-mail bulletins, word-of-mouth, and public speaking are also used. Employees initiate contact with the center, and request permission from their supervisors if they wish to use it. If they are given management approval, a work schedule is then coordinated with the telecommuting center management.

Center Policy and Control - The off-site manager of the telecommuting center, Rachel Alvarez, has duties that include contacting the computer department for service needs, and coordinating necessary supplies. She reports to the Pacific Bell area-vice president of public affairs who has pioneered other telecommuting programs. Conflicting demands on the center's resources have not yet occurred.

The human resources office of Pacific Bell develops telecommuting center policy. Different individuals occupy the same space on different days of the week, and despite the fact that only a single company uses the area, there is still a concern about security of proprietary information. To handle this concern, a secret code access to computers and sensitive information has been given to employees.

Optional telecommuting training is available to telecommuters, given by the consulting agency Telesis Management Institute. Most of the training is given at Pacific Bell headquarters, but some may be "suitcased" (i.e., the instructor will travel to another location if demand is high enough to meet expenses). Each individual department is responsible for paying the $95 cost of the six-hour training sessions.

Training, which is also available to the public at a cost of $190, includes the following topics:
* how telecommuting helps satisfy the federal and state clean air laws;
* the benefits of telecommuting to the employer, the employee, and the community;
* the different types of telecommuting; and

*   the characteristics of a successful telecommuting program and how to implement one (Telesis, 1993).

Financing and Costs - Information on the expenses of operating the center were not provided, and indeed may not be readily available since the center is subsumed into a larger facility. The center generates no direct income: it does not cost a participating department anything to use the center since it is owned by Pacific Bell and an interdepartmental transfer of overhead costs is not required.

Additional Thoughts - Alvarez feels that telecommuting within Pacific Bell is not yet as successful as it could be. She has the goal of increasing user demand for the center to the point that a waiting list would be required. Turnover among current telecommuters limits the use of the telecenter.

Alvarez indicates that Pacific Bell is renewing its efforts to make the center a greater success. The firm continues to market and create awareness for the telecommuting center as a work/travel alternative. She recommends using all available technologies (electronic mail, voice mail, and company publications) to "get the word out" about a telecenter; awareness is one of the best marketing strategies. She believes that state-of-the-art equipment would greatly encourage telecommuting, but with limited funding, other company priorities get the newest equipment.

5.1.5   Southern California - Apple Valley Telebusiness Workcenter

Background - The Inland Empire Economic Council (IEEC) decided to create this telecommuting center to determine the feasibility of telecommuting for commuters traveling to Los Angeles and Orange County from the rural high desert area of Southern California. The IEEC under the direction of Steve Pontell, President, and Paul T. McClure, Director of Telebusiness Workcenters, developed the center. Sponsors also helped in the development process. As of November 1993 the Apple Valley center came under the management of the Mojave Desert Air Quality Management District.

In July 1991, the San Bernardino County Board of Supervisors adopted a motion to establish the Apple Valley center and its task force. Approximately 4 months later, the center was opened (Peterson, 1993c). The extremely short implementation period gave little time for marketing and other planning issues.

Center Description - The Apple Valley Telebusiness Workcenter is located in a rural strip business center at 18888 Highway 18, Suite 105, Apple Valley, California 92307-2315. The center's nearby land uses include restaurants, dry cleaners, a post office, a supermarket, a hospital and fire station, and a variety of other businesses. This telecommuting center is not within walking distance of a mass transit system, and parking is free and readily available at the center and nearby areas.

The site for this center was intentionally chosen to be in a rural area near an interstate corridor. Apple Valley specifically was chosen because the community showed the greatest enthusiasm and support. The telecenter was opened October 1, 1991, and is expected to be open at least through March 1994. A full-time manager is on site. With little previous experience to call on, no major factors were considered in finding space for the telecommuting center, or in designing its layout. The telecenter planners accepted what was available.

The regular operating hours of the center are 8-12 AM and 1-5 PM, Monday through Friday. Telecommuters have 24-hour access to the facility, which is protected by an electronic alarm, via keys and alarm code. The 2,065 sq. ft. telecenter occupies part of a one-story building. The telecommuting center has a conference room, and a reception desk area which doubles as the site manager's office. The center can handle up to 12 telecommuters in its 12 open-office cubicles. Users feel that the telecommuting center is quieter than their central offices.

Many of the personal computers donated to the Apple Valley center were inadequate to handle telecommuters' needs. It has been an issue for the users and tenants, since "state-of-the-art" facilities were advertised for the telecommuting center (Peterson, 1993a).

Participant Description - The telecommuting center has participating telecommuters from five private-sector firms and public-sector organizations. Southern California Edison (SCE) is the anchor tenant. A telecenter anchor tenant is a company with a number of participating telecommuters at the center, whose presence (it is hoped) will encourage the use of the facility by other organizations. Other employers do not have any problem with SCE being the dominant tenant.

An attendance log keeps a record of the daily usage by the 13 private-sector and 4 public-sector telecommuters. It has been estimated from these records that, on average, 4 to 7 telecommuters are present at the center on any given day. Most people (14) telecommute 1 day a week, two people telecommute between 2 and 3 days a week and one person uses the center up to 5 days a week. Telecommuters have jobs in many fields, including sales, information services and technology, environmental health, real-estate assessment, nuclear engineering, machine technology, and building safety. The ratio of male to female telecommuters is greater than four to one.

Participating organizations decided which employees could use the center mostly by performing internal surveys. Contracts and agreements were executed between all participating organizations and the Apple Valley center management. Potential tenants were recruited by the following marketing strategies: mass media attention, videos, brochures, word-of-mouth, and direct mail to nearby residents.

Center Policy and Control - As well as overall monitoring of the operation of the center, site manager "Pete" Peterson keeps services and equipment in good working order, develops center policy, and completes reports on finances and other center activity. The site manager reports to the director of the telebusiness workcenters about progress and issues concerning the telecenter.

There have been no cases of conflicting demands on center resources (e.g. from telecommuters of different companies wanting to use the conference room at the same time), and thus no policy has yet been made about it. Workspaces are not shared among employers, but are shared among different employees of the same employer. Peterson acknowledged that cubicle sharing across

employers could create some new challenges in data/software storage. While the security of proprietary information has not been a major concern among the tenants currently using the Apple Valley center, ordinary precautions are taken such as locking up software and closely monitoring workspace use. Security *is* an important factor in recruiting tenants, however: one of the project's own corporate sponsors would not use the facility because there were no closed offices (Peterson, 1993a).

Telecommuting training is optional for telecommuters and their managers. One trainer, paid by the user company and the center management, would be contracted out to do all work. Training specifics are similar to those of the Riverside Center (See Section 5.1.7). Information for managers on how to manage remote workers is not currently included within the training. However, center management hopes to improve training if center operation is continued (Peterson, 1993a).

Financing and Costs - Information on the 1992-1993 telecenter budget was provided. The center had received $105,973 in total income, which included grants, in-kind contributions, and rental fees. It accrued a total of $90,780 in costs, which resulted in a positive cash flow of $15,192. There has been no need for a significant budget revision as no major, unforeseen expenses have occurred. Currently, sponsors provide a large subsidy to defray the cost to participants of telecommuting space. Tenant organizations do pay a $100 per month fee for a workspace. Twenty-four hour access and workspace usage are the primary privileges provided by the rent. This telecommuting center does not financially support itself from rental income alone at the present time.

Evaluation Study - Two reports have been developed concerning the Apple Valley Telebusiness Workcenter. The Inland Empire Economic Council prepared an evaluation and operations report on the two San Bernardino County telebusiness centers, Apple Valley and Ontario, for the time period July 1991 to December 1992, and site manager Peterson prepared a statistical analysis of data collected during the Apple Valley center's operation from 1991 to 1993. Both reports have a great deal of useful information. The following paragraphs briefly indicate some of the contents of these reports.

<u>Evaluation and Operations Report</u>:   This report is divided into five sections: origination, objectives, organizations, operations, and outcomes (similar to the format of our telecenter survey, but more detailed).   The origination section contains the history and legislation behind the development of the center, as well as copies of the contracts between organizations involved in starting the center.   The objectives section outlines the center planner's goals, and also shows the time-line of workcenter development. Section three summarizes the organizations involved with all aspects of the creation of the center.   The fourth section discusses in detail the attributes of the telecommuters and the telecommuting center, including training program documents (such as training guides and travel diaries) and center operating forms (such as fax logs and contact lists).

The last section discusses the outcomes of the project.   This section contains a variety of information including: projected energy and air quality impacts over a six-year period, reports for the months of July-September 1992 on commute miles saved through use of the two centers, and budget reports for the same period.   The section also contains the results of a pre-telecommuting attitudinal survey completed by users and their managers, and observations from a focus group meeting held with center users and their managers after telecommuting began.

<u>Apple Valley Center Statistical Analysis:</u> This report includes highly detailed information in eight areas: activity reports (such as the number of visitors and tours per month), mileage reduction, financial information, monthly workstation costs, copy and fax machine usage, equipment inventory, telephone usage, and administrative forms. From this report one learns, for example, that there were 51 outgoing calls in January 1993, and that the average number of photocopies made per trip to the copy machine for 1993 was 42. Another potentially useful statistic found in the report was that the average cost/workspace per month for 1993 was about six hundred and ten dollars (Peterson, 1993b).

Transportation-Related Findings - One interesting finding from the pre-telecommuting survey discussed in the Evaluation and Operations Report was that, although 62.5% of the participants drove alone to work, 95% of them expected to drive alone to the telecommuting center. While on the surface this appears to be a negative impact of the center, more detailed analysis is needed to determine whether or not this is true. For example, some or all of the 37.5% of the workers

who rideshare or take transit to work probably drive alone to access their carpool or bus. This access portion of the trip may be roughly equivalent to the trip to the telecenter.

It was calculated that nearly 50 thousand vehicle miles were saved in 1992 by using the center (based on 17 telecommuters). Also, during the time period from October 1991 to April 1993, telecommuters utilizing the Apple Valley center saved an average of 108 commute miles and 2.33 hours for each telecommuting center usage (Peterson, 1993b).

Additional Thoughts - Peterson believes that marketing strategies are the primary factor in telecommuting center success and that greater marketing for the Apple Valley center was needed. Given a chance to start again, Peterson indicates he would establish a more aggressive marketing plan, which would include a dedicated marketing representative and thorough follow-through.

5.1.6   Southern California - Ontario Telebusiness Workcenter

Background - The idea of establishing a telecommuting center originated with the Inland Empire Economic Council (IEEC), a non-profit organization of public and private sector entities. The IEEC also acted as a facilitator, bringing together the task force of sponsors that planned and implemented the center. The objectives in this project were to stimulate local economic development (by retaining workers during the day, who are then more likely to spend money locally), and to reduce regional air pollution and traffic congestion. Planning began in earnest by May 1991 and lasted six months (Wild, 1993c).

The planners viewed the project as a demonstration to employers of the benefits of telecommuting. Once employers experienced those benefits, including increased productivity, it was hoped that they would be "hooked". Project planners foresaw a natural migration from the telecommuting center to local executive office suites at the conclusion of the demonstration (Wild, 1993c).

Center Description - The Ontario Telebusiness Workcenter is located in an office park at 3281 East Guasti Road, Suite 275, Ontario, California 91764. It is about 35 miles from downtown

Los Angeles. Land uses near the center include restaurants, a post office, an airport, hotels, and a shopping discount outlet. This telecenter is located within walking distance of a mass transit system. Free parking is available at the center.

The center was opened October 1, 1991, and is expected to be open at least through the end of 1993. A full-time manager is on site. The main consideration in designing the layout of the telecommuting center was to provide enough space for the expected number of telecommuters.

The center's normal business hours are 8 AM to 5 PM, Monday through Friday, and telecommuters have 24-hour access to the facility via a building/elevator card. The telecenter occupies 4,600 sq. ft. of leased space in an eight floor building. Mail at the center is picked up from the telecenter manager. The telecommuting center is equipped with 24 workspaces that are open-office cubicles, and has the following additional features: an equipment room, visitor seating areas, audioconferencing capabilities, two conference rooms, a reception desk, and a lunch room. The center can handle up to 24 telecommuters at any one time. Despite the fact that there are no private, fully-walled offices, users of the Ontario facility feel that the center is quieter than their regular office. The site of the center was chosen for its low cost per square foot. A floor plan of the Ontario center is included in Appendix A.

Computers are provided for center users. Some new PCs (486s) were purchased to meet the needs of prospective tenants who would not participate unless the equipment was comparable to that found in the main office (Wild, 1993a).

Participant Description - The center has participating telecommuters from four private-sector companies and one public-sector organization. Southern California Edison (SCE) and GTE are the anchor tenants. An attendance log records daily usage by the 26 private-sector and 6 public-sector telecommuters. These records show that, on average, 5 to 10 telecommuters are present at the center on any given day. Approximately 30 employees telecommute one day a week, one person telecommutes between 2 and 3 days a week, and one person uses the center 4 to 5 days a week. Among telecommuters at the center, the ratio of men to women is approximately 3 to 1.

Telecommuting surveys (given to employees) were used by many of Ontario's tenants to help choose which workers could telecommute. Contracts and agreements were executed between all tenant organizations and the IEEC. Tenants were recruited by the following marketing strategies: mass media attention, brochures, word-of-mouth, and public speaking to service groups and corporations.

Center Policy and Control - As well as overall monitoring of daily center operation, the site manager keeps services and equipment in good working order, stocks office supplies, distributes mail, does all invoicing, gives tours, and schedules meetings. The manager also reports to the director of the IEEC. There have been no cases of conflicting demands on center resources yet, and no policy has been made to resolve such issues. Individuals from different organizations do not use the same workspace, but do work near each other. Employees from the same company can and do share the same workspace on different days of the week. Current telecenter tenants have not had any problems with security of proprietary information to date. However, security *is* an issue for prospective tenants. Because the Ontario center has no closed offices, at least two companies (one a project sponsor) declined to participate (Wild, 1993a).

Telecommuting training is mandatory at the Ontario center for telecommuters and their managers. One contracted trainer, paid for by the telecenter, does all training for the telecenter tenants. Training is the same as that provided for the Riverside case study, which is described in Section 5.1.7.

Financing and Costs - Specific financial information was not provided for the Ontario Telebusiness Workcenter. Corporate sponsors donated some personal computers, modems, furniture, a fax and copier, funding for marketing materials, and technical support. Work center manager Lorri Wild indicated that the financial situation at Ontario would be comparable to that described in the *Financing and Costs* portion of Section 5.1.5, the Apple Valley case study.

Evaluation Study - A formal evaluation was conducted on the Ontario Telebusiness Workenter. A description of the evaluation report can be found in the *Evaluation Study* section of the Apple Valley Telebusiness Workcenter case study. According to the report, a typical user of the Ontario

and Apple Valley facilities has the following characteristics: 35-45 years of age, male, married, and college educated (Inland Empire Economic Partnership, 1992).

Transportation-Related Findings - Ontario telecommuters utilized the telecommuting facility an average of one day per week. On those days, these telecommuters were able to avoid their typical 100-mile round-trip commute to the main office. This elimination of a long and congested work trip led to the average three- to four-hour commute time savings per usage experienced by Ontario telecommuters (Romano, 1993).

Additional Thoughts - Marketing is the biggest implementation issue for the Ontario Telebusiness Workcenter. Wild believes that a strong marketing campaign is the most critical factor in the success or failure of a telecenter. At Ontario, lack of funding for a more rigorous marketing campaign probably limited the success of the project. In hindsight, Wild would market the center to employers earlier in the planning and implementation stages. She recommends finding as many funding sources as possible to be able to successfully market a telecommuting center.

5.1.7   Southern California - Riverside County Telecommuting WorkCenter

Background - The Riverside County Telecommuting WorkCenter originated as a shared vision of both private and public sector entities. The Riverside County Transportation Commission (RCTC), Pacific Bell, and the Economic Development Partnership were the primary groups that planned and implemented the Riverside center as a means of alleviating traffic congestion and reducing undesirable vehicle emissions.

It took approximately a year to get state legislation proposed and passed that provided funding for the Riverside center as well as for the Apple Valley and Ontario telecommuting centers. Once funding was secured, it only took six months to plan and implement the center.

Center Description - The Riverside center is located in a light industrial office park at 3190 Chicago Ave., Riverside, CA 92507. Land uses near the center include restaurants, dry cleaners,

a post office, a supermarket, a gym, and a daycare facility. It is located within walking distance of a mass transit system, and also offers free on-site parking.

This center was opened in November 1991 and was initially a one-year project. Funding has been secured which will allow the center to remain open for at least one additional year. Center operation beyond that will depend on the extent to which the public and private sector continue to provide financial support. The Riverside center has an on-site, full-time administrator. Many factors were considered when the center floor plan was selected, including costs, marketability to prospective tenants, number of telecommuters, private offices, and space for modular open-office cubicles.

The normal business hours of the telecommuting center are from 8 AM to 5 PM, Monday through Friday, but telecommuters have 24-hour access via keys to the building front door and their own private office. The 8,100 sq. ft. Riverside center occupies part of a one-story building. The telecommuting center has many features to offer its users: video- and audio-conferencing capabilities, two conference rooms, lunch room, reception area, and a site administrator office (EDP, 1992). There are 19 private offices in the center, and space for another 24 office cubicles. Many of the closed offices contain multiple workspaces. The Riverside center could accommodate about 70 telecommuters daily within its 8,100 sq. ft. of space, and at the time of survey response (February 1993), 40 telecommuters were actively utilizing the center. No tenants have chosen to use the open office cubicles, even though they are offered rent-free whereas the closed offices cost $100 per month (Morton, 1993a and Romano, 1993). Users of the center feel that the facility has the advantage of being quieter than their regular office. Desired site selection criteria for the Riverside center included: attractiveness to commuters normally using the State Route 60 and 91 freeways, freeway access, school and shopping proximity, and transit accessibility.

Participant Description - The telecommuting center has participating telecommuters from five companies. The attendance log kept by the center indicates that about 37 people telecommute an average of 1 day a week, and 3 people telecommute an average of 2 to 3 days a week. The

telecommuters have a variety of occupations, including computer programmer, analyst, and salesperson.

Agreements between tenants and the Riverside management were made through memoranda of understanding (MOUs). Tenants decided which employees could use the center through an internal process and the assistance of the Riverside WorkCenter management. Participating organizations were recruited by the following marketing strategies: mass media attention, word-of-mouth, brochures, direct mail to candidate companies, and public speaking.

Center Policy and Control - As well as overall monitoring of center operation, the site administrator keeps services and equipment in good working order, and stocks office supplies. The site manager handles all cases of conflicting demands on center resources. A committee develops telecommuting center policies.

Office sharing is not a problem at the Riverside center. All telecommuters are in closed offices, and individuals from different companies do not work in the same closed office. Telecommuters from the same company can and do share the same closed office and desk on varying days. There has not been a major concern about the security of proprietary information, but one Riverside tenant said that it would not have participated if closed offices had not been provided (Morton, 1993a and Romano, 1993).

Alone of all the centers studied in depth, the Riverside facility does not provide computers for the participating telecommuters. The reasoning was that it would be impossible to know tenants' preferences ahead of time (e.g. whether PCs or Macintoshes would be required), so that it would be desirable to maintain maximum flexibility. Center management believes that this policy has not inhibited participation.

Telecommuting training/orientation is mandatory for both telecommuters and their managers. Formal training has evolved into an individual orientation to the building facilities and rules, and a distribution of developed curriculum on ways to effectively telecommute. At the very beginning of center usage, when a large number of telecommuters and their managers needed

training, Pacific Bell and Commuter Transportation Services (CTS) gave similar training, but in more formal group sessions. Training is free to the telecommuter. Training takes place either at the telecommuter's parent office or at the telecommuting center.

Financing and Costs - Riverside's financial statement for the period 9/1/91 to 10/31/92 shows a positive balance of more than $9500. Income, including grants, cash donations, space rental revenues, and in-kind contributions, totalled $273,565, while total expenses came to $264,038 (EDP, 1992). During this period no major unforeseen expenses occurred that led to budget revisions. Funding was obtained from many sources including the State of California and Pacific Bell. An employer is charged a subsidized rent of $100 per month per space. This rent provides the tenant with a private office and access to all center amenities. The market rent for the Riverside center would be around $1.20 per sq. ft. per month for space alone. Telecommunication charges are not included in the telecenter rent; the tenant must pay those separately. Secretarial services are not offered. The Riverside center does not financially support itself at the present time. It is believed that at capacity, the break-even operating cost would be $400-500 a month for a closed office that could hold three workspaces (Morton, 1993a).

Evaluation Study - An evaluation report to the State of California was developed by the Economic Development Partnership (EDP) on the Riverside County Telecommuting Project (EDP, 1992). A description of the marketing efforts, as well as a financial statement, can be found within the report. A detailed list of the tenant employers and telecommuters is included in the report, along with many other useful documents such as the workcenter rules, a workcenter brochure, and a list of program supporters.

Transportation-Related Findings - Riverside telecommuters utilized the telecommuting facility an average of one day per week. On those days, these telecommuters were able to avoid their typical 100-mile round-trip commute to the main office. This elimination of a long and congested work trip led to the average three- to four-hour commute time savings per usage experienced by Riverside telecommuters (Romano, 1993).

Additional Thoughts - Linda Morton, director for the IEEP telecommuting centers, believes that the two most critical factors to the success of the Riverside site were: 1) the "buy in" and continuing support of the initial participating employers; and 2) local public sector financial support. She also feels that insufficient funds for marketing, middle management objections from potential tenants, and state/national economic problems were factors that limited the success of the facility.

Morton, given the chance to begin again, indicates that she would secure funds for a minimum of five years to help minimize the consequences of year-to-year financial uncertainties to which center administrators must devote much time and energy. Marketing the center prior to opening would also be done if the clock could be turned back. She recommends hiring a professional marketing agency to institute a complete campaign prior to the opening of any telecommuting center. Morton believes that securing employer commitment prior to opening will increase the success of a telecommuting center.

5.1.8   Sweden - Nykvarn Neighborhood Work Center

The following case study is based on a comprehensive report (Engström, Provvonon and Sahlberg, 1986) of the remote work experiment conducted in Nykvarn, Sweden. Personal interviews were also conducted with project planners Dr. Mats-G Engström, the director of the Nykvarn project, and Gunnar Eriksson, a member of the Nordic Institute for Studies in Urban and Regional Planning (NORDPLAN). The Nykvarn case study follows a format similar to that of the other seven case studies which were based on completed surveys.

Background - The Neighborhood 90 project was the development and study of one of the world's first neighborhood work centers. It was completed by a team of researchers at NORDPLAN, an inter-disciplinary institute for advanced planning studies in fields such as transportation and communications. The goal of the Nykvarn project was to clarify and measure the advantages and disadvantages of the combination of remote office work and new information technology.

Planning for the project began in early 1980. By August 1982, the Nykvarn center was constructed and furnished. The center opened with a press conference on November 1, 1982, about three years after planning had begun on the project. The experimental research work in the center proceeded until May of 1984, a total of 18 months (Engström, Provvonon and Sahlberg, 1986).

The implementation time for the Nykvarn center was considerably longer than the times for similar centers in the United States, possibly because this was one of the first such centers to be developed.

Center Description - The Nykvarn Neighborhood Work Center was located in a community center in Nykvarn, Sweden, a suburban town about 30 miles from Stockholm. Land uses near the center included restaurants, small shops, a post office, a bank, a hospital, and a library. Immediately surrounding the community center were apartment buildings and terrace houses. Consequently, most of the telecommuters walked to the center, although some lived in other towns such as Södertälje and took the bus in a reverse commute direction to access the center.

A major deciding factor in choosing Nykvarn as the location for the experiment was that the decision had been recently made to build a new community center with adjoining housing in that town. The telecenter project management felt that this situation would allow them to actively participate at an early stage in the design of the premises.

One of the researchers on the project was able to assign her own work to the Nykvarn telecenter. She conducted her research assignments at the center which was closer to her residence than her parent office, and also performed Nykvarn project analysis as a direct observer, telecommuter, and on-site administrator.

The regular office hours of the center were from 8 AM to 5 PM, Monday through Friday, but the center was used at all times of the day and week since the telecommuters had 24-hour access to the center. The one-story corner building comprised an area of about 1900 square feet, and had the following features: a conference room, central open space for visitors and lunch/coffee

breaks, and nine workspaces (six were computer equipped). The nine workspaces were separated by screens to handle a maximum of 9 telecommuters a day. Despite not having any private offices for the telecommuters, interviews conducted by the research team with the telecommuters indicated that the users felt that the center had fewer distractions than their regular office. Users referred to the lack of interruptions from phone calls, and to increased productivity compared to the main office.

The Nykvarn experiment lasted from November 1982 to May 1984. However, the center did not close immediately after the funding terminated. One of the private companies which had a telecommuter involved in the experiment, SE Bank, took over the center and started a branch office. The location was good for bank employees who lived in Nykvarn, since it shortened their commuting distance, but for employees living out of the area, it was a long commute to a small suburban town. The bank closed the branch office about a year later due to financial reasons and that ended the use of the Nykvarn telecenter (Eriksson, 1993).

Participant Description - The Nykvarn Neighborhood Work Center had 11 telecommuters from five private-sector and two public-sector organizations. About fifty percent of them were present on any given day. The weekly usage of the center varied among the 11 telecommuters (7 from the private sector); half of them used it 4 or 5 days a week and the other half only 1 or 2 days a week. Diverse jobs were held by the 6 male and 5 female telecommuters, including banking and pharmaceutical work.

Marketing strategies for the Nykvarn center included mass media attention, word-of-mouth, direct mail to candidate companies, and direct mail to nearby residents. Specifically, questionnaires were sent to local employers and their employees to locate potential telecommuters. Project organizers read the surveys returned by interested parties and decided which employees could use the center based on the following criteria: the work done by the employee could be done away from the main office, the employee lived in or near Nykvarn, the employee could use (or would be willing to learn) technologies such as the computer, and an equal distribution of men and

women would be chosen. The employers were relatively willing to allow their employees to participate as long as the work being done at the center was not confidential (Engström, 1993).

Center Policy and Control - Agreements between the project organizers and the participants stated that the participating employer had no obligations to the project organizers; that the employer would be given free rent and equipment for its telecommuting employees; and that it would have freedom to leave the project at any time and for any reason. The telecommuters themselves devised the rules for center usage such as: the last one to leave turns out the lights. This is unlike U.S. telecommuting centers for which rules are generally set by the project organizers. It was believed that giving that degree of freedom and control to participants in the project would facilitate a natural transition to the new environment. An important agreement made by the participants was the need for joint approval of any new participants in the experiment, to avoid direct business competition on the same premises and to maintain the security of proprietary information (Engström, Provvonon and Sahlberg, 1986).

The duties of the on-site administrator included: monitoring operation of the center, stocking office supplies, maintaining services and equipment, and conducting on-site research for the experiment (i.e., making observations and asking pertinent questions as opportunities arose). The latter duty has not usually been required of the U.S. telecenter administrators, although they make informal observations, and in some cases voluntarily collect and analyze data.

Remote work training was intentionally not provided to the participants or their managers during the Nykvarn project. Rather, everyone (telecommuters, managers, and the project organizers) learned about work center arrangements "step by step" and by direct experience (Engström, 1993).

Financing and Costs - The Nykvarn Neighborhood Work Center project was primarily funded by a research grant from the Bank of Sweden Tercentenary Fund. Some companies donated furnishings and equipment, and the remainder of the costs were covered by a special grant given from the National Council for Building Research.

The funding allowed the project organizers to offer a fully-equipped office free of charge to willing participants. The offices were comparable to, or better than, the parent offices of the participants. One participant noted that his parent office did not have any computers, and that after using the ones in the Nykvarn office he had become his company's computer guru (Engström, Provvonon and Sahlberg, 1986).

Additional Thoughts - The Nykvarn remote work experiment was a large step forward in the understanding of remote work at a telecenter. The employers participating in the Swedish project seemed more willing and less skeptical than their U.S. counterparts to allow their employees to work away from the office, and to base employee performance on results, not time spent in the office (Engström, 1993). However, NORDPLAN researcher Bengt Sahlberg (1987, p.197) pointed out that not all employers contacted for participation were so willing:

> "The problems and threats that many pointed to in the discussions on the project have proved to be less important than expected. On the other hand the institutional and psychological obstacles are considerably greater than we expected. In particular the lack of organizational and institutional experience of remote work constitutes a considerable barrier to be overcome, particularly for managers, decision-makers, trade unionists and others who have some form of responsibility for employees. Enquiries in Nykvarn to discover the interest in remote office work resulted in contact with various firms and public authorities. In several cases the employees considered it possible to do their work at a distance, whereas the management considered they needed to have their employees within sight and earshot or that they could not trust them to work at a distance without control."

Nearly ten years after the Nykvarn experiment, those institutional and psychological barriers remain high. They are slowly being lowered, however, with increasing experience with telecommuting in general, and telecenters in particular.

5.2   Analysis

Analysis of the in-depth information provided on eight selected telecommuting centers reveals many interesting insights. These insights may prove useful to anyone undertaking the considerable task of opening and operating a telecommuting center. Findings from the analysis

are organized below into twelve key areas: goals and objectives, time required to plan and implement a telecommuting center, training, marketing and promotion strategy, telecommuting center location, center management, center features, concern for security of proprietary information, financing and costs, participant description, workspace utilization, and transportation-related impacts.

5.2.1 Goals and Objectives

The telecommuting centers studied were established with many goals and objectives in mind. Goals and objectives varied among centers, but they can be placed in three general categories: transportation, business, and research. Many center organizers incorporated all three of these categories into their planning and implementation; some focused on a specific purpose.

Transportation goals and objectives: Facilities were created to provide a shorter alternative to the conventional commute. Reducing travel demand within the region would help to reduce regional air pollution, energy consumption, and traffic congestion. Planners working in regions with high levels of congestion and poor air quality generally had transportation goals in mind when designing a telecommuting center.

A related objective was the need to assess the benefits and costs of telecommuting centers compared to other Transportation Demand Management (TDM) strategies. The legislation that appropriated funding for several of the Southern California telecenters, for example, required a cost-effectiveness analysis of telecenters compared to "the costs of traffic controls that would otherwise be necessary..." (California, State of, 1990). By looking at how effectively centers reach TDM goals, policy makers can reach better decisions on whether or not telecommuting centers should be supported for transportation reasons.

Business goals and objectives: Increasing efficiency, promoting local business, and making profits were ideas that some telecommuting center planners focused on. For example, one company studied decided to create a center "to promote more efficient use of existing office facilities." Similarly, one project team sought to use telecommuting as a method to increase the

efficient use of existing technology for state government. Another company saw the potential of promoting its business by developing a telecommuting center with spaces offered at market rates. A business goal that was frequently teamed with transportation goals was local economic development, resulting from telecommuters staying in their communities during the day and spending money locally.

At least one group of center planners had given some thought to the future of the concept after the demonstration period had expired. Those planners had hoped that employers would by then be sufficiently convinced of the merits of telecenters that they would want to continue that type of arrangement. The idea (if not explicitly a goal) was that employers would then migrate to nearby executive suites acting as telecenters (see Section 3.4), with the community thereby continuing to achieve the local economic benefits of retaining workers during the day.

Research goals and objectives: Most of the centers studied had research-related objectives, either implicitly or explicitly. As telecenters are still a novel concept, research is required to determine their effectiveness in meeting the transportation and business goals and objectives discussed above. Establishment of a telecommuting center allowed the operation of such a facility to be analyzed. The specific goal of one project was to clarify and measure the advantages and disadvantages of the combination of remote office work and new information technology. Another planning team hoped to learn what makes a telecommuting center "work", and then possibly use this knowledge to implement more successful centers in the future.

Discussion: Center organizers incorporated goals of transportation improvement, economic development, and research findings into their planning and implementation of telecommuting centers. They found that meeting all these goals with one facility is a challenge, and at times, some goals work negatively against each other. For example, rural economic development typically introduces increased vehicle use, and thus, while providing new business, may also contribute to traffic congestion. Even subcategories within a type of goal may not always work in concert. For instance, center planners attempting to reduce congestion and vehicle emissions via implementing a regional telecommuting center with electric vehicle access may not reach both objectives: the clean-running electric vehicle may reduce emissions, but do little to ease

congestion since telecommuters will still be driving on busy roadways. Hence, careful planning is necessary for telecommuting centers to achieve the goals an organizer is trying to obtain.

In establishing goals for telecommuting centers, it is important to distinguish between the goals a single particular facility can address and what a large number of centers collectively can accomplish. Some rural telecenters, for example, may have little directly to do with reducing urban congestion and a great deal to do with economic development of remote areas. (However, it is possible for the same center to fulfill both goals if it truly captures long-distance commuters to a metropolitan area). Regional telecommuting centers may have little effect on reducing commute trips, but a large effect on reducing vehicle-miles travelled. There is an understandable tendency for project planners to list as many goals as possible in connection with a telecenter, and indeed in the early stages of consciousness-raising it is useful to highlight the broad possibilities of the remote work concept. The danger lies in overselling a specific facility as fulfilling a large number of politically popular but collectively unrealistic goals. It is recommended, then, to develop and present a reasonable set of goals for a particular telecenter, while acknowledging that additional different facilities may address different goals.

5.2.2 Time Required to Plan and Implement a Telecommuting Center

Information on the estimated time to plan and implement a telecommuting center was obtained from phone interviews with telecenter site administrators and/or consultants to telecommuting projects. Responses for the amount of time needed ranged from six weeks to three years, with the mean for U.S. telecenters being a little less than six months (see Appendix B).

Many factors, subject to varying degrees of control, were involved in the length of time taken to establish a functioning center. Funding requirements, the choice of using an existing building versus new construction, the number of people working on the project, complexity of site location criteria (such as locating a center in a rural area, near a freeway, and near the residences of many employees), telecenter purpose, and marketing goals were the primary factors reported.

It might be expected that single-employer centers should be quicker and easier to implement than multi-employer centers since they do not require complex and time consuming issue negotiations with prospective employer-tenants. However, a single-employer center is not routine to implement by any means. The one single-employer center among our case studies took just as long to implement as the multi-employer facilities.

Managers of some centers indicated that requirements, such as funding availability for defined time periods in return for guaranteed products, induced an implementation pace that was faster than desired. Center organizers would obtain funding to operate a center for a year with the condition that an evaluation report would be developed at the conclusion of operation. However, the "clock" started as soon as the money was given, and consequently, pre-operating tasks such as marketing were done quickly so that a higher percentage of the funding time would go to center operation. Because of these accelerated opening deadlines, feasibility studies and adequate marketing were not done. Another negative consequence of the hurried start-ups was low utilization of the centers (see Section 5.2.11).

Looking back, respondents would have preferred to spend less time on facility development and more time on the critical marketing tasks associated with opening a center. They felt that it was more desirable to have a readily-available and furnished facility than to spend time on the details of outfitting a facility. However, it should be noted that for the cases studied here, the time to establish a center did not differ much whether an existing building was used or whether it was sited in a newly-constructed building. Where sufficient staffing was available, planning the center occurred simultaneously with the construction/remodeling phase of the start-up, thus causing no major delays.

The number of persons devoted to implementing the telecenters varied from one to ten. One center was opened under the primary direction of one person. This person did nearly everything, from calling about the office furniture to marketing to potential tenant organizations. This individual believed it was easier to get things done that way: only one person had to be convinced that something was right. Hawaii's method of start-up was at the opposite end of the spectrum. A task force involving university professors, transportation planners, and others, was

appointed to undertake the task of center creation. One of the organizers behind that project believed strongly that the "team of thinkers" was a key factor in the quick start-up time.

Site location criteria can have a strong impact on the amount of time needed to implement a telecenter. Depending on the number and complexity of criteria generated, a center planner can have an easy or arduous time locating a site, and in turn require much or little time to accomplish this task.

In conclusion, start-up times will vary depending on the situation. However, almost everyone interviewed believed that more time was needed to develop that particular center. They felt that 12 to 16 months would have been more appropriate, and that the success of the telecommuting center, especially in the beginning, would have been greater as a result. Thus, it is recommended that 12 to 18 months be allowed for planning to implement a telecommuting center. This would allow time for a careful search for the ideal site to be made, marketing research to be done, a marketing program to be developed and implemented, and creation of sound telecommuting center policy to take place.

5.2.3 Training

All involved in running the centers felt that some training was needed to prepare telecommuters for successful participation in a center. However, the training actually conducted did not typically involve in-depth seminars on the hows and whys of successful remote work, but consisted of a simple orientation to help the participant become familiar with telecenter "house rules" and equipment.

Most training provided was very informal. One center simply gave out literature on telecommuting and had no face-to-face meetings. Training with professional human resource consultants was only done by one of the centers, but whether or not it better prepared employees for remote work from a center is unknown.

Almost all centers had the same type of orientation program. The telecommuter would be given a tour of the building that included a description of the house rules (e.g., turn off the lights if you are the last person to leave) and the equipment and amenities available at the center (e.g., coffee maker and facsimile machine). Supervisors were invited for a similar tour, but they usually opted out due to more pressing demands on their time. Information packets containing telecommuting tips were also normally given out to telecommuters and supervisors. Tips included advice such as: bring more work than normal because it is not uncommon to finish more tasks in a shorter period of time due to fewer distractions at the center; and plan ahead of time what work is best-suited to telecommuting, such as reading and critical thinking. Additional information included how to maintain good work habits and how to keep in close contact with the main office.

Conventional wisdom holds that training for both telecommuters and their managers is essential to telecommuting success. For the centers studied here, by contrast, lack of in-depth training did not appear to be a serious problem (although one site manager did--when asked--report a desire to upgrade the training program at that site). Several points should be noted, however. First, it may be that a certain amount of "hidden" training took place -- that is, activities such as management and employee briefings and other information dissemination about telecommuting and the center that occurred in the process of recruiting participation. These activities would not have been formally considered training, but may have had the desired effect of shaping realistic expectations about telecommuting. Second, the written information provided to telecommuters and their managers may have mitigated the need for face-to-face training sessions. Finally, it may be that the early adopters of the telecommuting center concept are those who already have the traits of successful telecommuters and telemanagers and for whom training would therefore be superfluous. None of these observations supports the conclusion that training is unimportant. As telecommuting moves to the mainstream, it is likely that more attention will need to be paid to this aspect of implementation. The issue of how much training is needed and how it can best be delivered is a useful subject for further research.

5.2.4   Marketing and Promotion Strategy

A key factor in the successful development of a telecenter is an aggressive marketing approach. In the broadest sense, marketing includes product development, design, positioning, and pricing as well as promotion. Many of these aspects of marketing were implicitly or explicitly addressed in the planning process and are discussed in other locations (such as Section 5.2.5, Telecommuting Center Location; Section 5.2.7, Center Features; and Section 5.2.9, Financing and Costs). This section makes some general observations about marketing and some specific observations about promotion.

Almost all site managers reported extreme dissatisfaction with the marketing aspect of center implementation. They felt that marketing was neither undertaken in sufficient quantity, nor was it properly timed. The promotion strategies most used included: public speaking to service groups, word-of-mouth, and mass media attention. Direct mailings to candidate organizations and residents located near the center were not emphasized. Site administrators who included a direct mailing component in their promotion program achieved positive results, and they recommend that this approach be used more. When undertaken, public speaking engagements proved fruitful for some of the telecommuting center marketers by arousing interest in the telecenter concept and helping to recruit new tenants.

Many respondents mentioned that marketing the centers was difficult because not much is known about telecommuting centers, and few examples existed. It was hard for potential tenant organizations to visualize the layout or operation of a telecommuting facility. Thanks to the diligent work of these early pioneers, there are established, operating centers to be seen and reports of telecenter experience available. However, for a short term pilot project, potential employers are still likely to be concerned about the productivity of remote workers, and about the long-term plans for a demonstration telecommuting center. In the long term, for telecenters to become permanent, employers must see savings or benefits to outweigh the costs of paying for the new space at the telecenter. Dealing with these concerns means that marketing will continue to be a formidable challenge for some time to come.

Marketing made a difference in the amount of participation at telecommuting centers. For example, the Antelope Valley Telebusiness Center (see Section 3.2.2.1), which placed a strong emphasis on marketing, had more than half of its workspaces contracted out to telecommuters prior to its opening. This level of tenant participation is higher than many of the telecommuting centers that have been open for more than a year and is attributable primarily to differences in the level of marketing efforts undertaken.

In conclusion, the importance of employer recruiting is clear. Pooling information from the eight telecenters studied, the following marketing guidelines are offered: be serious about marketing; hire professional consultants if in-house expertise is not available; market early in the planning process and continue throughout the project; and use every available tool to promote the telecenter -- mass media, phone calls, speeches, direct mailings, newspaper articles, flyers, e-mail, electronic bulletin boards, and so on.

5.2.5   Telecommuting Center Site and Location

The success of any telecommuting center will depend greatly on its location (position relative to geographical space) and site (specific lot, buildings, and surroundings). Therefore, careful location and site selection are important. Site and location criteria for the eight centers chosen for analysis included: need to be in a rural area; an existing building must be available for use; location must have potential telecommuting employees nearby; surrounding area must have amenities, like stores and banks; freeway access; and transit accessibility.

Restaurants, supermarkets, and a post office branch were the most common opportunities near the centers studied (see Appendix B). Daycare in the vicinity of the center was not common, but could become so if the demand for telecommuting among households with small children warrants it. A well-planned site selection will provide greater incentive for tenant participation. Workers will prefer to have the option to run short errands around the workplace. If they have this opportunity at the main office and not at the telecenter, recruitment of these employees could prove difficult. Also, having a telecommuting center located near shopping and eating

opportunities will minimize vehicular travel for these types of trips. This is an especially important consideration for centers whose main goals are to reduce travel and improve air quality.

Location and site selection will depend in part on the goals of the particular project. For example, if it is important to eliminate auto commuting entirely, then the center should be easily accessible by foot, bike, or transit to a number of potential telecommuters. If, on the other hand, the goal is to achieve some economies of scale by providing a large facility to draw telecommuters from within a ten-mile radius, then freeway accessibility is an important criterion.

5.2.6 Center Management

Effective administration is also critical to the success of a telecommuting center. The consensus of opinion was that it is important and helpful to have a full-time site manager.

Most of the centers studied did have site administrators. Those that did not had on-site technical support and/or off-site managers. Site management duties included: keeping services and equipment in good working order, monitoring operation of the center, creating reports on financial status and overall center evaluation, and hosting tours of the facility.

Site managers also provide other key services that are not at first apparent. They provide site security by monitoring who is using the center and noticing if anything out of the ordinary is occurring. They also provide social and professional interaction for the telecommuters: most of the managers interviewed knew many of the center telecommuters by name. They represent the center to the media and the public. Site managers can also provide technical support, such as helping with the copy machines and computers. One manager was becoming known as a computer "guru" among the telecommuters.

A very small facility within a residential development (like the Greystone Apartments discussed in Section 3.6.1) may not need a full-time administrator. But for most facilities of the size studied here, it is recommended to have a full-time site manager who is friendly and helpful, and to have someone to provide technical support on the operation of equipment (like modems). If

these duties can be combined in the same person, so much the better. Because there will be turnover among telecommuters, a permanent site manager can provide long-term continuity and stability for the center.

5.2.7 Center Features

Nearly all telecommuting centers studied had these features: equipment room, reception desk, site administrator office, conference room, and lunch room. The only feature that all eight centers had in common was a conference room, which indicates the perceived importance of this particular item. The conference room could be used for private meetings, which was especially valuable since most of the centers had open office cubicles rather than private offices.

A typical workspace in a center included a desk, adjustable chair, phone, and computer. Workspaces in some centers had extra furnishings such as guest chairs and file cabinets. One center reported that the file cabinets were not used much since telecommuters usually did not work at the center full time and, therefore, took all work home at the end of the day.

Availability of computers at the center was important. The computers did not have to be state-of-the-art, but they did need to be up-to-date and equipped with commonly-used software (such as word processing programs and spreadsheets). One center did not provide computers. Its management did not consider that a problem because the center provided offices that were computer-ready, thus allowing telecommuters to bring the equipment best suited to their particular needs.

Having a local area network (LAN) may be another desirable telecenter feature. Computer networking permits sharing software, other files, and peripherals such as printers. Thus, a LAN can potentially provide operational cost savings. It may also facilitate telecommuting in the case that center users from the same organization need to share common software and data files to work effectively.

Currently, technology in the centers studied is relatively basic: phones, computers (not necessarily networked), fax and photocopy machines. This configuration may be adequate in many situations. However, as sophisticated communications technology (such as Integrated Services Digital Networks) and associated applications (such as videoconferencing) become increasingly prevalent throughout the workplace, telecommuting centers will likely reflect that trend. Such technologies and applications may make telecommuting more attractive and feasible for more people.

5.2.8 Concern for Security of Proprietary Information

Although five of the eight telecommuting centers included in the case studies reported that there has not been a concern about proprietary information security, it is still an important issue. One rule developed by the telecommuters at Nykvarn (see Section 5.1.8) was that there had to be "joint approval" of any new participants in the center pilot project, due to the desire to avoid housing direct competitors on the same premises.

Some companies that initially expressed interest in using particular telecommuting centers did not follow through due to major concerns over the security of proprietary information. Private offices were a requirement for such firms, and few of the telecommuting centers were able adequately to accommodate this requirement. There were no private offices in the Nykvarn center and consequently employers did not allow their staff to use the center on days when they were dealing with "confidential" information.

It is interesting to note that even for the single-employer facility studied, security of proprietary information was an issue. Computer passwords and security codes were used to address this concern.

In an effort to showcase the security provided at the Hawaii Telework Center, Hawaii managers had the Department of Taxation use their facility. It was felt that if work with tax records could be done securely at the center, then site security would be sufficient for virtually any other type

of work. This "security demonstration" was successful and other organizations that were initially hesitant decided to use the center as well.

To conclude, lockable individual storage space, secret computer access codes and site-administrator monitoring will help allay the concerns employers have over maintaining the security of proprietary information. However, only private offices will convince the most security-minded employers to utilize the facility. In addition, employees who have private offices in the main workplace may find an open office cubicle in a telecommuting center to be unacceptable. Thus, it is recommended that planners consider including private offices when designing any telecommuting center, to increase the pool of potential facility tenants.

5.2.9   Financing and Costs

A complete breakdown of income and expenses was seldom available. However, some key facts provided are shown in Table 5.1.

Multiple-employer telecenters that involved a separate facility (as opposed to space within an employer's existing facility) had start-up budgets ranging from $120,000 to $425,000. The proportion of start-up costs provided by the public sector ranged from around 30% to 100%. Most commonly, about 30-40% seed money would be supplied by one government agency, with matching funds coming from other public agencies and the private sector. Private-sector start-up donations of cash, furniture, and office equipment have in several cases been essential to the development of these early telecommuting centers. It is important to realize that similar levels of private-sector donations to public-sector-operated centers are not likely to be sustained as such centers become more common.

Most of the telecommuting centers are open for a demonstration period of one to three years, after which they must obtain other funding or close. However, there are centers that are not demonstrations, and could remain open indefinitely. For example, a single-employer facility is being used strictly by its own employees (mainly drop-ins from outside offices), and will remain open as long as company executives feel it is valuable. Another telecenter, although located

within a single employer's facility, is available for use by telecommuters from outside the company and will remain open as long as the company has no other need for the space.

Employer participants paid from zero to $850 per month to rent a space at the telecommuting centers, with $100/month being the amount charged most often. Rent was held considerably below market values to encourage facility usage; employers were not willing to pay market rates for two spaces for a single worker, one at the parent office and one at the telecenter. Monthly operating expenses for the centers reporting this information varied widely, from about $6600 to $18,900. There appear to be strong economies of scale associated with larger centers, as the center with the largest total costs had the lowest cost per workstation, $270 a month. However, this is partly due to the relatively low utilization of that center (see discussion in Section 5.2.11), as some costs are proportional to the number of occupants. The high estimated cost per workspace associated with the Ballard facility is due to the fact that its pro-forma budget accounts for all costs (such as equipment amortization and full-labor costs for the center organizers), whereas the other facilities typically report only direct operating expenses and omit some costs such as the value of donated labor. It is possible that if all the centers completely accounted for their expenses, their cost figures would be comparable.

None of the telecommuting centers studied are financially self-supporting at this time. Whether or not they will be in the future is unclear, but since employers are unwilling to rent two spaces for one employee and telecenters require a substantial marketing budget, it will probably not be soon. In the long run, however, the increasing acceptance of non-territorial offices and other remote work arrangements means that the former issue may become less important. As the employer eliminates permanently-assigned space at the parent office for certain employees, the telecenter may become another accepted alternative location along with floating offices, client's offices, the home, and even the vehicle.

Table 5.1
Telecenter Financing and Costs[1]

Telecenter	Number of Workspaces Available	Total Monthly Expenses	Monthly Expenses per Workspace	Other Information
Hawaii Telework Center	17	$15,500	$912	$125,000 grant from State; $300,000 in donations from private industry.
Pacific Bell Satellite Center	12			
Ballard Neighborhood Telework Center	6	$12,500 pro-forma; includes all expenses, not just direct operating costs	$2,083	$80,000 donated in equipment and furniture; offers made to donate computers and software.
Washington State Telework Center	13	$6,569	$505	Total cost of setting up space estimated at $119,000; State grant of $135,000
Apple Valley Telebusiness Workcenter	12	$7,565	$630	Cash donations split between centers:
Ontario Telebusiness Workcenter	24			$100,000 PVEA, $100,000 SanBAG, $550,000 private
Riverside County Telecommuting WorkCenter	70	$18,860	$269	Fourteen-month income: $264,038 for 9/91-10/92
Nykvarn Neighborhood Work Center	9			Bank of Sweden Tercentenary research grant.

[1] A complete breakdown of income and costs was seldom available, and blanks within the table indicate unknown values.

5.2.10   Participant Description

Most users of the telecenters studied in depth are male professionals (see Tables 5.2 and 5.3). A ratio of approximately two males to one female was found among telecenter users. Their jobs varied, but almost always were highly-skilled and relatively well-paid positions. Engineers, programmers, and managers were common jobs held by telecommuters, while clerical/secretarial positions were seldom reported.

Although who is allowed to telecommute is ultimately a matter of internal employer policy, it is recommended that future telecenter demonstrations make an effort to redress this imbalance by extending telecommuting to a broader range of occupations and incomes. Administrative support workers may find it more difficult to persuade management to allow them to telecommute, as their jobs often involve frequent face-to-face interaction. But part-time telecommuting can often be arranged where mutual cooperation is present. And where telecommuting is appropriate for them, administrative-support workers may be more likely to prefer the center-based form of telecommuting to the home-based form: a greater proportion of their job satisfaction may result from social interaction at the workplace than would be the case for the professional worker. By the same token, telecenters may make it more feasible for less-affluent workers to telecommute: they may have greater space constraints at home than more affluent workers, and they may be less able to afford a home computer (if that is a condition of telecommuting).

Another finding (see Table 5.3) was that the majority of telecommuters were employed in the private sector: 99 private-sector employees versus 57 public-sector employees. Although two centers were available only for public-sector users, the one single-employer center was operated by a private-sector company, and the largest center happened to have only private-sector telecommuters. For whatever reasons, it is evident that the public-sector sponsors of telecommuting centers have succeeded in serving the private sector as well as their own employees.

Table 5.2
Occupations of Center Telecommuters

Telecenter	Occupations	Type of Work
Hawaii Telework Center	administrative assistant investigators personnel officers pesticide specialist probation officer programmer tax return preparers	
Pacific Bell Satellite Center	system analysts	contracted labor management non-management regulatory environment
Ballard Neighborhood Telework Center		self-employed business- owner
Washington State Telework Center		computer consulting management project work services to external clients
Apple Valley Telebusiness Workcenter	assessor machine technicians nuclear engineer	building safety environmental health information services sales
Ontario Telebusiness Workcenter	auditors info. systems analysts job-placement agent mortgage broker systems planning/operation transportation coordinator	engineering information technology
Riverside County Telecommuting WorkCenter		field visits maintenance professional programming research secretarial
Nykvarn Neighborhood Work Center	bankers data systems consultant population forecaster project engineer	data entry family law training pharmaceutical work programming

Table 5.3
Description of Telecommuters

Telecenter	Number of Private-Sector Employees	Number of Public-Sector Employees	Number of Men[1]	Number of Women[1]	TOTAL
Hawaii Telework Center	0	17	11	6	17
Pacific Bell Satellite Center	12	0	10	2	12
Ballard Neighborhood Telework Center	1	0	0	1	1
Washington State Telework Center	0	26	7	19	26
Apple Valley Telebusiness Workcenter	13	4	14	3	17
Ontario Telebusiness Workcenter	26	6	24	8	32
Riverside County Telecommuting WorkCenter	40	0	29	11	40
Nykvarn Neighborhood Work Center	7	4	6	5	11
TOTAL	99	57	101	55	156

[1] Numbers based on estimates from survey. Respondent generally knew only the approximate ratio of men to women at the center.

5.2.11 Workspace Utilization

In this report a workspace is roughly equivalent to an area in which one person works, and may be an open office cubicle, a partitioned workstation, or in a private office (which may have more than one workspace). Workspace utilization is the percent of time a workspace is occupied, and is calculated by dividing the average number of spaces used per day by the number of spaces available. The mean utilization was 34 percent for the centers studied in depth, but varied from as low as 13 percent to as high as 90 percent (see Table 5.4).

Occupancy level is one measure of telecenter success, but only one measure. Under some conditions, a center with a low occupancy rate may not be deemed a failure. For example, if the main objective of the project is to research the use of technologies supporting remote work, a low occupancy rate may be of less concern. If, however, the main objective is to evaluate the viability of telecommuting centers as a transportation or business strategy, then the factors contributing to low occupancy levels will be very much of concern.

It is ironic that, of the eight facilities studied, the center with the second-highest number of telecommuters present per day has the lowest workspace utilization. As a result of favorable contractual arrangements for the site, the center has more available spaces than originally planned -- about three times as many work spaces as the facility with the next highest number. While it may appear that the center is operating inefficiently and should reduce the number of available spaces, it could be that this open space is what brings in the large number of telecommuters per day. These telecommuters may feel more comfortable in the quiet surroundings and have less fear of information theft. However, most telecenter operations will not be able to afford the luxury of large amounts of open space.

Identifying an optimum occupancy level for a particular telecenter should take into consideration the amount of rental income needed to offset overhead costs, the value of transportation or environmental benefits to be garnered, and so on. Those factors which tend to encourage a high occupancy rate must be balanced against the need for keeping space coordination problems to a minimum, the desire for a quiet and reasonably private workspace, the ability to accommodate

Table 5.4
Telecenter Workspace Utilization[1]

Telecenter	(1) Average Number of Spaces Used on a Normal Workday	(2) Number of Spaces Available	(3) % Utilization [(1)/(2)]
Hawaii Telework Center	15.3	17	90
Pacific Bell Satellite Center	4.1	12	34
Ballard Neighborhood Telework Center	0.9	6	15
Washington State Telework Center	8.4	13	65
Apple Valley Telebusiness Workcenter	4.7	12	39
Ontario Telebusiness Workcenter	7.4	24	31
Riverside County Telecommuting WorkCenter	8.9	70	13
Nykvarn Neighborhood Work Center	5.0	9	56
TOTAL	54.7	163	34

[1] The values presented in this table are based on estimates taken from survey responses, telephone interviews, and literature. Utilization values can vary greatly over time, and thus this table should be interpreted as a "snapshot" in time of telecenter usage.

drop-in users of workspaces and conference rooms, and the need for "demonstration spaces" to help recruit new long-term tenants.

5.2.12   Transportation-Related Findings

A number of studies have been conducted on the transportation-related impacts of telecommuting (Handy, *et al.* 1993). The more extensive of these studies analyzed the effects of telecommuting on total travel, not just commute travel. No comparable studies have yet been made of the transportation impacts specifically of center-based telecommuting. However, reducing commute travel was an important objective behind the establishment of many of the telecommuting centers studied here. Accordingly, center operators were motivated to collect data on those impacts, although a complete analysis of those data has seldom been conducted (or at least published). The data summarized in Table 5.5 are either drawn directly from project reports, provided through conversations with site administrators, or calculated from one or both of those two sources. In the second case, it is believed that the numbers provided by site administrators are at least loosely based on attendance logs kept by the center; however they may not represent precise calculations. Note that these data focus only on commute trip impacts, not on total travel impacts.

The tabulations in Table 5.5 constitute the first known compilation of transportation impact data across multiple telecenters (including two relatively new centers described in Section 3 but not included among the case studies presented elsewhere in this Section). They are based on a total of 163 telecommuters. These data support the hypothesis of significant reductions in vehicle-miles traveled from telecenter use. The number of commute person-miles saved per center usage ranges from 38.5 to 150 with an average of 93.4 miles. This compares to an average of 36.1 commute person-miles saved per telecommuting occasion for home-based telecommuters. The implication is that the telecenter users studied travel more than twice as far to the usual work place than home-based telecommuters, who already live about twice as far from work as the average commuter (Handy et al., 1993). Perhaps more important to the telecenter user is the 2.8 hours saved in commute time, on average. Some telecenter users averaged as much as 4 hours saved per center usage. The ratio of saved miles to saved time indicates an average commute

Table 5.5
Estimated Transportation-Related Impacts of Telecenter Use

Telecenter	# of Telecom-muters[1]	Center Usage (Days/Week/ Person)	Commute Miles Saved[2]	Commute Hours Saved[2]	Other Information Given/Used
Hawaii Telework Center	17	4.5	38.46[4]	1.77[4]	Avg. user saves: •$2,500/yr •9,000 mi/yr •350 gal/yr
Washington State Telework Center	22	1.57	50	1.11[5]	•Reduces travel by 60,000 miles annually.
Apple Valley Telebusiness Workcenter	17	1.5	108	2.33	•Saved 50,000 miles in 1992.
Ontario Telebusiness Workcenter	32	1[6]	100[6]	3.5[6]	Avg. user saves: •100 mi/round trip •3-4 hr/trip
Riverside County Telecommu-ting WorkCenter	40	1[6]	100[6]	3.5[6]	Avg. user saves: •100 mi/round trip •3-4 hr/trip
East Highlands Ranch Telebusiness Center	5	2	150[7]	4[7]	Avg. user saves: •300 mi/week •8 commute hrs/week
Antelope Valley Telebusiness Center	30	1.9	122.6[7]	2.79[7]	Avg. user saves: •233 mi/wk •5.3 hrs/wk
AVERAGE	23.3	1.69[3]	93.36[3]	2.76[3]	

[1] The number of telecommuters on which the transportation findings are based may differ from numbers shown elsewhere.
[2] Round trip savings per center usage.
[3] Averages are weighted by the number of telecommuters at each center.
[4] Calculated from provided yearly totals.
[5] Calculated from data provided, assuming an average speed of 45 mph.
[6] Combined estimate for both Ontario and Riverside centers (provided by IEEP staff).
[7] Calculated from provided weekly totals.

speed associated with each center. The weighted average of those speeds across centers is about 35 mph. This suggests that the regular commute faced by these telecenter users is not only long but slow, presumably in stop-and-go congestion for much of the way. There are clear energy and air quality benefits to reducing this travel. However, a more detailed study of the transportation, energy, and air quality impacts of telecommuting centers is needed, to analyze effects on local congestion, mode choice, non-commute travel, fuel consumption, and emissions.

SECTION 6

CONCLUSIONS AND
RECOMMENDATIONS

6. CONCLUSIONS AND RECOMMENDATIONS

Remote work centers are found in many parts of the world. Experimentation with forms adapted to local circumstances is being conducted on five continents in at least twenty countries. This widespread interest is one important indicator of the potential benefits that remote work centers are perceived to bring. It is also a hopeful sign that telecenters in some configuration will prove to be financially viable. This final section of the report includes: a summary of key findings from Sections 3, 4 and 5; several scenarios representative of telecenter functional forms most likely to be seen in the future; and a list of recommendations to be kept in mind for future implementation.

6.1 Summary of Findings

Isolated examples of successful remote work centers were found in various places around the world. A pattern of elements that promoted this success could be discerned across many functional forms and in many locations. A consistent set of barriers to telecenter adoption was also observed. These topics are discussed in this section, as are findings on key operational aspects of telecenters, tension resulting from the uneven distribution of costs and benefits among employees, employers and society as a whole, and certain equity issues relevant to the public subsidization of telecenters.

6.1.1 Attributes of Success

So far, the success of a remote work center appears to depend on the ability of its founders to secure funding for a period of several years. The most prevalent types of remote work centers are the single-employer satellite office and the small rural telecottage. Examples of thriving single-employer facilities are found in the U.S. and elsewhere. While telecottages, as distinct from rural branch offices or functionally decentralized offices, are rare in the U.S., they are the dominant remote work center concept in other countries. Several concepts related to telecenters were also found to be flourishing. One notable exception to this picture of success is the

multiple-employer telecommuting center, which to date has not appeared to be financially viable and economically sustainable beyond the demonstration stage.

Most successful rural telecottages in other countries have been started with at least some public-sector funding. The amount and longevity of this funding is not clear. Some of the apparent success of this remote work center form may be due to a strong commitment to testing the concept over a period of years. On the other hand, there are reports that some of the early telecottages have already achieved or expect to achieve financial independence from governmental subsidization.

Another key element of the telecottage concept is that it combines more than one goal. These goals include provision of telecommunication and data links to other regions, skills training on telecommunications equipment and computers, job training for center- or home-based remote work, brokerage of remote work services to clients in other regions, small business formation, provision of business services to local home-based business and remote learning facilities. This combination of services is consistent with the primary focus of these facilities: encouragement of economic development in depressed rural areas.

A strategy of longer-term funding (a minimum of five years) plus multiple roles for these facilities may be equally fruitful for rural, suburban and urban telecenters in this country. Some rural telecenters in the planning stages in parts of the U.S. appear to be following this path. Also, in some cases the stated objectives of telecenter demonstrations in urban areas in the U.S. include encouraging local economic development. Multiple-use facilities may also be more economically viable since the potential for attracting tenants, opportunities for billable services, and stability of cash flow should increase with diversification of telecenter purposes.

Single-employer satellite offices also appear to be a robust telecenter form, although there are relatively few examples of these compared to the more conventional branch office and functionally decentralized forms of remote work facilities. In all of these ways, large organizations can and do take advantage of advances in telecommunication and information technologies to assume a more decentralized structure. The prime motives in this decentralization

seem to be: a desire to achieve reduced office space costs; the need to expand into new labor markets, and in some cases, the desire to retain highly-skilled employees; and the availability of surplus space due to equipment down-sizing in the communications and information processing industries. The single-employer telecenter is a logical form of the telecommuting center concept for large organizations which already have multiple facilities with available space. To the extent that it occurs, this form will be implemented largely without public subsidy.

Other successful concepts that share attributes in common with telecenters include the private sector endeavor of urban executive office suites and measures such as the use of unassigned offices to reduce office space costs. Both of these concepts seem financially viable and both depend on the increased use of work accomplished in a setting other than the traditional main office. If these concepts live up to their early promise, then this points to markets for telecenter services that could be developed in the future. This development may consist of marketing and promotional efforts targeted to capture the same business, and could encourage increased private-sector provision of a broader range of remote work facilities.

Success of the multiple-employer telecenter is mixed at the time of this writing. Almost all early demonstrations of this kind of center were not extended beyond the pilot phase. These facilities either closed outright or were transformed into a single-employer telecenter (Hawaii) or an entirely different business (Shiki). Typical barriers to success include managerial resistance to remote work (common to all forms of telecommuting) and the cost of maintaining two office spaces for each telecommuting employee (common to single- and multi-employer centers). In addition to these barriers, the multi-employer telecenter must face issues such as the concern for security of proprietary information, and the need for intricate coordination among telecenter organizers, tenants and telecommuters.

It is quite possible that these centers will eventually prove sustainable, but due to the complexity of their nature, they may require a greater number of trials to work out a useful implementation and operational methodology. There are some encouraging signs that this is the case. At least one of the more recent telecenters opened in Southern California undertook certain implementation-stage efforts that led to a relatively high initial rate of occupancy. Hopefully, as

the results of early demonstrations become more widely known and a consensus is reached on the lessons to be learned from these efforts, more successful multiple-employer telecenters will be initiated.

6.1.2   Key Operational Issues

Section 5.2 provides an in-depth analysis of key aspects of telecenter implementation and operation. Of those aspects identified, the three most critical operational issues were found to be telecenter marketing, location, and cost.

6.1.2.1   Marketing

One of the most significant findings is the uniform agreement by telecenter operators on the need for effective market research and promotional activities early in the planning stage. Much of the disappointing lack of interest and occupancy in early telecenters seems to be attributed to a lack of awareness of the facility's existence and services. On the other hand, a recently opened telecenter in Southern California took the marketing message to heart and conducted a vigorous promotional effort. As a result of this effort, which included press releases, broadcast media events, ceremonial functions, mailings to prospective employer tenants, development of an easily available packet of brochures, and presentations to key associations and individuals, occupancy of the center was high from the beginning.

6.1.2.2   Location

Another important aspect of telecenter operation is its location. The decision to locate a telecenter at a specific site requires balancing a variety of factors. A preference for tenant-ready office space was expressed by case study participants. This type of space will make provision of many of the important center features (like reception areas, conference rooms, comfortable and quiet work spaces and private offices, and computer and equipment sharing capabilities) relatively easy. However, much available office space is not located adjacent to residential areas where telecommuters live, and in many cases may not be especially accessible by any transportation

mode except the private automobile. Where local zoning ordinances permit, it may sometimes be possible to retrofit a former home as a telecommuting center. However, zoning ordinances restricting the proximity of businesses and residences may considerably hamper efforts to eliminate vehicle trips to telecenters, especially in post-World War II suburban developments.

Siting decisions must also include a consideration of surrounding amenities. The availability of restaurants, convenience outlets like post office branches, and shopping opportunities within walking distance can be important if travel reduction and air quality improvement are among the goals for implementing a telecenter. In this context, it is also important that nearby amenities be truly accessible to pedestrian traffic from the telecenter. Geographic proximity is no guarantee of accessibility.

6.1.2.3   Cost

The cost of quality space is also a key concern. Attractively furnished state-of-the-art offices may cost more to obtain, thus requiring more tenants and higher rents to break even. On the other hand, less expensive real estate may not be attractive to potential tenants and their telecommuting employees. It is important that the "break even" occupancy level for a telecenter be known for different levels of rent charged in order for this type of financial tradeoff to be analyzed.

6.1.3   Critical Barriers to Telecenter Success

6.1.3.1   Cost to Employers

Several barriers to telecenter success were identified. One of the most important was a disinclination on the part of the tenant employers to pay rents approaching market rate, or indeed, any rent at all. This seems to be rooted in the cost impact of paying for two office spaces for each telecommuting employee. As long as almost all telecommuters retain a desk at their conventional office and telecommute on average only one day/week, this barrier may be extremely difficult to overcome. Claiming hard to quantify benefits, such as increased

productivity, to offset the added cost does not so far appear to be convincing to prospective tenant-employers.

Several conditions may help to lower this hurdle. One would be the institution of full-time telecenter use by designated employees. This would allow the elimination of the main office desk, but might exacerbate the problems of isolation reported in early European experiments with multiple-employer telecommuting centers. Another trend that may make even part-time telecenter use more attractive to employers is the recent interest in the non-territorial office concept. If an employer eliminates a permanent workspace for certain groups of employees, it may make sense to rent space in a telecenter for use on a reservation basis for employees who are in the vicinity. The inclusion of teleconferencing capability at telecenters may make this more viable.

6.1.3.2   Discomfort With Remote Supervision

Another implementation barrier is rooted in a fairly wide-spread discomfort felt by managers faced with the task of effectively supervising remote workers. This seems to have resulted in the restriction of candidate telecommuters to those workers with jobs traditionally seen as independent and professional. In the early stages of the telecenter adoption process this may be acceptable, but unless managerial acceptance comes with increased familiarity and experience, the great majority of workers may never have the option of telecommuting. On the other hand, changes in the traditional form of employee-supervisor relations seems to be leading to a greater acceptance of flexible work options. This, combined with federal and state legislative requirements to reduce congestion and improve air quality, may result in this barrier becoming less significant over time.

6.1.3.3   Security of Confidential Information

Security concerns also surfaced as potential hurdles. Prospective telecenter tenants were concerned about the capability of ensuring the confidentiality of organizational information. There was also a need to avoid housing the employees of competing organizations in the same facility. The provision of private offices will be very important in attracting telecommuters,

especially full-time telecommuters. One of the strengths of the private-sector urban executive suite concept is that the space rented is a private, secure office.

6.1.4   Unbalanced Distribution of Costs and Benefits

One thread drawing many facets of this study together is an apparent disparity in the distribution of the costs and benefits associated with telecenter operation. This is most obvious when considering the experiences of multiple-employer centers but is associated in lesser degrees with other forms of center-based telecommuting. That this is so is not particularly surprising, but it does pose a dilemma for those attempting to implement and justify the continuing operation of telecenters.

In many ways, the primary beneficiaries of a well-functioning multiple-employer urban telecenter are the telecommuters. They exchange long commutes and workplaces that are sometimes not conducive to full productivity for shorter commutes, less supervision, more independence, on-site technical support for computer hardware and software, and quite often superior workspaces. In early European experiments problems with isolation from the professional and social interaction of the primary workplace were reported. But in later demonstrations in this country, telecommuters typically used the telecenter only part-time, thus alleviating this difficulty.

Benefits accrue to the population of a region as a whole to the extent that congestion, energy consumption, and air pollution are reduced by a change in telecommuters' travel behavior. However, part-time telecommuting on a large scale does pose several potential problems. For one, it may disrupt existing shared-ride commute arrangements to the parent office like carpooling, vanpooling and regular use of mass transit facilities, thus leading to an increase in single-occupancy-vehicle commuting. Also, potential congestion, energy, and air quality benefits may be seriously diminished if telecommuters drive to the center. The likelihood of that outcome is reduced by ensuring that easy pedestrian, bicycle or transit access is available to a telecenter.

Direct costs, on the other hand, are incurred by the employers of telecommuters. In the short term, unless rents are completely subsidized for a demonstration telecommuting center, the

employer must bear the cost of maintaining two workspaces per telecommuting employee. This puts extreme downward pressure on the rent that telecenters may charge. In fact, it may not be possible to judge the true financial stability of a multiple-employer telecenter unless there is a commitment to maintaining the facility for a reasonably long period of time, perhaps five to seven years. Only if the telecenter can offer leasable space over the same multi-year periods as competing office facilities, would significant numbers of employers be induced to seriously consider the use of telecenter space as a vital part of their office space requirements. Employers must also bear the cost of reorganizing work groups to accommodate telecommuting employees and the cost of training managers to properly supervise remotely working employees. In the long term, they will also often be required to pay for the reorganization of space in the primary office.

These are all immediate barriers to employer participation. It may be that multiple-employer telecenters are strongly attractive only in the presence of serious cost drivers like the extremely high office space costs that are found in prime locations in downtown business districts. Other driving factors might be extreme rush-hour congestion which is so unpleasant on any mode of transportation that organizations lose employees they want to retain to institutions located elsewhere, and the presence of stringent employer-based commute trip reduction requirements in federal, state and local legislation.

6.1.5   Workforce Equity Issues

The typical telecenter-based telecommuter was found to be a male in a highly-skilled, professional position. Managers, engineers and computer programmers were well-represented among telecommuters, while clerical and administrative support workers were seldom found. This is consistent with the target market for executive office suites, which seek clients from among executives, self-employed professionals, and regional sales staff. This socio-economic stratum is perceived to be willing and able to enjoy the benefits of an independent workplace.

This raises a large equity issue, in that the use of public funds for telecenters may largely be benefiting people already considered among the privileged of society. It is hoped that future telecenter demonstrations can address this issue of equity, although who is allowed to

telecommute is ultimately a matter of internal employer policy. While administrative support employees may have less leverage in obtaining the benefit of an alternative work option, and the requirements of administrative support may include more face-to-face interaction, these employees may benefit from part-time telecommuting, and may prefer the social interaction of a center to the relative isolation of home. Telecenters may also make it more feasible for less-affluent workers to telecommute: they may have greater space constraints at home than more affluent workers, and they may be less able to afford a home computer (if that is a condition of telecommuting).

An equity issue of a different type may also become critical for telecenter operators and those who sponsor them. The Nilles *et al.* (1976) diffusion state of organizational arrangement (see Figure 2.1) is already common in the United States; more and more jobs are held by independent contractors and other contingent workers. These positions are typically part-time, have limited benefits, often lower pay, and provide no job security. Some single-employer remote work facilities have been established in this country and elsewhere specifically to take advantage of an available pool of local, part-time workers. When these part-time jobs are newly created, this can be a great benefit. However, if the part-time positions are created at the expense of full-time or more highly paid part-time employees, then there is a significant negative side to this activity. It is certainly possible that telecenters, especially those that combine job-training in data processing and telecommunications skills with brokering of the services of trained independent contractors, may exacerbate this trend.

6.2   Telecenter Scenarios for the Future

The remote work concept of telecommuting arose from a background of tremendous innovation in communication and data processing technology, and growing concerns in several public policy arenas. Telecommuting is here to stay. It is quite likely that both home- and center-based forms will co-exist, since they serve different needs with differing degrees of success. Telecenters will continue to evolve in response to new technology, changing demographics and work practices, and evolving public concerns.

While the final forms and degree of social and economic impact that telecenters will have are not known at this time, imagining possible adoption scenarios can be a useful qualitative exercise. Several possibilities with a reasonably high chance of occurrence are discussed in this section. However, this should not be considered an exhaustive examination of probable or potential variations, even under a specific scenario. It should be noted that most of these scenarios involve multiple uses, a facet believed important to the long-term viability of the multiple-employer telecenter concept.

6.2.1 Large Regional Satellite Offices in Suburban Office Parks

Large firms are motivated by high downtown office space costs and stringent air quality regulations to establish remote work centers. A single-employer satellite facility is preferred in order to accommodate as many employees as possible, to provide on-site supervision as required for employees in low autonomy jobs, to provide better security against industrial espionage, and to avoid undesirable contact with the employees of competitors. Employees from a wide area will commute to the center which is closer to home than the main office. The large size and need to accommodate commuters requires a building with substantial floor-space and available on-site parking. A substantial percentage of the commute will be by automobile on area freeways. For these telecommuters, vehicle-miles travelled (VMT) and emissions are shifted spatially, and reduced but not eliminated.

6.2.2 Small Neighborhood Multi-Employer Telecenters in Urban Core Residential Areas

A municipality receives state funding to establish training programs for disadvantaged youth and welfare recipients at the same time a small amount of federal block grant money becomes available for urban redevelopment. A building is renovated in a lower to lower-middle income local business center that has seen better days; the city subsidizes the provision of advanced telecommunications infrastructure to the site and rents a storefront in the building for a small telecenter. A center that provides training in the use of information processing and telecommunications technology is co-located with the telecenter. Local residents walk to the

center, receive training, and use the telecenter facilities to help small-business formation or as part of trainee programs sponsored by large local employers. Some graduates of the program will take positions that require their new skills; others will continue as entrepreneurs and pay a fee to the telecenter for use of the facility. Little impact on commute VMT is experienced since these telecommuters were not previously employed. Regional VMT may rise if large numbers of trained telecommuters take positions at firms outside the neighborhood; however, the social benefits of gainful employment far outweigh the congestion and air quality impacts of these particular commutes.

6.2.3 Small Multi-Employer Telecenters in Local Business Centers of Rural Market Towns

Small towns in rural areas follow the lead of Oberlin, Kansas (Gordon, 1993a; see Section 3.5.2) in financing a civic center with advanced telecommunications infrastructure to attract employment into the area. A few self-employed professionals are attracted to the area, in part due to the availability of the telecenter. Local residents who are trained to use the advanced equipment can join a local co-op which brokers their services to organizations outside the region in a fashion similar to what is currently happening in rural areas of England (see Section 4). The telecenter is accessed by automobile since the residential density is very low in the area. The VMT increase has negligible impact since the area has more than adequate highway capacity. The air quality impacts are equally insignificant.

6.2.4 Medium-sized Regional Multi-Employer Telecenters Adjacent to Suburban Central Business Districts

A mixture of salaried telecommuters in jobs with a high degree of autonomy, self-employed professionals and start-up businesses work from a medium-sized telecenter similar in concept to an executive office suite. The center is privately owned and operated and tends to cater to executives and other up-scale employees, although employees of any rank are welcome. Several telecommuters work full-time at the facility, others part-time. A large insurance company leases a suite of two private rooms which are used as a meeting room for customer conferences and as

a drop-in office for adjusters making service calls on clients in the adjacent suburban central business district (CBD). The telecenter is accessed primarily by auto, although some full-time telecommuters do use the local transit system which is reasonably convenient due to the telecenter's proximity to the local CBD where the transit lines converge. Total employee VMT and emissions decrease since trips to the telecenter are shorter than to the parent office in the central CBD.

6.2.5   Small to Medium Neighborhood Telecenters in Upscale Planned Communities

These facilities are ubiquitous in several settings: luxury condominium and residential developments, retirement communities, and apartment complexes housing technically literate students at a local university. One example of this type of facility is found in a luxurious planned community, which is built according to neo-traditional development principles (Pearson, 1990; Handy, 1991) and incorporates a neighborhood telecenter within a community-center building. Within walking or bicycling distance of the residences, it is used on a drop-in, part-time basis by baby-boomers enjoying early retirement, who are developing second careers or doing a little consulting on the side. A group of self-employed professionals also use the facility from time to time, but most keep a discreet home office since they are not explicitly prohibited by the development's covenants. The telecenter offers advanced office and telecommunications services and equipment that is used too infrequently to justify incorporating into the home. Even though center users walk or bicycle to it (for health reasons as much as anything else), the impacts on VMT and emissions are equivocal, since these trips usually do not replace conventional commute trips.

6.2.6   Small to Medium Single-Employer Satellite Telecenters Located on the Premises of a Large-Employer Branch Office

Large employers in communications and related industries have surplus space in various facilities scattered throughout a metropolitan region that is no longer required due to technological change and miniaturization of the equipment needed to provide service to their customers. These buildings are located close to concentrations of customers, like the central and local business

districts of a city. Small to medium-sized telecenters are established for use exclusively by employees of the same large firm in several of these buildings. A mixture of employees use the telecenter: those who drop in when the commute is especially bad or have meetings in the area, and those permanently assigned a space either full-time or part-time because they live locally but are part of a more distant work group. Drop-in employees typically commute to the center from their home by automobile while some, though not all, permanently assigned employees use local mass transit facilities. The buildings tend to be a little too far from residential neighborhoods to allow easy pedestrian or bicycle access. Commuting to the facility tends to be more on the arterials than the freeway, although some permanently assigned telecommuters live very far out into the suburbs and drive forty minutes by highway to get to the telecenter. They find this acceptable because commuting into their former workplaces would add forty-five minutes or an hour to their journey to work. Total employee VMT and emissions are reduced, but not eliminated. The presence of several permanently assigned telecommuters coming in from outside the metropolitan area tends to keep aggregate VMT figures high although all telecommuters report reductions in commute time and distance.

6.2.7 Small Telecenters Located on the Premises of Local Business Services Providers or Educational Institutions

Business services providers, especially regional and national chains, aggressively pursue the provision of telecommuting facilities on the premises by adding, where possible, a quiet room with computer-equipped workspaces, and specialized telecommunication and data linkage services. Provision of drop-in or leased telecommuting facilities is seen as a natural extension of their core business: copying services, desk-top publishing, fax transmission capability, videoconferencing, and in-store computer rental on an hourly basis. Outlets without an extra room can provide only drop-in telecommuting space, since the store environment is not conducive to long-term office productivity. The telecommuters at this facility are often independent contractors who occasionally need the specialized telecommunications or data link services offered by the store. Impacts on VMT and emissions are moderate for facilities that are able to offer leased space.

Alternatively, local community colleges begin marketing space in computer labs to telecommuters, self-employed workers, and telemarketing operations on an *ad hoc* basis. In some situations, the labs were previously used primarily for evening classes and sat idle during normal working hours. In other cases, the labs are used by the school during the day, and for telemarketing activities in the evening. College students are matched with potential employers (see Gordon, 1993b for an early example of this type of strategy). Impacts on VMT and emissions are minimal.

6.2.8 Small Multi-Employer Telecenters Located Adjacent to Several Low- to Medium- Density Residential Areas

A large business and a local government agency initiate a public-private partnership to establish a residential-area-based office. The partnership is prompted, in part, by the need for both parties to meet state and federal air quality requirements. To ensure that federal highway funding remains available to the area, the local government decides to subsidize some of the rental costs of this project because of its potentially significant air quality benefits. Having experienced first-hand the increased productivity and job satisfaction of its employees at a regional telecenter, the large business decides that a strategically-placed telecenter, located adjacent to several low- to medium- density neighborhoods containing many of its employees, will yield similar employee-related benefits while helping it further comply with local air quality laws. The center is operated by the Transportation Management Association (TMA) serving the area, and through that TMA, the two initial partners recruit additional participating employers to help build the critical mass needed to sustain long-term viability. The employees using the center all live in the adjacent neighborhoods and most walk or bike to work. Others living close, but not within walking distance, use transit or neighborhood electric vehicles to get to the center. The substitution of automobile trips to and from work with walking, biking, transit and clean-fueled vehicles results in decreases in local VMT and emissions.

6.2.9   Combined Effect of All Scenarios

All of the above scenarios are plausible and may actually be implemented on a fairly wide-spread basis. It is therefore reasonable to consider the combined effects that will be observed once all are implemented.

The net effect is most likely to be a continuation of the existing trend toward office and residential decentralization from the denser urban areas. The desire for cheaper office space and the need to comply with environmental regulations will fuel a boom in telecenter facilities and in the proliferation of "desk-less", mobile employees. Some small economic advantages to the central city may accrue if telecenter/training facilities are aggressively sited in urban core neighborhoods.

Upscale pockets of telecommuters in rural areas would become widespread, especially in areas of scenic beauty. Conflicts between the affluent newcomers and the less well-to-do long-time residents may result in the "return to utopia" (or from another vantage, the sought-after rural economic development) being less enjoyable than anticipated.

The net effect will be to reduce VMT somewhat in metropolitan regions and increase it in rural, exurban areas. In addition to the reduction, a shift from regional freeways to arterials will also be noticeable. This may be an acceptable way to achieve a reduction in region-wide congestion since some local streets have reserve carrying capacity. Collectively, such streets comprise about 80 percent of lane miles of roadway nationwide, yet carry only 15 percent of vehicle miles (Federal Highway Administration, 1986). However, there are certainly individual instances in which the local arterial network has little or no excess capacity during the peak. To the extent that commute trips, albeit shorter ones, are still made in personal vehicles, the reduction in emissions will be smaller than the reduction in VMT. This is because simply starting a cold engine emits a disproportionate amount of the pollutants emitted during the entire trip. According to the California Air Resources Board, a typical five-mile trip generates 61 percent of the hydrocarbon emissions of a typical twenty-mile journey (Burmich, 1989). However, reducing emissions by 39 percent may still be worth doing. Further, it is quite possible that technological

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advances such as a pre-warmer for the catalytic converter, which will reduce the emissions spike for engine cold-starts, and increasingly cost-effective electric vehicles will ultimately make the emissions impacts of telecommuting commensurate with the VMT impacts. To the extent that residential-area telecenters become widespread the overall number of *vehicle trips* will decrease as well as VMT. This would offer the maximum reduction both in congestion and in emissions of any of the scenarios described above.

6.3   Recommendations for Future Implementation

Several recommendations for planning and implementing multiple-employer telecenters are offered as a result of this study. It is believed that these represent key factors that will greatly enhance the prospects for a successful operation. These suggestions are:

1.   Define a clear, realistic, and consistent set of goals and objectives to guide project development and to provide a standard against which telecenter success or failure can be measured.

2.   Include a thorough and aggressive plan of market research and center promotion, beginning in the implementation phase and continuing through the life of the demonstration.

3.   Allow one year to 18 months to plan and implement the telecenter.

4.   When long-term viability of the center is an objective (as opposed to short-term market research or demonstration) secure long-term financial commitments up front. Funding over five to seven years, with a business plan to achieve self-sufficiency before the end of that period, is desirable.

5.   Spend time on site selection. The criteria should be in accordance with the center goals and objectives and should seek to balance high-quality center features and nearby amenities with cost considerations.

6.   Provide private offices for permanent, security-minded tenant-employers. Semi-private workspaces should be acceptable to drop-in users since they will take their work home with them at the end of the day.

7.   A full-time, on-site manager should be available to handle administrative, technical support and promotional activities for the center.

8.   Combine multiple uses of a single facility, for example as is being done with telecottages in other countries. This combined use should make the telecenter a more viable entity and have favorable community impacts.

9.   Develop information, training and possibly incentives to enable non-professional and non-managerial employees to take advantage of the telecommuting work option.

10.   Document and evaluate each new generation of telecenter demonstrations. Much has been learned, but much remains to be discovered regarding the successful implementation of multiple-employer telecenters. It is important to determine what factors are important to all center operations and which are key only in certain situations and under certain circumstances.

In conclusion, this report gathers information on remote work center planning, implementation and operation from many sources. It is a review of *current* practice. The different forms that telecenters and related concepts take are adaptations to the environments in which they operate and the goals which they must serve. Given the continued rapid pace of technological and demographic changes that affect the implementation of remote work concepts, new telecenter forms and variations on those that currently exist will undoubtedly emerge. Woven throughout the information from which this report was compiled was a strong sense of promise for the future of remote work concepts. In the near term, many questions regarding optimal implementation and operational strategies remain, but success, for at least some variations on the telecommuting center theme, seems assured.

SECTION 7

TELECENTERS CONTACT LIST

7. TELECENTERS CONTACT LIST

Multi-Employer Centers

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Hoteling:

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Other Related Concepts - continued

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SECTION 8

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8. BIBLIOGRAPHY

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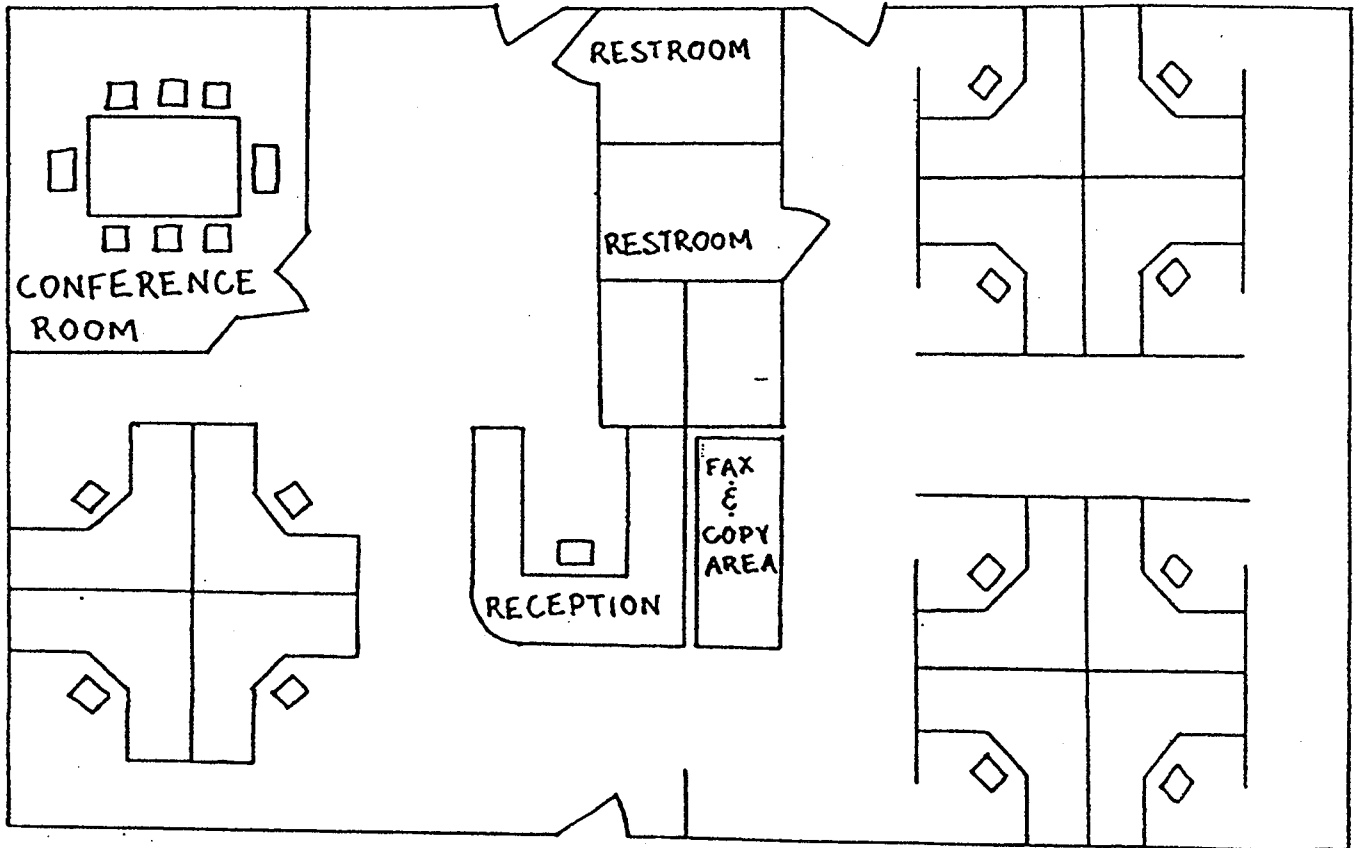
APPENDIX A

TELECENTER LAYOUTS
AND OTHER SKETCHES
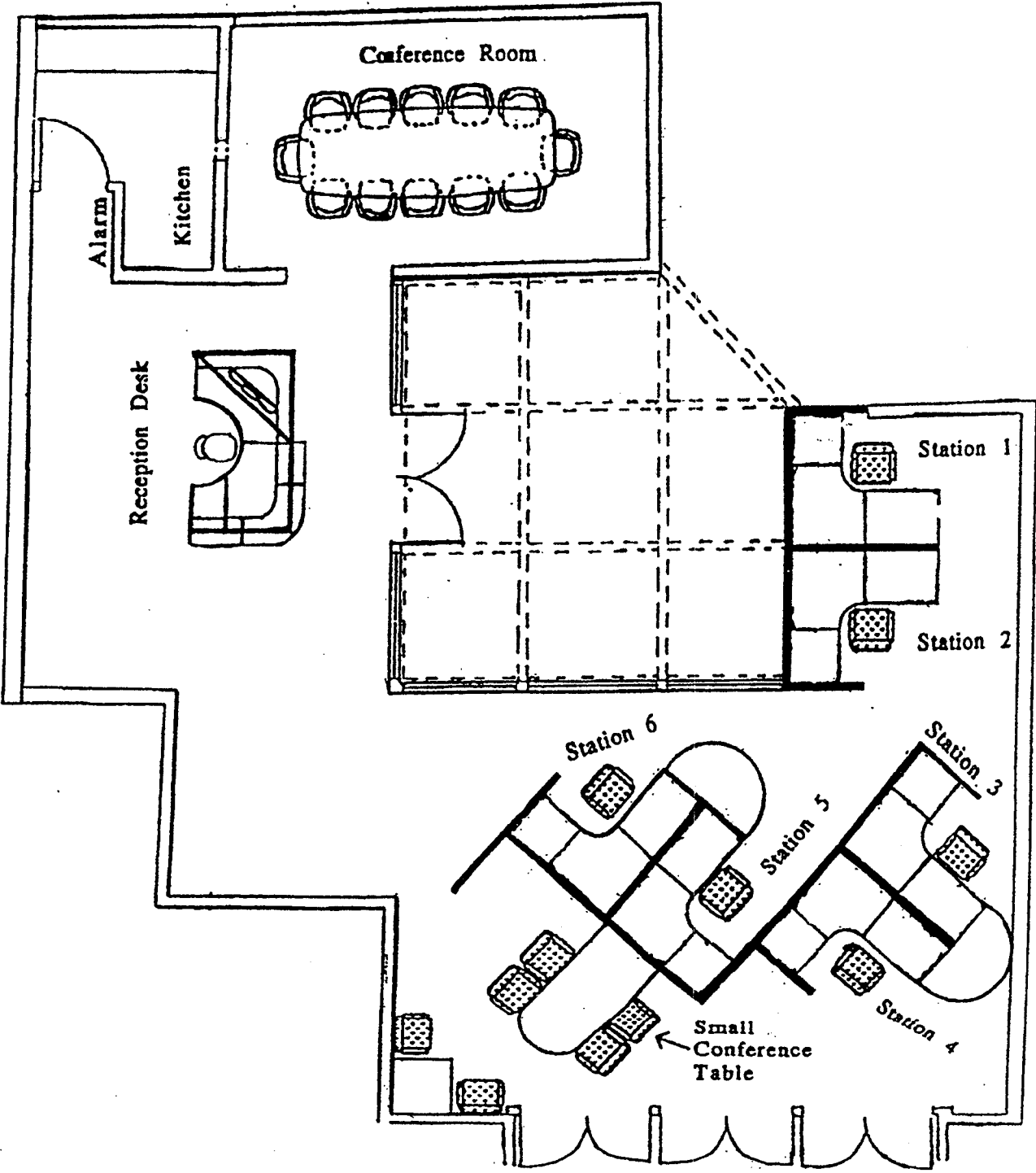
APPENDIX A: TELECENTER LAYOUTS AND OTHER SKETCHES

Figure A.1

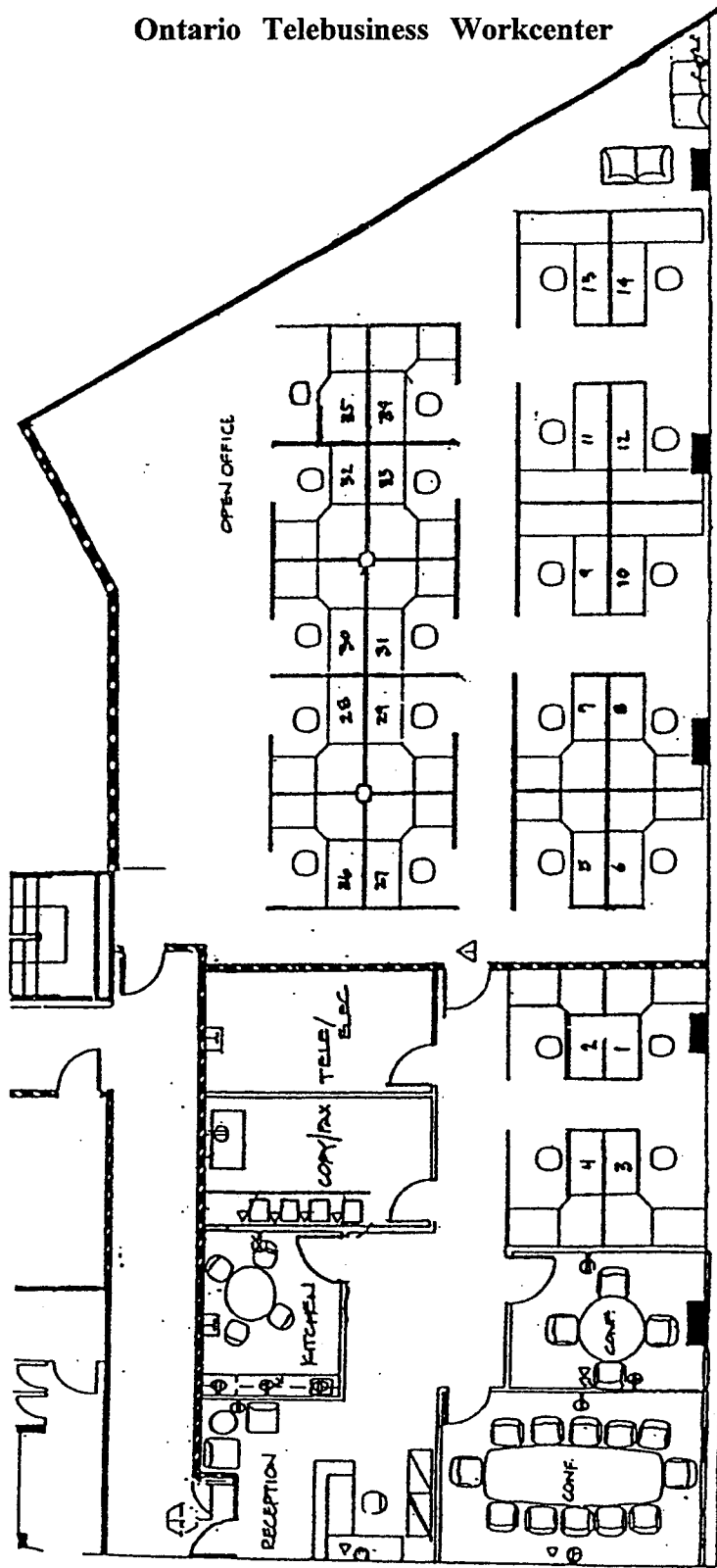**Apple Valley Telebusiness Workcenter**

Figure A.2

East Highlands Ranch Telebusiness Workcenter

SOURCE: Inland Empire Economic Partnership (IEEP)

Figure A.3

Ontario Telebusiness Workcenter

SOURCE: Inland Empire Economic Partnership (IEEP)

Figure A.4

Telecommuting WorkCenter of Riverside County
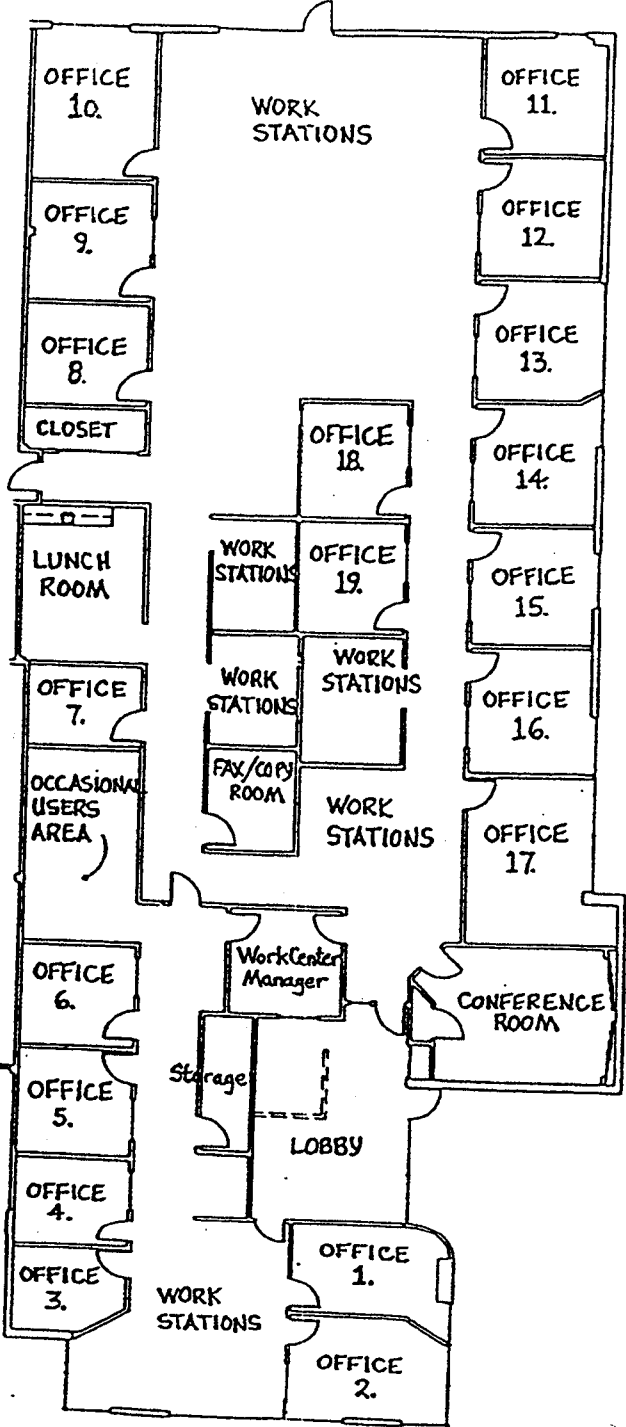
SOURCE: Inland Empire Economic Partnership (IEEP)

Figure A.5

Hawaii Telework Center
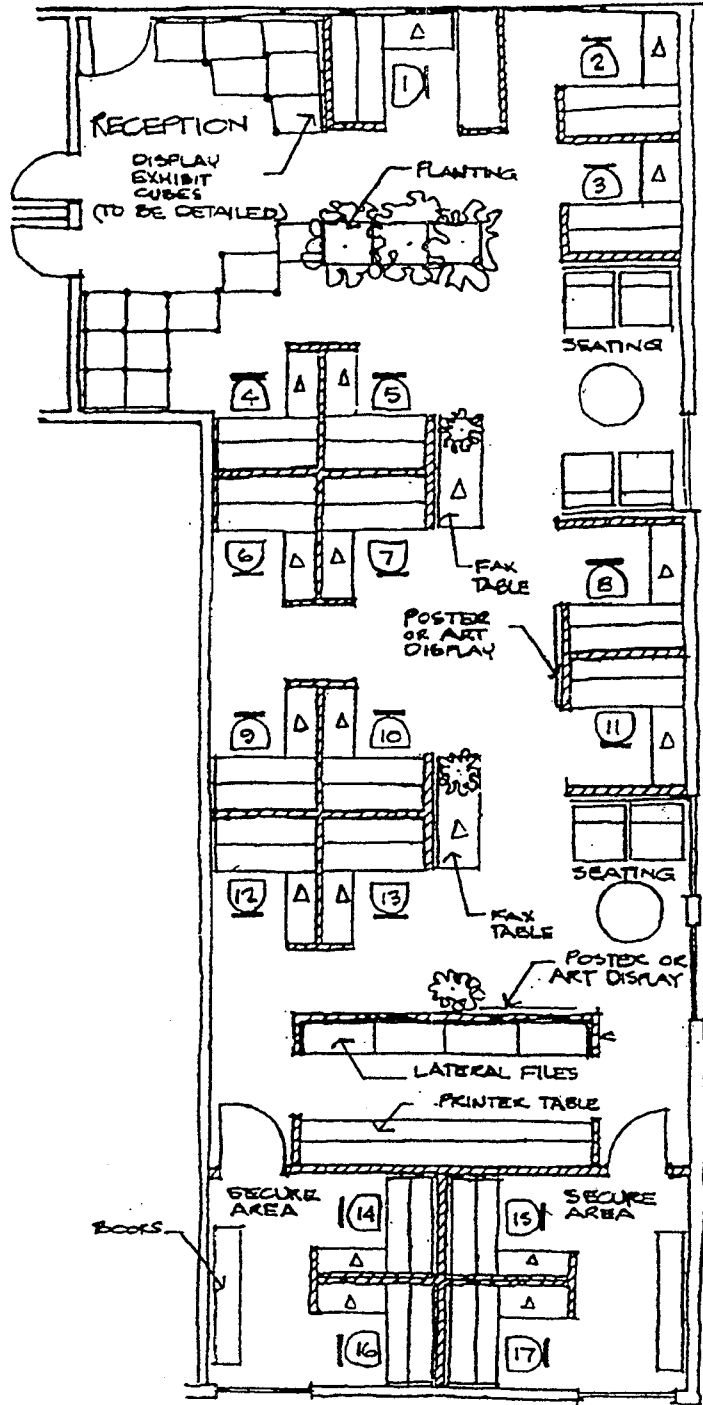
SOURCE: Telecommuting Review: The Gordon Report

Figure A.6

Downtown Plaza Executive Center

SOURCE: Frank Cottle, Office Technology Group

Figure A.7

Park Tower Executive Center
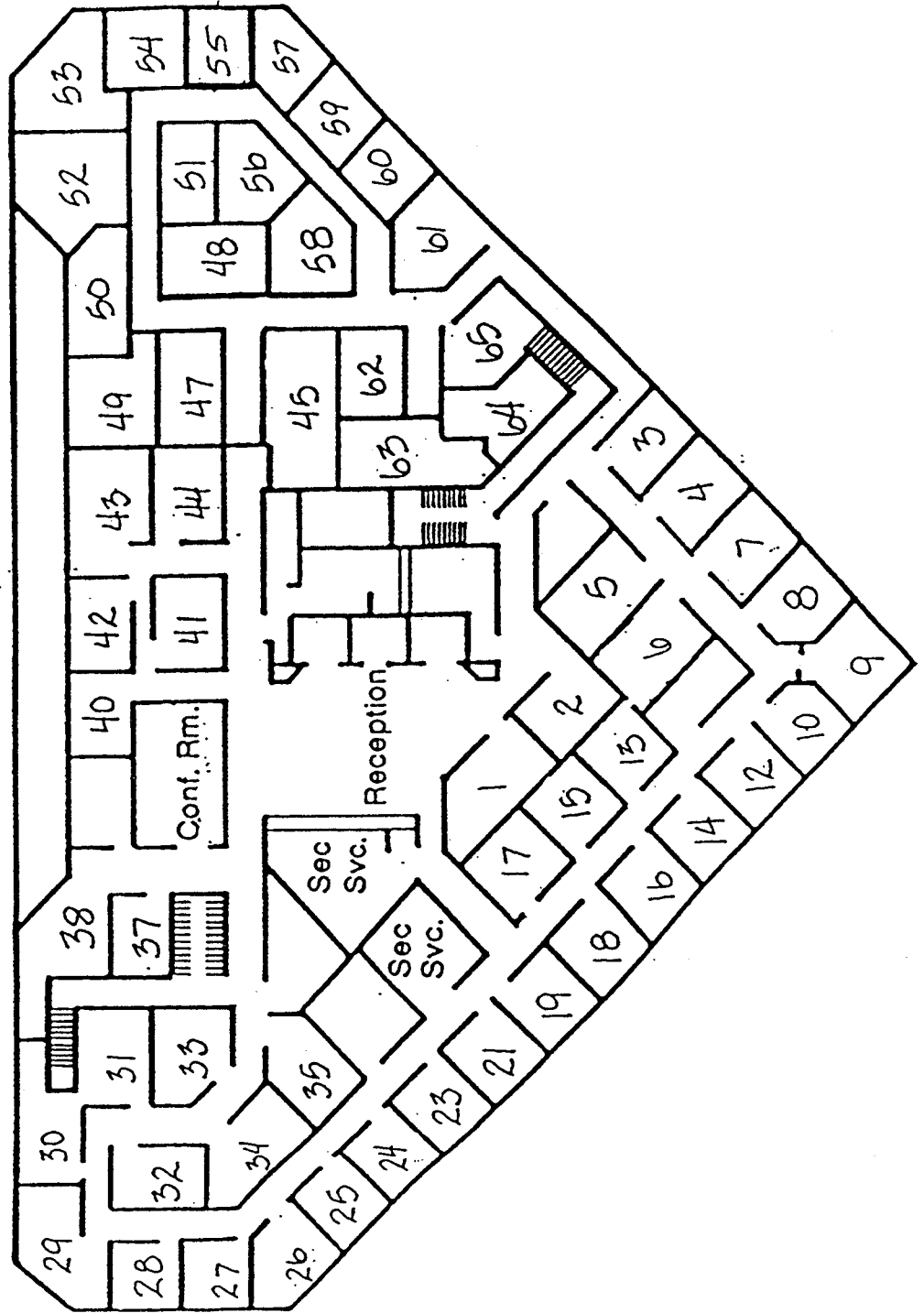
SOURCE: Frank Cottle, Office Technology Group

Figure A.8

World Trade Executive Center
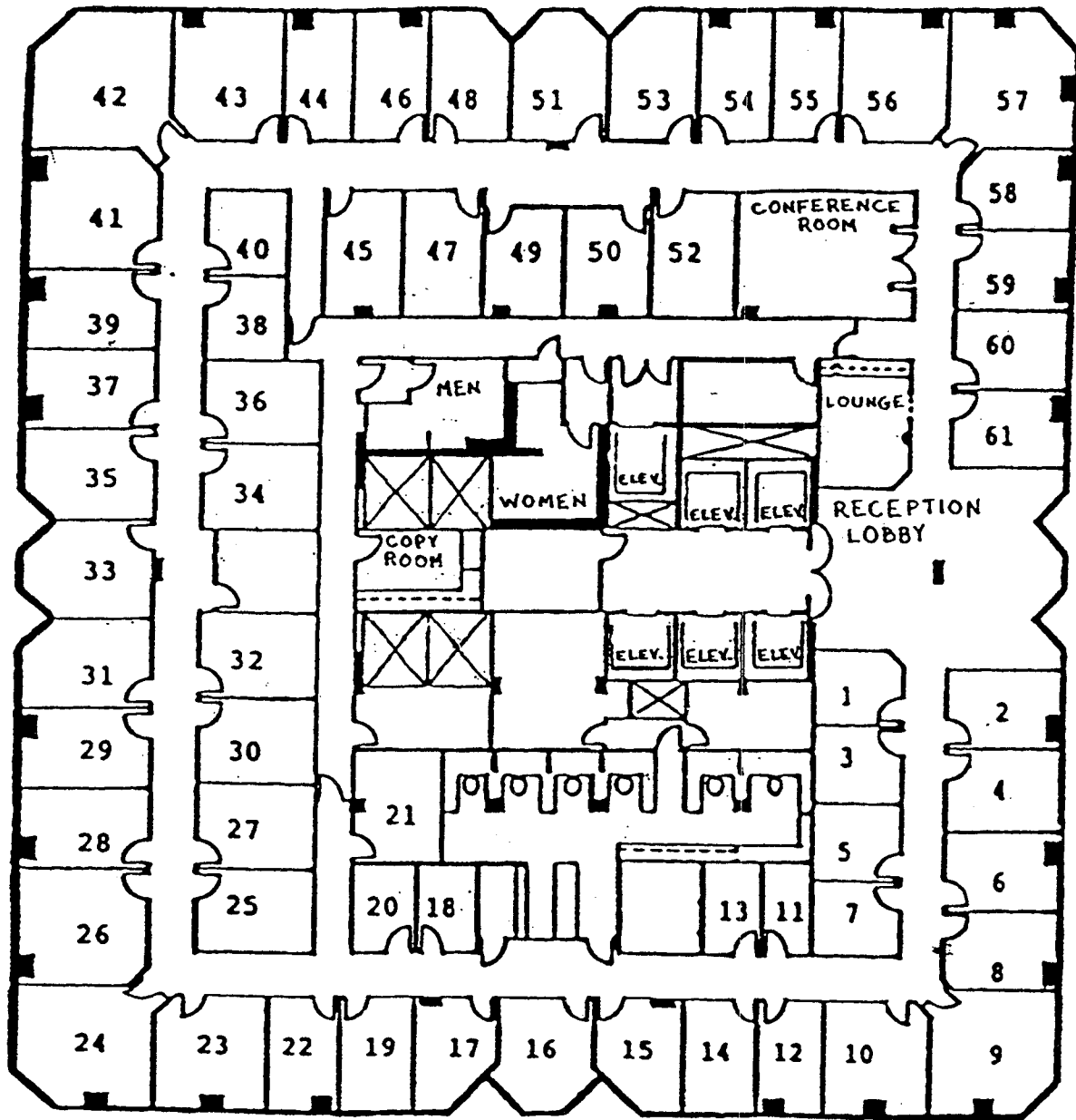
Figure A.9
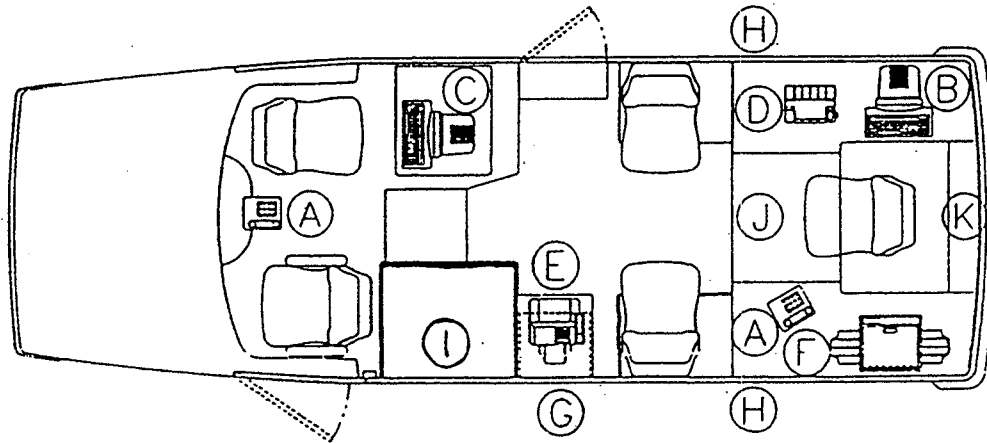
Mobile Office

MOBILE OFFICE Floorplan

A. Telephone and Intercom

B. Personal Computer (CPU under)

C. Word Processor (CPU under)

D. Printer (connected to both CPUs)
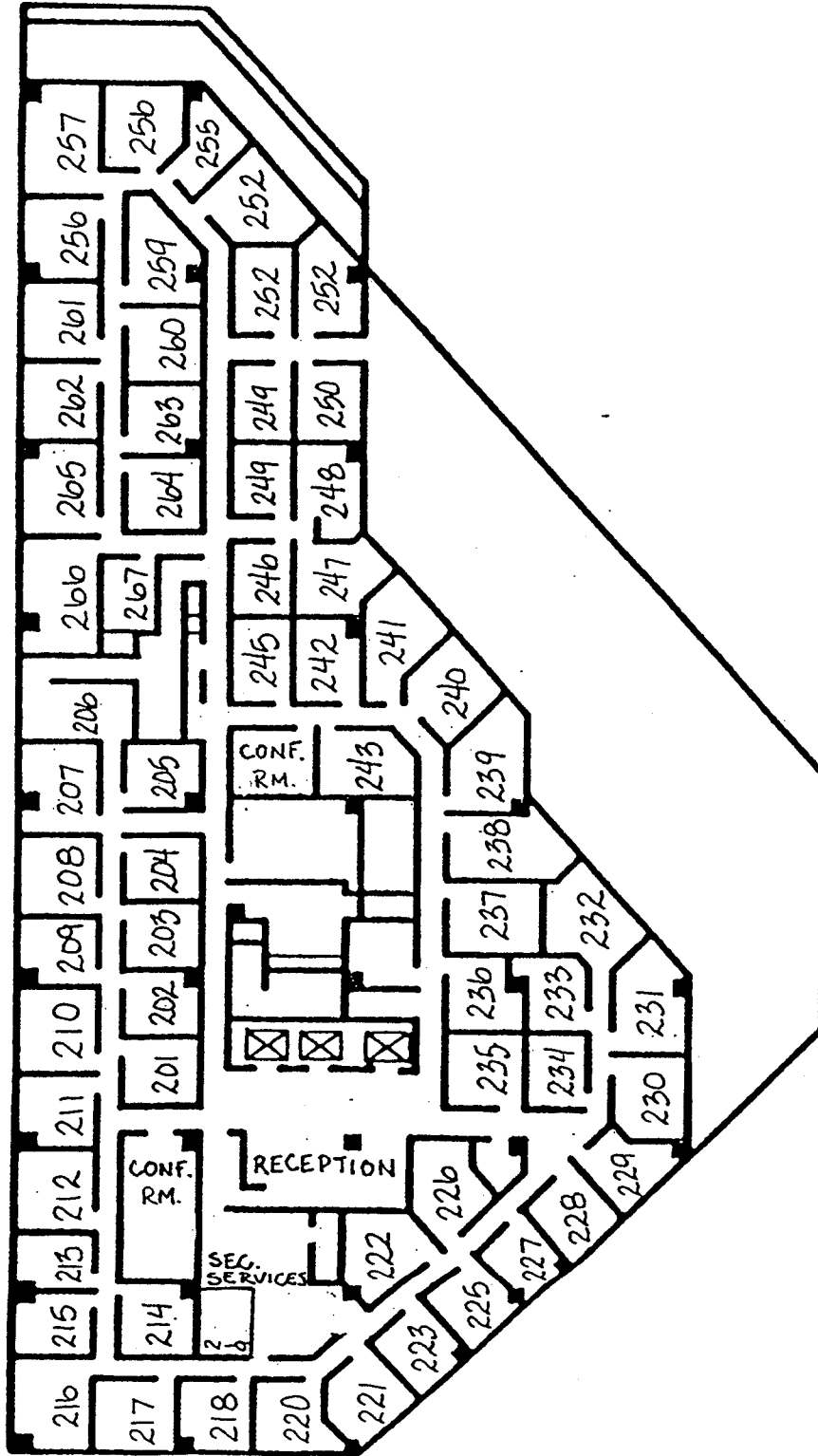
E. Fax Machine (one file drawer under)

F. Desk Top Copy Machine

G. Library (shelves over)

H. Overhead Storage

I. Closet (also video equipment storage)

J. Flip Up Desk Top

K. Storage under

SOURCE: Franklin Becker, Cornell University International Facilities Management Program

Figure A.10

Shiki Satellite Office

SOURCE: Telecommuting Review: The Gordon Report

Figure A.11
KSP Creative Satellite Office

SOURCE: KSP Public Relations Brochure
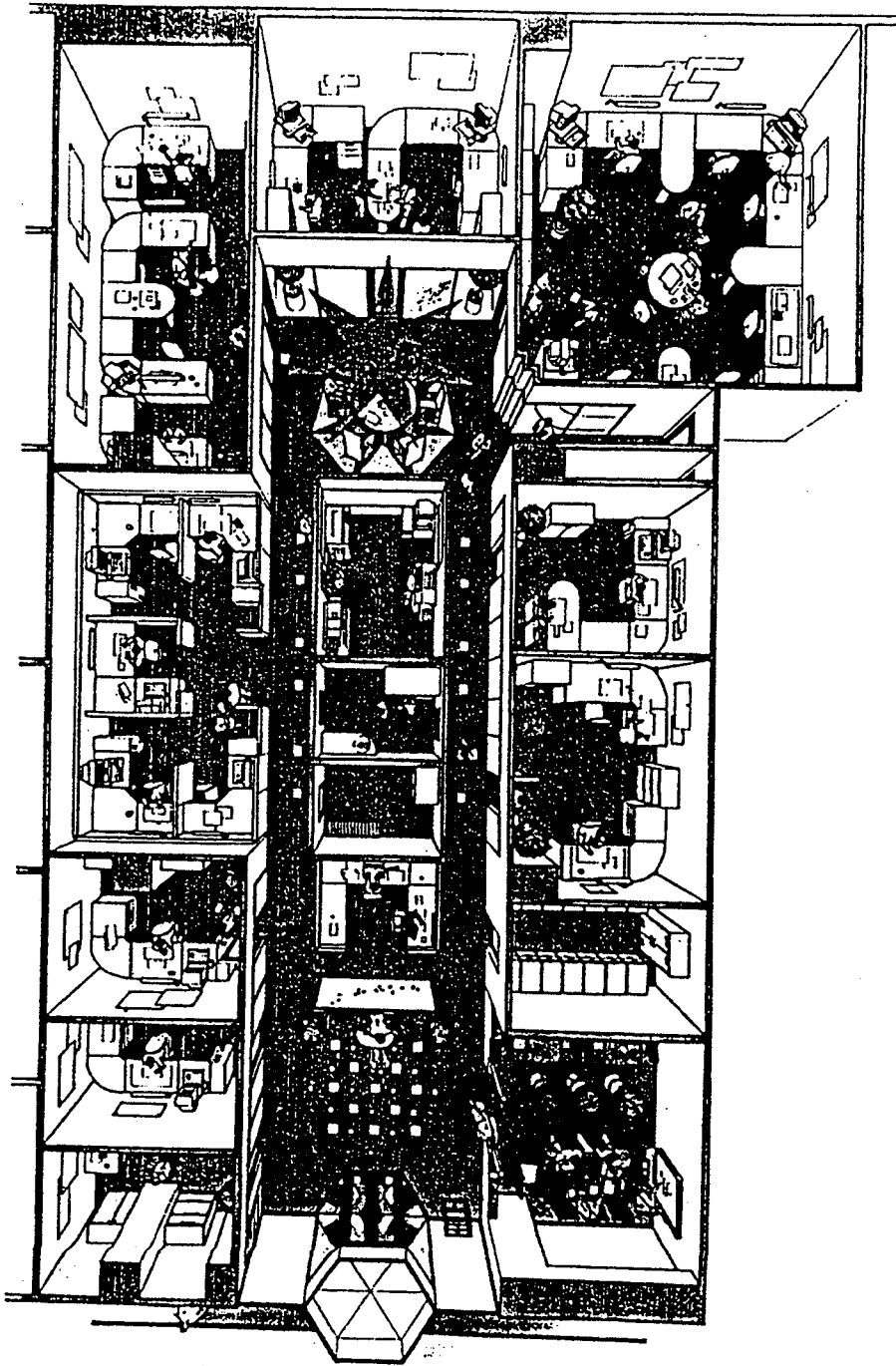
Figure A.12

Oakmoor Modular Units
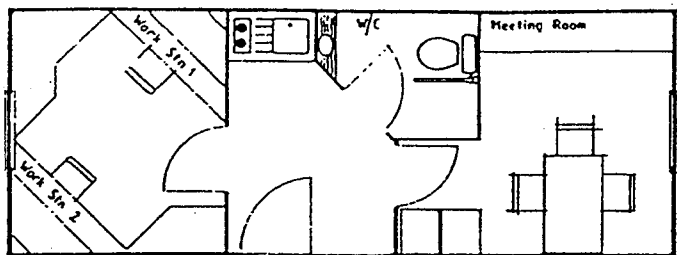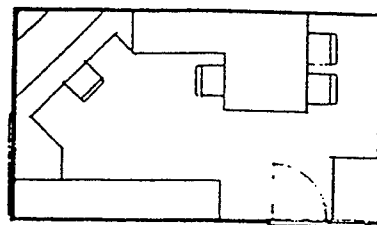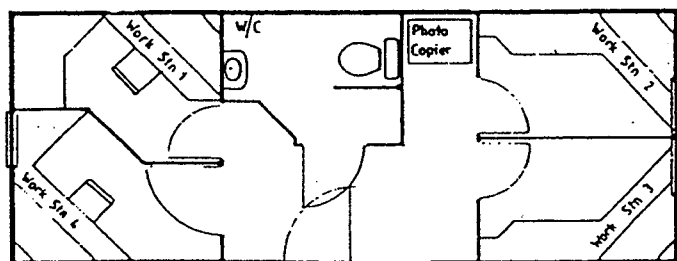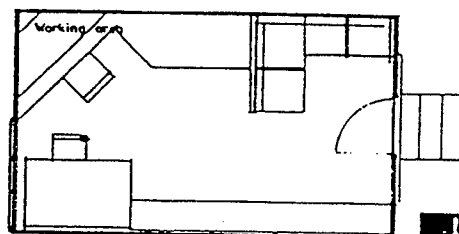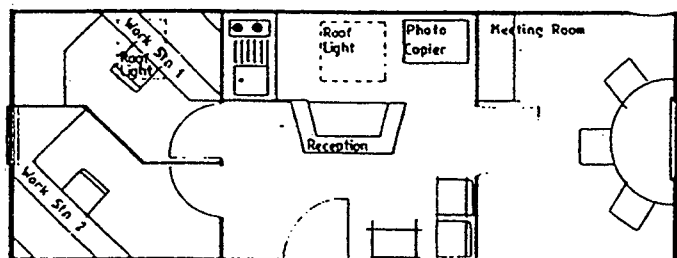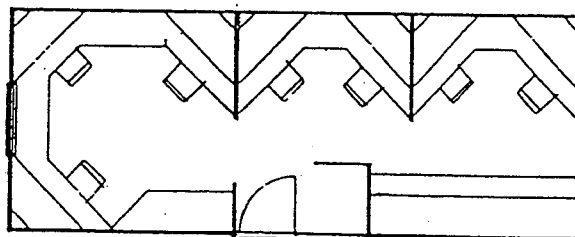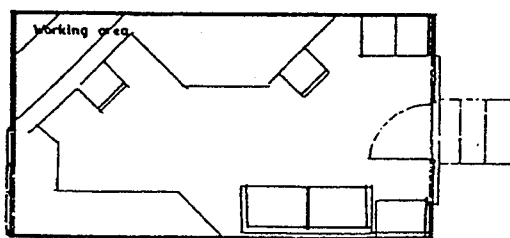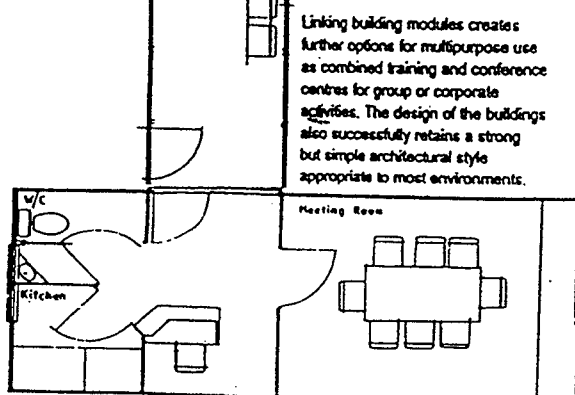
Linking building modules creates further options for multipurpose use as combined training and conference centres for group or corporate activities. The design of the buildings also successfully retains a strong but simple architectural style appropriate to most environments.

SOURCE: Telecommuting Review: The Gordon Report

APPENDIX B

TABULATED RESPONSES
TO CASE STUDY SURVEY

APPENDIX B: TABULATED RESPONSES TO CASE STUDY SURVEY

An important part of this study was to obtain and analyze in-depth information about existing telecommuting centers. A review of this experience-to-date may provide valuable insight into the dynamics of center implementation to anyone engaged in opening new telecenters. A set of questions was developed to elicit key facts regarding existing telecenters. These questions were intended to be the guideline for a telephone interview; however all respondents chose to complete the questions in writing. Valuable information was obtained through analysis of the responses provided by telecommuting center administrators or other knowledgeable people connected to the center. The questionnaire was sent out in the summer of 1992 and responses were received from September 1992 through February 1993. The data gathered was used to develop the case studies presented in Section 5 of the report.

This appendix contains the tabulated responses to the survey. Responses were obtained from one single-employer facility (Pacific Bell Satellite Center) and seven multi-employer facilities (Hawaii Telework Center, Ballard Neighborhood Telework Center, Washington State Telework Center, Apple Valley Telebusiness Work Center, Ontario Telebusiness Work Center, Riverside County Telecommuting Workcenter and Nykvarn Neighborhood Work Center). The Nykvarn center was located in Sweden; all others are U. S. facilities.

All but one of these case studies (the Nykvarn study) are based primarily on the questionnaire discussed above. Supplemental information from other sources was obtained and included in the case studies. These sources include telephone interviews, on-site visits, and articles in local newspapers serving the telecenter area.

TABULATIONS

I. BACKGROUND

1)   Entity (ies) that thought of creating this center:

private business   _3_   government agency   _5_   entrepreneur _1_

2)   Reasons for wanting to open the telecommuting center:

* to determine the feasibility of telecommuting from a rural strip center;

* to increase employment opportunities and business growth;

* to reduce air pollution and traffic congestion;

* to learn more about telecommuting while also serving the community and promoting other respective businesses;

* to measure the advantages and disadvantages that the combination of remote office work and new information technology represents.

II. CENTER DESCRIPTION

1)   Location of the telecommuting center:

central business district	_1_	residential area	_0_
neighborhood business district	_2_	rural strip center	_1_
office park	_3_	technology park	_1_

2)   Nearby amenities:

day care	_2_	restaurants	_8_	supermarket	_5_	hotel	_1_
hospital	_2_	dry cleaners	_3_	post office	_5_	bank	_2_
airport	_1_	print shop	_1_	other shops	_2_	library	_1_

3)   Ability to walk from center to mass transit system:

Yes   _7_   No   _1_

II. CENTER DESCRIPTION - continued

4)   Charge for parking at the telecommuting center:

Yes   1   No   6   No information   1

5)   Center still open as of August 1993:

Yes   6   No   2

6)   Employee classification associated with administering the center:

receptionist	1	site administrator	6
technical support	1	secretary/clerk	0

7)   Method of telecommuting center management:

telecommuter acts as technical support	1	drop-in site manager	0
dedicated on-site administrator	5	off-site contact	1
no site management needed	0	shared on-site administrator	1

8)   Factors considered in design of the center layout/floor plan:

no factors, available space was taken	1	marketability	3
separation of employees	1	privacy	2
comparability to other centers	2	costs	5
number of telecommuters	4	amount of space	1
no information	1		

9)   Normal business hours for the telecommuting center:

8 AM to 5 PM	4	8 AM to 6 PM	1
6 AM to 9 PM	1	9 AM to 5 PM	0
24 hours per day*	1		

(* swing and graveyard shifts included)

II. CENTER DESCRIPTION - continued

10)   Availability of center for after-hours use:

Yes   8   No   0

11)   Type of facility used to house the center:

within building occupied by one company   1
within one company's portion of a shared building   1
separate leased or owned space   6

12)   Mail is handled/distributed by:

direct distribution to person	1	locking mail boxes	0
direct distribution to office	1	unlocked mail boxes	1
pick-up from receptionist	1	no formal mail	3
no information	1		

13)   Special features of the telecommuting centers:

audio-conferencing capabilities	2	site administration office	4
video-conference room	2	conference room	8
drop-in user spaces	1	lunch room	6
equipment room	4	gym	1
seating areas	4	private offices	2
reception desk	4	lounge	3
child care	0		

14)   Security system used (more than one response possible):

security guards	1	electronic alarm	3	video-cameras	0
key-card access	2	coded entry	1	no information	1
no security system	1				

II. CENTER DESCRIPTION - continued

15)   Telecommuting center noise level:

about as noisy as the main office	2
quieter than the main office	5
noisier than the main office	0
no information	1

16)   Time-line of telecommuting center operation:

	Opened	Closed
Nykvarn:	November 1982	May 1984
Hawaii:	May 1989	------------
Pacific Bell:	1989	------------
Ballard:	Fall 1990	------------
Washington State:	January 1991	February 1992
Apple Valley:	October 1991	------------
Ontario:	October 1991	------------
Riverside:	November 1991	------------

17)   Size of buildings containing the centers and amount dedicated to telecommuting:

	Size	Amount for telecommuting.
Hawaii:	1 floor; 1,900 sq.ft.	1 floor; 1,900 sq.ft.
Pacific Bell:	26 floors; 356,000 sq.ft.	1 floor; 1,200 sq.ft.
Ballard:	2 floors; 4,000 sq.ft.	1 floor; 1,600 sq.ft.
Washington State:	5 floors; NA	1 floor; 2,500 sq.ft.
Apple Valley:	1 floor; 2,065 sq.ft.	1 floor; 2,065 sq.ft.
Ontario:	8 floors; NA	1 floor; 4,600 sq.ft.
Riverside:	1 floor; 8,800 sq.ft.	1 floor; 8,800 sq.ft.
Nykvarn:	1 floor; 1,904 sq.ft	1 floor; 1,904 sq.ft.

II. CENTER DESCRIPTION - continued

18) Office arrangement and number of workspaces:

(PO = Private Offices, OC = Open Office Cubicles, and WS = Workspaces)

Hawaii :   2 PO with 4 WS, and 13 OC with 13 WS.
Pacific Bell: 1 PO with 1 WS, and 11 OC with 11 WS.
Ballard: 0 PO with 0 WS, and 6 OC with 6 WS.
Washington State: 0 PO with 0 WS, and 13 OC with 13 WS.
Apple Valley: 0 PO with 0 WS, and 12 OC with 12 WS.
Ontario: 0 PO with 0 WS, and 24 OC with 24 WS.
Riverside: 20 PO with 46 WS, and 24 OC with 24 WS.
Nykvarn: 0 PO with 0 WS, and 9 OC with 9 WS.

19) Criteria for site selection and location:

* site is near employee population;
* to take advantage of an existing building rather than requiring new construction;
* wanted to be in a rural area;
* site has desirable computer capabilities;
* cost per square foot for building usage;
* desirable amenities are nearby;
* plans for building in the area were already underway.

20) Why this particular site was chosen:

* met selection criteria and budget limits, available at the right time;
* location was ideal, cost per square foot;
* local support and site administrator/researcher lived close by;
* proximity to employee population;
* did not have to rebuild, willing owner;
* the town showed the greatest enthusiasm, rurally located;
* location ideal for drop-in users.

21) How telecommuters access building after business hours:

* by punching in an assigned electronic secret code;
* door/elevator access card was used;
* opened a combination-lock;
* used their own door key.

III. PARTICIPANT DESCRIPTION

1) Presence of an anchor tenant (i.e., a dominant user of the center that may lead others to use the facility):

Yes _2_   No   _6_

2) Number of public- and private-sector employers using the telecommuting center at the time survey was completed (given under Date):

	Date	Public	Private		Date	Public	Private
Hawaii	2/93	8	0	Apple Valley	9/92	1	5
Pacific Bell	2/93	0	1	Ontario	1/93	1	4
Ballard	9/92	0	1	Riverside	2/93	0	4
Washington State	9/92	10	0	Nykvarn	N/A	2	5

3) Total number of public- and private-sector telecommuters at the time survey was completed:

	Public	Private		Public	Private
Hawaii	17	0	Apple Valley	4	13
Pacific Bell	0	12	Ontario	6	26
Ballard	0	1	Riverside County	0	40
Washington State	26	0	Nykvarn	4	7

4) Ratio of men to women using the facility:

Hawaii	11 to 6	Apple Valley	4.25 to 1
Pacific Bell	10 to 1	Ontario	3 to 1
Ballard	N/A	Riverside County	2.5 to 1
Washington State	1 to 3	Nykvarn	6 to 5

5) Typical number of telecommuters present at the center on any given day:

Hawaii	14-15	Apple Valley	4-7
Pacific Bell	4	Ontario	5-10
Ballard	1	Riverside County	8-15
Washington State	7-8	Nykvarn	5

III. PARTICIPANT DESCRIPTION - continued

6)   Number of days per week that center users telecommute:

	1	2-3	4-5		1	2-3	4-5
Hawaii	0	0	17	Apple Valley	14	2	1
Pacific Bell	9	1	2	Ontario	30	1	1
Ballard	0	0	1	Riverside County	37	3	0
Washington State	18	6	2	Nykvarn	no information		

7)   Types of jobs that the telecommuters have:

Hawaii:	administrative assistant, investigators, personnel officers, pesticide specialist, probation officer, programmer, tax return preparers.
Pacific Bell:	contracted labor, management, non-management, regulatory environment, system analysts.
Ballard:	self-employed business owner.
Washington State:	computer consulting, management, project work, services to external clients.
Apple Valley:	assessor, building safety, environmental health, information services, machine technicians, nuclear engineer, sales.
Ontario:	auditors, engineering, information systems analysts, information technology, job-placement, mortgage broker, systems planning, transportation coordinator.
Riverside:	field visits, maintenance, professional, programming, research, secretarial.
Nykvarn:	bankers, data entry, data systems consultant, family law training, pharmaceutical work, population forecaster, project engineer, programming.

8)   How employers decided which employees could telecommute from the center:

*   internal surveys were distributed to employees to gain information on
     employee attitudes on telecommuting;
*   managers looked at job requirements and decided which were suitable;
*   some employees requested telecommute work option.

IV. POLICY AND CONTROL

1)   Duties of the telecommuting center administrator:

keeping services and equipment in good working order	6
preparing financial statements, and reports/records	2
scheduling meetings, doing invoices, setting up tours	1
monitoring the operation of the center	6
employment of center administrative staff	0

2)   Different individuals may occupy the same space on different days of the week:

Yes   7   No   1

3)   Individuals from different companies may share the same workspace:

Yes   0   No   8

4)   Concern about security of proprietary information among tenants:

Yes   3   No   5

5)   Remote work training is available through the center:

Yes   6   No   2

6)   Training is taken by :

telecommuters   6   managers   6

7)   Training takes place at (more than one answer is possible):

main office   2   telecommuting center   5
training institute   1

IV. POLICY AND CONTROL - continued

8)   Training expenses are paid by:

each individual company   _2_   telecommuting center   _4_

9)   How priorities are set in cases of conflicting demands on center resources:

This situation has not yet occurred. However, responses on how such a situation would be handled were:

*   obtain a consensus among site administrator and involved participants;
*   site manager has full power to choose which one gets priority.

10)   Who develops policy pertaining to behavior of telecommuting employees at the center:

*   the site administrator develops all policy;
*   employee's organization with assistance from site manager;
*   a telecommuting center policy committee;
*   telecommuters at the center, as a group.

11)   Attendance log kept at the telecommuting center:

Yes   _3_   No   _5_

12)   Marketing strategies used:

direct mail to candidate companies	_3_	brochures	_4_
direct mail to nearby residents	_2_	videos	_2_
mass media attention	_6_	word-of-mouth	_7_
public speaking to service groups, etc.	_6_		

13)   How agreements were made between participating organizations and the telecommuting center management:

simple letters of agreement were made by both involved and signed	_2_
memoranda of understanding were given	_1_
signed contracts were used	_2_
no information	_2_

V. FINANCING AND COSTS

1)   Telecommuting center space is:

rented 5   owned   2   no information   1

2)   Telecommuting center financially supports itself at the present time:

Yes   1   No   7

3)   Who pays for the telecommuting center space:

Telecommuter's employer pays all expenses   1
Telecommuter's employer pays fraction of cost   4
Government grants   6
Other sponsor organizations   5

4)   If owned, what would the market rent for this facility be:

Hawaii Telework Center: $1.95/sq.ft.
Riverside County Center: $1.20/sq.ft.
Other Centers: no information

5)   Monthly charge to use the center:

Hawaii	$0	Apple Valley	$100
Pacific Bell	$0	Ontario	$100
Ballard	$850	Riverside County	$100
Washington State	$125	Nykvarn	$0

6)   What this rent includes:

*   use of all work center amenities, including conference rooms, lunch rooms, computers, etc;
*   use of Local Area Network (LAN), technical support;
*   access to printers, copy machines (telecommuter pays by piece for material).

V. FINANCING AND COSTS - continued

7) Telecommuting center financially supports itself at the present time:

Yes   1   No   7

8) Who pays for the telecommuting center space:

Telecommuter's employer pays all expenses	1
Telecommuter's employer pays subsidized cost	4
Government grants	6
Other sponsor organizations	5

VI. ADDITIONAL THOUGHTS

1) What do you feel were/are the most critical factors to the success of this telecommuting center:

* marketing;
* continuous support from initial participating employers, local financial support;
* more time spent implementing than studying;
* implementing a marketing campaign;
* location, loan of LAN by vendor;
* on-site technical support, public funds to subsidize operation.

2) What, if any, factors do you feel limited the success of this center:

* circumstances of users change which preclude participation (employee turnover);
* lack of marketing;
* insufficient funds for marketing, middle-management objections, state economic problems;
* the center was viewed as too expensive, too luxurious - an image problem;
* current economic slump and budgetary restrictions;
* lack of a marketing campaign due to funds;
* unstable funding source, lack of voice mail, agencies not wanting to pay for two spaces.

VI. ADDITIONAL THOUGHTS - continued

3)   If you had to do it over again, what would you do differently:

*   continuously market and create telecommuting awareness;
*   establish an aggressive marketing plan and follow through;
*   secure funds for a minimum of five years, market concept prior to opening;
*   not very much;
*   follow the same program;
*   market the center to employers earlier on;
*   get a five year budget commitment; get a waiting list of employers wanting to use center.

4)   What recommendations do you have for marketing telecommuting centers:

*   use all of the available technology to get word out - like e-mail, voice-mail, company publications;
*   hire a totally dedicated marketing representative;
*   hire a professional firm to institute a complete marketing campaign prior to opening centers; secure employer "buy-in" prior to opening.
*   create a successful national media hype;
*   use news releases when possible, speak to as many service clubs as possible, educate students, offer evaluation service to companies or organizations who may consider teleworking options, have an available operating center that can be visited by prospective teleworkers and their employers.

5)   Are there any other thoughts on the telecommuting center you would like to share:

*   work centers (in my opinion) will not survive without continued financial support, employers unwilling to incur even small lease costs;
*   build/outfit telecommuting centers to the specification of individual employer companies;
*   just do it (implement a center);
*   the concept as demonstrated to date is unsound, and raises more questions than it answers.

6)   A checklist of materials that would help us in our research:

We asked each respondent for any available written information on the telecommuting center such as implementation plans, floor plans, budget and cost schedules, and evaluation reports. We received floor plans for most of the centers, but other materials were generally not provided.