

A note from our President and Chief Executive Officer

## Pete Sinclair

Congratulations on your decision to explore Telecommuting. It is an exciting work program that can enhance the way your organization does business.

With Silicon Valley businesses seeking innovative ways to maintain their competitive edge, to recruit and retain key individuals and to enhance the quality of life for all their employees, solutions such as Telecommuting take on strategic role. For these reasons, Telecommuting is a concept that directly supports the ideals of Smart Valley, namely the creation of an electronic community with enhanced economic competitiveness and quality of life. The guidelines, policies and technologies described in this document have evolved over the past four years and reflect input and real life experiences from companies and teleworkers.

If you are searching for information regarding Telecommuting, this guide should answer many of your questions. Since 1994, Smart Valley has conducted three surveys of telecommuting trends in Silicon Valley. The information obtained through these surveys has contributed to the philosophies expressed in this guide. The information in this document has truly been “battle tested” and we are sure it will provide you with the necessary building blocks to get your organization’s Telecommuting program started.

Determine the scope of your company’s efforts and adopt only those ideas or activities that meet your company’s needs. We challenge and encourage you to be creative and customize your Telecommuting program to meet the individual needs of your organization.

Good luck!

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Thanks to These Individuals for their Ongoing Support of the Smart Valley Telecommuting Project

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## Chapter One

# Introduction

## What is Telecommuting?

Some definitions of telecommuting include employees who occasionally check voicemail or email from home on evenings or weekends. Smart Valley defines telecommuting as the partial or total substitution of telecommunications technology for the trip to and from the primary workplace along with the associated changes in policy, organization, management, and work structure. Simply put, it's moving the work to the workers, instead of the workers to work. Computers, cellular phones, fax, email and advanced communications links such as the Internet, remote LAN/WAN Access and affordable high speed communications access have removed the physical barriers that once required workers to be in their offices.

There are several types of Telecommuting arrangements:

### *Work at Home*

This is the most popular form of Telecommuting. The employee designates workspace at home to conduct business functions.

### *Hoteling*

This is a "just-in-time" concept for workspaces, in which employees who need a workspace for a limited, temporary time can reserve one for a period of (usually) a few hours to several days. There is usually a bank of workspaces dedicated for this purpose, and reservations must be made to gain access. Employees who have given up their regular office space, because they are frequent or full-time telecommuters or mobile workers are the most frequent users of hoteling. They may need to come in to the office for a meeting and need a workspace before or after the meeting. Other users include

### Types of Telecommuting

Work at Home

Hoteling

Satellite Office

Neighborhood Work Center

Virtual Office

employees who normally work at a different office location, but need a temporary workspace at the hoteling location.

### *Satellite Office*

These are remote office locations usually placed within a large concentration of employee residences or customer locations, allowing employees at a single company to share common office space and reduce the time and expense of the commute to and from the main office facility.

### *Neighborhood Work Center*

The neighborhood work center provides workspace for employees of different companies in one location. Each company housing employees at these locations is usually responsible for the administrative and technical requirements of its employees.

### *Virtual Office*

Telecommuting also represents the mobile workforce: employees who are constantly on the road using technology as the main link to centrally located resources. However, occasionally checking voice mail from home or on the road, or working at home less than one day per week does not qualify as Telecommuting under our definition.

## Who Telecommutes?

According to a recent survey published by Telecommute America, the number of US telecommuters has grown to almost 11 million in 1997, and of those, 17 percent reside in California. In the 1997 Smart Valley Telecommuting survey, 65 percent of the respondents indicated that they telecommute and 70 percent said they lived on the West Coast. Furthermore, nearly half of the telecommuters in this study said they lived in the San Francisco Bay Area.

The majority of the Smart Valley Survey respondents who said they telecommute indicated that their company does not have a formal telecommuting program (51 percent), nor do most employees have a fixed schedule. One third of the respondents (36 percent) said they have a fixed schedule. Of those who have a fixed schedule, only 35 percent indicated that they were required by their manager or company to specify the days.

There appears to be little or no correlation between distance commuted or time spent commuting to whether or not a respondent telecommutes. On average, respondents said they commuted 19.6 miles each way to work. In addition, it takes commuters approximately one half-hour to get to work (34 minutes).

## Why Telecommuting?

### Corporate Benefits

The ease with which a computer age employee can be linked to his or her office is prompting more and more businesses to evaluate the potential of Telecommuting as a strategic business initiative. Why should you choose to telecommute? Well, it is a lot more than working at home, doing the dishes on your break, and wearing bunny slippers. With the recent sharp rise in freeway congestion, smog, and commuter violence, working at home is rapidly becoming the most viable alternative. It is environmentally safe, cost-effective, and simply a lot more fun.

Several years ago, telecommuting was seen as a way to reduce pollution and lessen traffic congestion. Since that time, experience has taught companies that while these may be noble goals, the more prag-

matic outcomes are related to employee productivity, expansion of the workforce and ultimately the ability to conduct business anytime and anywhere...the "Virtual Corporation."

Understanding the potential business problems associated with your telecommuting program is essential to its success. Awareness of these problems will assist you or your senior managers in determining what program will make sense for your organization. Before sponsoring a Telecommuting project, ask yourselves, "What's in it for us?" This exercise will enable you to determine the reasons that support implementation of a pilot program.

Common reasons for implementing a Telecommuting program include:

### *Recruiting*

- Extends geographic boundaries
- Makes the company more attractive by offering new and flexible work structures

### *Employee Retention*

- Provides alternatives to lengthy and costly commuting
- Gives employees more flexibility in choosing their city of residence
- Accommodates dependent care responsibilities
- Saves recruiting and training costs
- Provides a flexible alternative to relocation

### *Office Space Cost*

- Enables satellite offices to be in non-premium areas
- Reduces total office requirements when employees work at home

### *Productivity*

- Increases productivity by 10-30 percent, according to the State of California Telecommuting Pilot Program
- Decreases distractions and interruptions

### *Absenteeism*

- Reduces travel and geographic barriers
- Benefits employees mentally and emotionally
- Has potential for reduction of long-term disability costs
- Accommodates emergency child care situations

*Air Quality Legislation, Regulation, and Ordinances*

- Complies with air quality ordinances
- Reduces pollution

*Emergency Preparedness/Disaster Recovery*

- Complies with emergency requirements
- Increases emergency effectiveness

**It Just Makes Sense**

Many California companies are implementing telecommuting programs for their employees, and are already reaping benefits in productivity, morale, and profit. With the recent transit strike in the San Francisco Bay area as well unpredictable weather conditions, natural disasters and just plain bad traffic, now more than ever is the best time to examine teleworking. Just take a look at these facts:

- Californians spent 300,000 hours daily sitting in traffic in 1997. 90,000 of those hours were wasted by Bay Area commuters alone, costing more than \$210 million.
- If 10 percent of the workforce telecommuted once a week, more than 1.2 million gallons of fuel would be saved, that's 12,963 tons less air pollution.
- The money publicly invested in San Francisco Bay Area transportation totaled \$3.5 billion, more than the entire budgets of North and South Dakota combined.
- California has 24 million motor vehicles registered, dumping 414 tons of pollutants into the atmosphere. Do you really want to be out there?
- According to the 1997 results from the San Francisco Chronicle, five California cities rank in the top ten most "gridlocked" cities in the nation (San Francisco, Oakland, Los Angeles, San Bernardino, and San Diego).
- The number of US telecommuters has grown to almost 12 million in 1997, 17 percent of all telecommuters live in California.
- A telecommuting program can be set up easily and economically for your company. Depending on your work responsibilities, you don't even need to have a computer with a modem to telecommute.
- A 1997 study released by Harvard Medical School estimates that by the year 2002, traffic fatalities will be the number three cause of death in the US.
- Telecommuters spend an average of thirty seconds commuting to their living room couch at the end of the workday.

## Chapter Two

# Corporate Incentives

## Strategic Goals

When telecommuting was new, it was viewed primarily as a flexible work option or an accommodation for individual employee needs. As it has become a more popular way of working, and as technology has advanced, this view of telecommuting has expanded beyond being merely a flexible work option. Today, remote workers can be electronically connected in the same way that on-site workers are, at little or no additional cost to the company. The history of telecommuting has demonstrated credible productivity benefits. The current business environment is one in which telecommuting and other forms of “virtual” work are likely to be viewed as innovative business strategies, instead of, or in addition to, being flexible work options. In the future, we may find that remote work is no longer singled out as a competitive strategy or a flexible work option, but simply accepted as a way of doing business, as computer usage is today.

In our current environment, however, it is useful to focus on the strategic value of implementing remote work options. Companies want to see a linkage to overall business goals. Strategic goals for implementing a Telecommuting or Virtual Office program will vary from company to company. Telecommuting programs are more likely to succeed and thrive when they are integrated with the company’s overall long-term business strategy. If the strategic goals for implementing telecommuting are limited to short-term cost reductions, the program is less likely to succeed. Below, we discuss a number of strategic goals that telecommuting and remote work programs can be designed to address.

### *Competitiveness*

A primary goal for many companies has been to enable employees to be closer to customers or

### Telecommuting Advantages:

Competitiveness

Productivity

Recruitment and Retention

Cost Avoidance

Cost Reduction

clients. For this goal, employees must be mobile, and they need to be equipped with the technology to work from the “anytime, anywhere” office. In this way, they can have access to the company’s network and data base as they work with their customer at the customer’s location, or at any other location such as a hotel room, an airport, or at home. This increases employees’ ability to be responsive to customer needs, and can contribute to decreased cycle times, or the time required to develop new products and services that meet customer needs.

### *Productivity*

Closely related to the above is the goal of enabling increased productivity. Time gained through eliminating or reducing the time spent commuting or making extra trips to the office evenings or weekends can be used for productive work. Telecommuters also find that their productivity is enhanced when they can work in an environment free of office interruptions and distractions. Whenever a project requires intense concentration, telecommuting can provide the appropriate environment for productive work. In study after study, telecommuters and supervisors of telecommuters have agreed that productivity can be increased, often dramatically, by enabling workers to perform work away from their normal work location.

To further support the continued belief that telecommuting increases productivity, telecommuters recently surveyed by Smart Valley indicated that on average their productivity has increased by 25 percent. Although telecommuters say their productivity has increased by nearly a quarter, the number of hours worked per week is nearly the same as the overall population. On average, respondents said they worked about 42 hours a week, telecommuters say they worked about 43 hours per week, while non-telecommuters say they worked about 40 hours per week.

However, a distinction must be made between having a goal of enabling increased productivity, and establishing an expectation or requirement of increased productivity by adopting telecommuting. This distinction is subtle; it is one of creating an environment in which productivity can flourish, versus establishing an explicit standard of higher expectations. The former is likely to result in increased productivity and employees viewing telecommuting as a privilege and a valued benefit; the latter will most likely result in resentment, employees viewing telecommuting as a “trap”, and little, if any gains in productivity. The bottom line is that increased productivity must be seen as a welcome benefit of implementing a telecommuting program. It would not be a good idea, for instance, for a company to implement telecommuting and then set higher performance standards for telecommuters than for on-site workers.

#### *Recruitment and Retention*

Utilizing remote work can also be a strategy for recruiting and retaining the best talent, particularly in industries or geographic areas where obtaining talent is extremely competitive. Many companies have established telecommuting arrangements for individuals in order to recruit or retain talent. A valued employee’s spouse might accept a job across the country, and rather than lose the employee entirely, companies have worked out ways for the employee to continue working for the company even while residing elsewhere. After working out one or more of these arrangements, the company might then decide to formalize its willingness to do so, thereby explicitly making telecommuting part of their recruiting and retention strategies.

Again the recent SVI survey tested this question. When asked if two companies offered you a job and one allowed you to telecommute 91 percent said the ability to telecommute would influence their choice.

#### *Cost Avoidance*

Telecommuting can also be used as a strategic way of avoiding costs that would be incurred otherwise. A fast-growing company may find itself outgrowing its offices but for business reasons may be reluctant to build or lease more space. An ideal solution may be to equip employees to be mobile workers or telecommuters. Depending on which jobs are growing, the company can make choices as to whether new employees, existing employees, or both may begin working out of virtual offices rather than physical offices. Some growing companies (especially in Silicon Valley or similar locations) might find that, although they are willing to rent new space, there may not be adequate space available in the local area. In order to accommodate the growth in their workforces, virtual work then becomes a strategic goal. Both of these scenarios can work effectively if the company incorporates the telecommuting or mobile work option into its high-growth culture.

#### *Cost Reduction*

In addition to the real estate cost avoidance scenarios described above, we can also consider another scenario of reducing actual occupancy costs. This occurs when companies consolidate operations, perhaps by eliminating the number of leased locations. If there are fewer office locations for the same number of employees, telecommuting combined with other alternative officing solutions (e.g., hoteling, shared space, and the like) can relieve the congestion in the remaining locations. Although if managed well, this approach can encourage more telecommuting, it is not encouraged as a way of starting a new telecommuting program. Employees generally do not view telecommuting as a valued benefit when it is offered as a substitute for an on-site office, unless there are other compelling strategic reasons that are clear to employees. When cost reduction is the only strategic goal for implementing telecommuting, employees are more likely to view the program negatively.



Cost/Benefit Analysis

I.Introduction

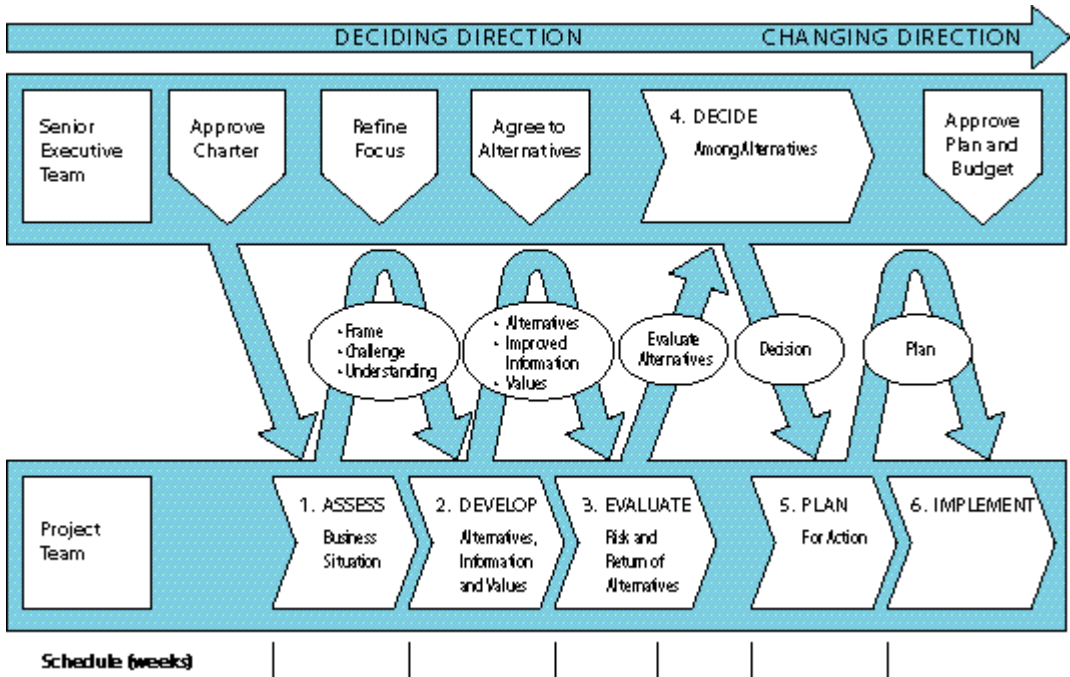
In response to many requests for a generic cost/benefit template to evaluate alternative telecommuting strategies, Strategic Decisions Group (SDG), a strategic management consulting firm headquartered in Menlo Park, has developed a sample evaluation (i.e., a case study) for a hypothetical Silicon Valley company. This case study is intended to be used by companies that are contemplating telecommuting options. It includes the process, tools, and techniques that SDG uses in assisting its clients develop and choose among various strategies for all types of large, complex corporate decisions, of which a telecommuting strategy is just one example. This same approach has helped companies choose among strategies at the corporate, business unit, and departmental levels in industries such as high technology, automobiles, utilities,

pharmaceuticals, biotechnology, telecommunication, and consumer products.

While the following example identifies four alternative facilities/telecommuting strategies for evaluation, only the "Laissez-Faire" strategy evaluation is shown. This should sufficiently demonstrate the concepts, process, and tools.

Note about SDG: SDG's approach is typically executed by cross-functional project teams who work together on a daily or weekly basis. A senior executive team is involved at key points in the process to set direction and to provide feedback and guidance to the project team (see Figure 1). This approach ensures high-quality information and organizational buy-in to whatever strategy is chosen at the end of the process. Other advantages of this process are that 1) it is decision-based-it methodically identifies things a company can do and control, 2) it incorporates uncertainty, and 3) it enables quantitative evaluation of all factors involved in choosing a strategy.

Figure 1.SDG's Six-Step Strategy Development Process



## II. Problem Background and Scope

ABC Company, a \$2 billion high-tech firm in Silicon Valley, was running out of office space for a second time in six years. Such growth was more than anyone had anticipated. The last time this happened, the firm made a painful and costly move to new offices down the road. The senior management team, determined to avoid another such move if at all possible, decided to pull together a project team whose objective would be to explore various ways of making the existing space last longer. There were many options—from rearranging the current layout and reducing the space allocation per person to launching a telecommuting program and creating shared space for telecommuters. The CIO was particularly interested in researching the idea of telecommuting—she was hearing more and more about it from her peers.

A cross-functional project team was formed consisting of key people from various departments: Human Resources (HR), Facilities Management, Information Systems (IS), Engineering, R&D, and Sales/Marketing. The project team met with the senior management team to agree on the project vision and scope. The point of determining the project vision was to clearly state why this team was assembled, what they were going to do, and

what success for this project would look like (Figure 2). The project scope (Figure 3) defined which decisions were on the table for discussion (i.e., strategic decisions), which decisions were off the table (i.e., policy decisions), and which decisions could wait until after the project was over (i.e., tactical decisions).

## III. Developing a Creative, Doable Alternative

The project team took the strategic decisions identified in the project scope (Figure 3) and generated a strategy table to display the decisions as well as various options associated with each decision (see Figure 4).

The team then brainstormed a wide range of strategies by choosing options from each column. The net result of this activity was four strategies, which they then described in more detail and presented to the senior management team for input (see Figure 5).

The four strategies are *laissez-faire*, reduce office space, everybody telecommutes, and take the plunge (lavish home setup).

### *Laissez-Faire Strategy*

With the *laissez-faire* strategy, the office arrangement that made the most sense to the team was

**Figure 2. Project Vision**

Project Vision	
<i>What are we going to do?</i>	
<ul style="list-style-type: none"> <li>• Develop and analyze various facilities/telecommuting strategies for our firm</li> </ul>	
<i>Why are we doing this?</i>	
<ul style="list-style-type: none"> <li>• To solve our immediate problem with space: enable us to stay in the same space for at least three more years and postpone/avoid a costly move to another, larger location</li> <li>• To experiment with ways we can eventually support our employees in “anytime, anywhere” mode</li> </ul>	
<i>How will we know if we are successful?</i>	
• In the short term:	We will have a strategy that employees and senior management can agree to support.
• In the long term:	We will not have to move for at least three more years.

that of hoteling; employees who wished to participate would voluntarily give up their permanent offices and reserve shared offices on an as-needed basis. The current offices would not be changed so rearrangement costs would be limited. However, because this strategy would leave it up to individuals to decide if and how frequently they would participate, it was uncertain just how much space could be saved. In order to motivate employees to telecommute, the team thought that the company would need to provide an incentive(s). Rather than specific equipment for the home, the company should give telecommuters a lump-sum payment with which the telecommuters could purchase needed equipment.

In addition, because this strategy would raise the need for greater modem access than what the firm currently had installed, the team decided that ABC would have to expand network support and ask the IS group to publish usage directions. Nothing beyond the existing IS help or training would be supplied.

*Reduce Office Space; Special-Request Telecommuters Strategy*

This strategy included reducing all office space. Everyone would have a cube but each would be smaller and in some cases, shared. Telecommuting would be used as a tool to retain good employees who would otherwise leave for various reasons (e.g., spousal job transfers). Provisions would be made on a case-by-case basis, but the firm would not go out of its way to make telecommuting a widespread policy and it would do as little as needed to facilitate these arrangements. No new telecommunication equipment or support would be added and the telecommuter would give up his/her office and work entirely from home.

This strategy appeared to be the most expensive from a facilities standpoint but would require no new equipment or support for telecommuters.

*Everybody Telecommutes Strategy*

Telecommuting would be mandatory for all employees two to three days per week. Home

**Figure 3. Project Scope**



offices would be outfitted at each manager's discretion. Existing company offices could be reserved on a daily basis. The objective would be to limit use of the company office space to facilitate needed face-to-face interactions/meetings. The project team included additional social gatherings in this alternative to simulate water-cooler interactions. They also felt that this alternative would have to include IS and HR resources to 1) enhance the existing network/telecommunication capabilities, 2) add state-of-the-art groupware, and 3) provide thorough training for all participants and managers.

*Take the Plunge Strategy*

All company-provided office space would be replaced with smaller cubes. Individuals can choose to participate in a telecommuting program, or not; however, everyone will be motivated to participate with generous home setups and deluxe remote support from the company (e.g., 24-hour help desk, HR person dedicated to the program, initial training prior to participation). The company will provide extensive socializing/networking opportunities

(e.g., desktop videoconferencing, monthly socials, learning fairs, mentoring programs) with the money it saves monthly on space.

The senior management team agreed that all four alternatives were doable and very different, but decided that the "everybody telecommutes" strategy was too countercultural for their tastes and therefore they rejected it out of hand. They told the project team to proceed with evaluating the remaining three strategies, any one of which they could commit to, depending on the results of the evaluations.

IV. Structuring the Problem and Gathering Information

The team made a list of information they would need to evaluate the remaining three alternatives. They then constructed an influence diagram using the information from their list. (See Figure 6.) An influence diagram summarizes the relationships between the decisions, uncertainties (i.e., costs, benefits), and evaluation parameters (or results).

Figure 4. Facilities/Telecommuting Strategy Table

KEY DECISIONS					
Who Telecommutes	Frequency of Telecommuting	Home Improvement Provided	Other Support Added	Facilitation of Socializing/ Connectedness	Definition of Office Arrangement
<p>Anybody who wants to, as long as job fits</p> <p>Mandatory — everyone out of office at least four full days per week</p> <p>Special requests on a case-by-case basis</p>	<p>Up to individuals</p> <p>Case-by-case basis</p> <p>Full-time</p>	<p>Everything that makes sense (PC, fax printer, ISDN)</p> <p>Manager's discretion</p> <p>Nothing — employee supplies everything</p> <p>Lump-sum payment</p>	<p>Business</p> <ul style="list-style-type: none"> <li>— Increase remote communication</li> <li>— Coated-up help desk</li> <li>— HR person</li> <li>— Training</li> </ul> <p>Expand existing network, same, publish some guidelines</p> <p>None minimum; published HR policy</p> <p>Nothing</p>	<p>Nothing new; just the basics (voice mail, e-mail)</p> <p>Some launching of new programs (e.g., annual learning fairs, periodic company socials)</p> <p>Aggressive launch of group technologies (videoconferencing, group S/W, monthly socials, etc.)</p>	<p>Everyone keeps an office but they are smaller</p> <p>Hoteling — shared offices on a reservation system</p> <p>Space in a conveniently located Telework Center</p> <p>Primary office is home; limited hoteling</p>

The senior management team provided the following information:

*Evaluation parameters*

- The overall expected net present value (NPV) of incremental cash flows of each strategy, as well as the risk profile of the cash flows
- The firm's weighted average cost of capital is 10%.
- The time frame for this analysis would be 3 years.
- All cash outlays are considered expenses (for tax purposes).

The remaining information was gathered by the team:

*Estimated costs associated with each alternative*

- Space redesign, facilities
- Telecommuting program
  - Initial costs
- HR costs to put together a program (e.g., performance/appraisal redesign, if applicable)

- Changes in insurance (e.g., Workers' Comp.)
- Legal/contract development/reviews
- Training
  - Managers
  - Telecommuters
- Technology
  - Computers
  - Software
  - Modems
  - Networks
  - Installation
- Ongoing program maintenance
  - IS
    - Communications
    - Help desk
  - HR
    - At least one person must coordinate
  - Facilities/administration
    - E.g., coordination of hoteling space

Figure 5. Facilities/Telecommuting Strategy Table

KEY DECISIONS						
Strategy Theme	Who Telecommutes	Frequency of Telecommuting	Home Improvement Provided	Other Support Added	Facilitation of Socializing/ Connectedness	Definition of Office Arrangement
Take the plunge	Anybody who wants to, as long as job fits	Up to individual	Everything that makes sense (PC, fax printer, ISDN)	Business - Increase remote communication - Booked-up help desk - HR person - Training	Nothing new; just the basics (voice mail, e-mail)	Everyone keeps an office but they are smaller
Let-see-Prime		Case-by-case basis				
Reduce Office Space; Special Request Telecommuters	Mandatory – everyone out of office at least 4 or 5 days per week	Full-time	Manager's discretion		Some launching of new programs (e.g., annual learning fairs, periodic company socials)	Hoteling – shared offices on a reservation system
Everybody Telecommutes	Special requests on a case-by-case basis		Nothing - employee supplies everything Lump-sum payment	Expand existing network some, publish some guidelines  None minimum; published HR policy  Nothing	Aggressive launch of group technologies (videconferencing, group S/W, onerthy socials, etc.)	Space in a conveniently located Telework Center  Primary office is home; limited hoteling

*Estimated benefits associated with each alternative*

- Real-estate savings
  - Reduced real estate costs by X% per year-over what would have been spent to move and provide all employees with equivalent space
- Telecommuting benefits
  - Increased revenues per employee derived from a productivity improvement of X-Y% due to reduced commute times and improved employee morale
  - Improved sales of A-B% due to increased time with customers
  - Reduced training and learning-curve costs related to reduced employee turnover
  - Ability to attract highly productive, talented people

Next, in Section V, the approach illustrated here is applied to the *laissez-faire* strategy.

## V. Information Gathered for the Laissez-Faire Strategy

### *Identifying and Incorporating Uncertainty in Information*

To understand the range of risk associated with the *laissez-faire* strategy, the team interviewed various company experts, extracting their knowledge on specific cost/benefit variables. If a cost/benefit was a fact (e.g., the 1995 average cost per square foot of office space), the team assessed a single number from the expert. If, however, the cost/benefit was uncertain (e.g., the 1997 average cost per square foot of office space), the team provided a range of values. These ranges, referred to as "low, base, high," are intended to capture 80% of an expert's uncertainty about a variable. Experts were asked to provide a number that was so low that there was only a 10% chance that the actual value would be lower; a high assessment would be so high that there would be only a 10% chance the actual number would be higher. A base value is one such that the expert believes there is a 50/50 chance that the actual value will fall on either side of the base assessment.

Most of the assessments documented below are uncertainties and therefore are described as having a range of possible values, rather than a single estimate.

*Decisions*

### Office Arrangement

With *laissez-faire*, ABC would set up a shared space in the main headquarters building. There is a cost of \$40K to convert this space, but it had to be retrofitted anyway because the group that was previously occupying it moved. Therefore, this \$40K cannot be totally attributed to telecommuting since it would have been turned into single offices at some point. Thus the team attributed half the cost (i.e., \$20K) to the telecommuting program. The facilities expert assessed a low of \$30K and a high of \$60K for the retrofit, resulting in a low of \$15K and a high of \$30K attributable to the *laissez-faire* strategy.

To participate in the telecommuting program, employees would be asked to give up their personal office space and move into shared space, which could be reserved and semi-personalized for them on an as-needed basis (e.g., their phone extension would be programmed to ring at whatever desk was reserved for them).

### Who Telecommutes

Any of the exempt staff would be considered eligible for the telecommuting program at first. In the pilot, the HR expert assumed that 10 people would participate in the first year (low 6, high 15); approximately 25 people in the second year (low 20, high 35); and about 50 people in the third year (low 25, high 100).

### Frequency of Telecommuting

As the name of the strategy suggests, the company would adopt a *laissez-faire* attitude toward telecommuting; i.e., any amount of telecommuting would be supported that enabled employees to accomplish the same or higher level of work. This would be negotiated between employees and their immediate managers.

### Hardware and Communications

The company already supplies each exempt employee with a high-powered laptop computer, internal modem, and fax software. Therefore, no additional equipment would be provided for home users.

The company would, however, offer a one-time lump sum of \$1500 to each participating individual to spend as he/she wished, to enhance his/her home office. Employees could purchase items such as fax machines, printers, speaker phones, or bookshelves, or be reimbursed for added phone services

(e.g., an extra phone line, ISDN, long-distance calls to the office).

Traditional Support

- Network Infrastructure
  - Ten network modems adequately handle the load of the remote communications today.
  - IS would add one new modem per five additional people
    - Each modem costs \$20K, including installation.
- Help Desk
  - No additional remote-user support would be added initially; however, one full-time, dedicated person would be required when 50+ people participate in this program.
  - It is estimated that this dedicated person would be hired at the beginning of Year 2 and cost the company about \$70K annually, including benefits (low \$50K, high \$80K).

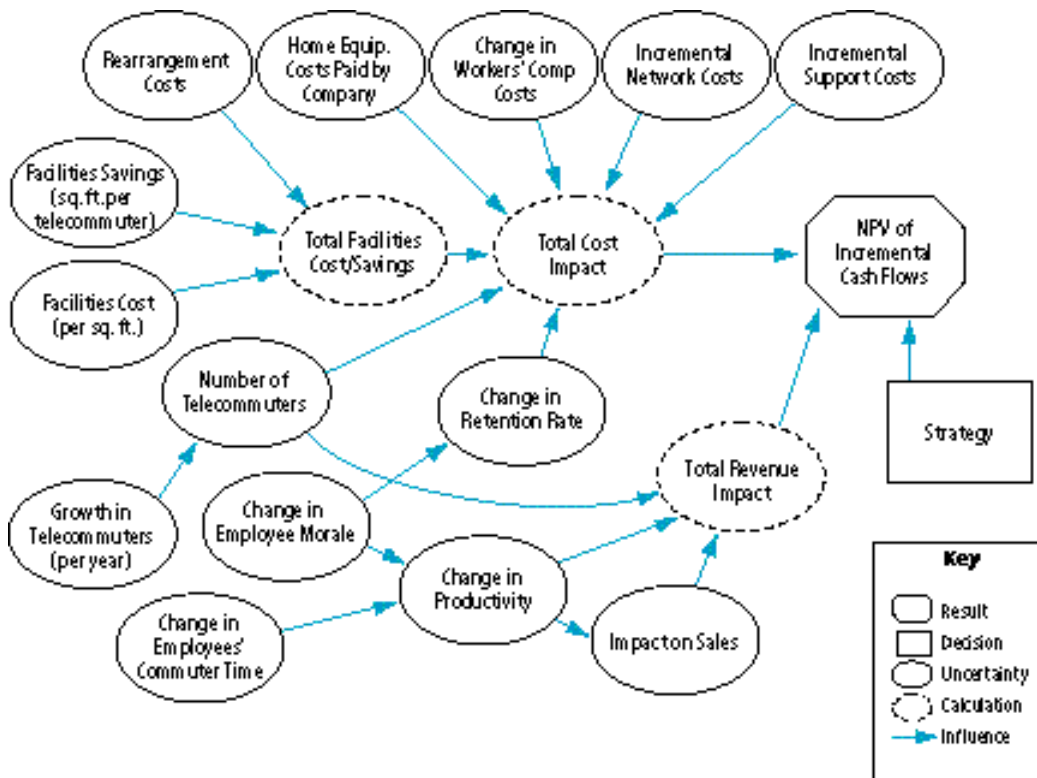
- HR/Administrative Personnel

- Currently, this program falls within the realm of existing HR responsibilities. However, eventually a full-time person dedicated to managing the shared office space would be needed, probably when there are 50 people participating. The company would bring this person on when there are 25+ people participating, at an annual cost of approximately \$60K including benefits (low \$50K, high \$65K).

Non-traditional Support (i.e., Socializing)

The firm already has electronic mail, holds learning fairs once a year, and is introducing a leading groupware package. The groupware software is mainstream to the firm's business, however, and therefore its cost cannot be solely attributed to telecommuting. However, the firm may want to

Figure 6. Influence Diagram



use this software, once it is fully implemented, to facilitate socializing/group interactions/serendipity discussions. This cost would be attributed solely to this strategy and the team estimated the cost at \$100K initially and \$25K annually.

Also, ABC is investigating videoconferencing, but this is also mainstream to its business and not due solely to this strategy. Thus they assumed no costs associated with videoconferencing equipment since videoconferencing will probably not be installed between employees' homes and any of the corporate office sites within the next three years.

**Costs and Benefits**

*Real Estate*

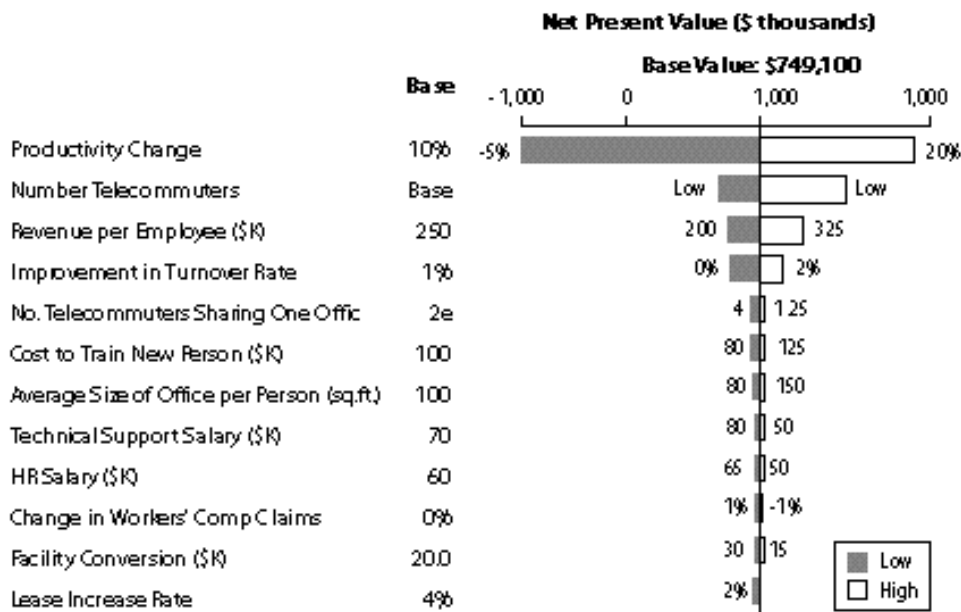
The company currently pays \$3.28/sq. ft./month for office space; each exempt employee is allocated roughly 100 sq. ft. (This varies between a low of 81 sq. ft./office and a high of 200). ABC's lease increases with inflation annually (2-4%/yr.).

The company hopes to achieve a 50% space reduction (low 25%, high 75%) for each person who signs up for this program.

*Employee Productivity*

While a case can be made for increased productivity, due to reduced commute time and improved morale, not everyone at ABC believes this. Some believe that employees will use the reduction in commute time to improve the quality of their personal life only. The CIO sees productivity improving because people will be able to work anytime, anywhere; they can work all hours of the night and day, whatever is most convenient for them. For this same reason, she also feels that staff will be better able to serve clients. Therefore, she estimates an overall 10% increase in productivity, with about 2% of this attributed to increased sales resulting from improved client satisfaction. The COO, however, believes that there will be no improvement, or even a reduction in productivity, as employees will be around even less to share ideas around the water

**Figure 7. Sensitivity Analysis of Laissez-Faire Strategy**





cooler. He feels that the reduction could be as much as 5%! Program participants in other telecommuting projects have estimated that they are 20% more productive on average. The project team decided to incorporate all these estimates in their evaluation to see what the impact on NPV would be of each belief.

The firm uses revenues per employee per year as its yardstick of productivity; this has been averaging around \$250,000, with a low of \$200K and a high of \$325K.

*Retention*

The HR director felt that there would be some impact on retention as a result of improved morale. While the current turnover at the firm is already very low (i.e., 4% per year), the director felt that this strategy would lead to an incremental improvement in retention of about 1%. Her low estimate amounts to no improvement and her high is 2%.

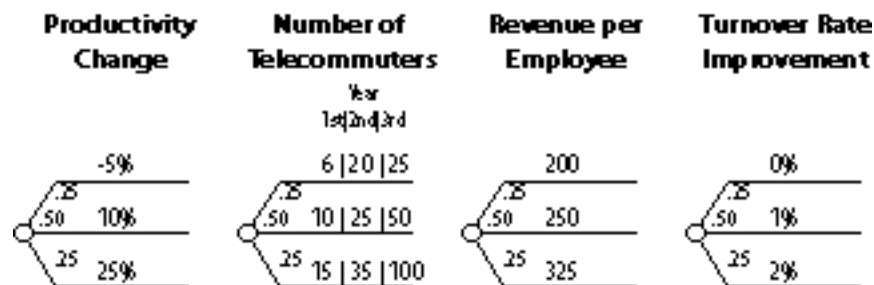
Retention is key at this firm because it takes, on average, about two years to bring a new person up to speed. The cost to the company is roughly half the person's compensation during this period, which includes time spent in formal training as well as time spent in on-the-job training, not only by the person who is learning but also by the people who are teaching. This cost is estimated to be about \$50K per year for two years, or roughly \$100K (with a low of \$80K and a high of about \$125K).

*Workers' Compensation Claims*

The director of HR believes that Workers' Comp claims could go either up or down as a result of telecommuting. On the low side, she estimates they may go down by 1%, and on the high side, perhaps up by 1%, with no change in her base estimate.

Workers' Comp claims currently cost the company \$27K per year.

**Figure 8. Varying the Four Uncertainties that Most Impact NPV**



## VI. Evaluation and Results of Laissez-Faire Strategy

An influence diagram (see Figure 6) summarizes the relationships between the decisions and uncertainties (i.e., costs, benefits) that impact cash flow. A spreadsheet model was created to represent these variables and their relationships to one another, and, ultimately, to calculate net present value (NPV) for each strategy given any combination of input ranges.

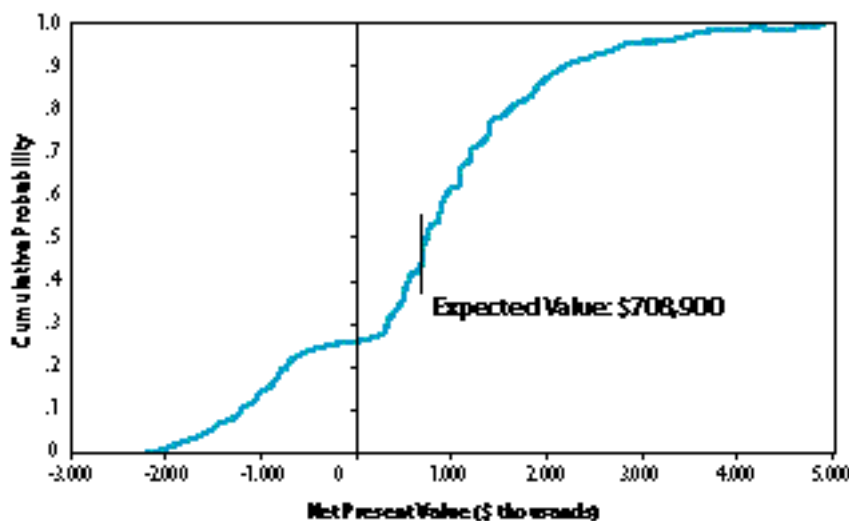
### Sensitivity Analysis

The team used the model to run sensitivity analysis on all the strategies. Sensitivity analysis showed which variables contributed the most uncertainty to NPV. The results for the laissez-faire strategy are shown in Figure 7. When all variables are set to their base-case values, the NPV of this strategy is approximately \$749,000. Note, however, that if productivity (top bar) drops 5% instead of improving (left side of top bar), then NPV is a negative \$1 million (read off top scale). If productivity improves to the high side or 20%, then NPV is almost a positive \$2 million. Taken singly, none of the variables cause NPV to be negative except productivity.

### Probabilistic Analysis

In order to see the effect on NPV of combining uncertainties, the team performed probabilistic analysis. They took the top four variables from sensitivity analysis (i.e., the top four contributors to the uncertainty in NPV; see Figure 8) and calculated NPV for all combinations of variables (i.e., low, base, high), and plotted them against their (cumulative) probability of occurring. Figure 9 depicts the cumulative probability distribution for the laissez-faire alternative. When the team multiplied all possible NPVs by their respective probabilities of occurring, they arrived at a probability weighted average, or expected value, of approximately \$709,000. Therefore, when all risks are incorporated, on average this strategy would be expected to return a positive \$709,000 for ABC. Note the range of outcomes: NPV ranges from a low of -\$2.2 million to a high of almost \$5 million. For an outcome of -\$2.2 million NPV to occur, all four variables would have to be low (i.e., a productivity change of -5%, revenue per employee of \$200,000 per year, a reduction in turnover rate of 0%, and a low level of telecommuting participation). For an outcome of \$5 million NPV, the same four vari-

Figure 9. Probabilistic Analysis



ables would all have to be high (i.e., productivity improvement of 20%, revenue per employee of \$325,000 per year, reduction in turnover rate of 2%, and a high level of telecommuting participation). The chance of losing money in this strategy (i.e., of getting \$0 or less) is about 25%, which can be seen by looking in Figure 9 at the point where the distribution crosses \$0, and reading up and over to the intersection of the curve at \$0 with the y-axis.

34 = 81 calculations were performed

The team performed the same analysis on the other two alternatives and presented all the results to the senior management team. The senior management team decided to implement the laissez-faire strategy since it had the highest expected NPV as well as the best chance of making money (i.e., 75%). An implementation team was then put together to execute the laissez-faire strategy.

## VII. References

There are publications and courses that offer more information about applying this approach within your company. To obtain any of the following publications or to inquire about SDG's courses, call 650-854-9000.

### Addressing Business Concerns

There are a number of general business considerations to be accounted for in the preparation of a telecommuting program. Employers and their telecommuting candidates should define these considerations and make specific arrangements that suit their particular needs.

### Tax Requirements

The telecommuter may ask tax questions related to working at home, particularly concerning the home office deduction. Employers will probably want to avoid giving advice on this issue, since the law is complicated, its interpretation is continually challenged, and the consequences of following or not following the law fall to the individual, not to the employer. Employers should advise employees to contact their accountant or tax consultant to find out how the law applies to them. A copy of the IRS publication #587, *Business Use of Your Home*, can be obtained by calling the IRS at 1-800-829-1040.

### Workers' Compensation

Insofar as the work-at-home situation is concerned, if the injury appears to be work-related – if it occurs in the home office or while working with office-related equipment – the chances are better that workers' compensation will cover the medical costs relating to the injury. However, if the injury occurs in a part of the house other than the office or while running an errand after normal business hours, it will not appear to be work related. (See Appendix I – Telecommuting Policy)

### Security

Before implementation of a telecommuting program, assess the security controls in your company or department. Find out what the current security arrangement is, and upgrade it if necessary. Many of the same controls will apply at home (passwords, hardware and software security standards, etc.). When deciding what work an employee will take home, assess the following:

- The extent to which the information is known outside of your company
- The extent to which the information is known to your personnel
- The value of the information to your company and its competitors
- The amount of effort or money spent to develop the information
- The ease or difficulty with which the information could be accurately duplicated
- The potential consequences of its disclosure outside of your organization.

Implement controls to protect highly confidential material. For example, hard copies of confidential information should be disposed of in a security-conscious manner, just as they would if the employee were working on-site. In some cases, this may require extra effort on the part of telecommuters - they may need to bring confidential materials to a company location to be shredded, for instance, instead of disposing of them in their trash at home. (See Appendix III – Telecommuting Security Policy Checklist)

### Insurance

Equipment is at a greater risk of being damaged or stolen in transportation, so it is the telecommuter's responsibility to make every effort to protect

equipment from damage or theft during transportation and at the home office. Telecommuters must be very aware of where their equipment is at all times, and constantly think of security.

### Union Considerations

Potential loss of control may prompt a union to be opposed to telecommuting. They may fear that telecommuting is a disguise for electronic sweatshops where workers spend excessively long hours, lose benefits, get paid on piece-work, and compete against fellow workers to meet quotas. In recent years, many unions have softened their positions opposing telecommuting, as they have perceived that remote work is the wave of the future. However, even these unions may still have some strong concerns, and companies usually find that they need to address these concerns with the union in a meaningful way.

Companies handle union/telecommuting issues in various ways. Some organizations reserve telecommuting for non-union personnel only. Others maintain that they have the right to change the location of the workplace without negotiation with the union. Some companies include their union representatives in planning for telecommuting programs.

### Emergency Preparedness/Disaster Recovery

Telecommuting programs facilitate compliance with company emergency preparedness requirements and increase emergency effectiveness. For example, in the case of a fire at the main office, telecommuting employees could easily resume work at their home where voice calls to the damaged office could be redirected. Call forwarding or Voice Mail on home lines would handle calls when employees are on the line or don't answer. Email and corporate databases could be accessed via modem or switched digital service remote networking arrangements.

One garment manufacturer has designed the company's emergency preparedness/disaster recovery program around telecommuting and remote access for staff functions. This firm has contingency plans for telecommuting from home or from alternate locations for all personnel who might be affected. Conference rooms are equipped to accommodate numerous individuals setting up PC workstations and the company stages annual drills to ensure the smooth functioning of its disaster plans.

### Formal and Informal Programs

Many telecommuters choose not to become "official" telecommuters, for a variety of reasons. Some companies choose not to have a formal program, but rather deal with remote access needs on a one-on-one basis. In fact, studies of telecommuting sponsored by Smart Valley, Inc. have consistently found that unofficial telecommuters outnumber official telecommuters by two to five times.

Reasons for employees remaining "unofficial" include the following:

- Want to keep their office space or prefer not to hotel or share offices.
- Don't want to be seen as getting special privileges.
- Want a flexible schedule rather than sticking to a strict telecommuting schedule.
- Don't see a benefit to becoming "official".

However, the same study also cited advantages to having a formal program, especially in non-technology-savvy companies and companies in which the culture would not otherwise accept telecommuting:

- Formal programs lead to more telecommuters (formal and informal). Formal programs provide support that help novices get started, they signal that telecommuting is an OK thing to do (and ask for), and they provide managers with information and support to enable them to effectively manage teleworkers.
- Formal programs may lead to telecommuters being more productive, when training and information are provided ahead of time, and help lines are available.
- Formal programs cause companies to think deliberately about how they view telecommuting and what they really want from it, which causes them to quickly discover new options that can lead to increased and enhanced telecommuting program components (e.g., hoteling, working at company offices closer to home).
- Formal programs can lead to improved support for all remote access users as the network is upgraded to support formal telecommuting.

Companies considering starting or enhancing telecommuting programs could therefore increase the effectiveness of the program and perhaps speed the necessary cultural changes by adopting a formal program. But all companies would be wise to remember that they may always have some infor-

mal telecommuters who do not show up in their official tracking numbers, due to the “alternative” nature of remote access work in the current business environment. Companies will probably discover, as their telecommuting or virtual office programs evolve, that the distinction between a “formal” and an “informal” program disappears as remote access becomes fully integrated into standard operating practices. Most companies are not there yet, but many companies may evolve to that point by the year 2000.

### Evaluating Progress

It is useful to periodically evaluate your telecommuting program and your employees’ remote access needs, in order to ensure that you are enabling them to be as productive as they can be. There are numerous ways of evaluating progress, and the technology that contributes to telecommuters’ productivity can itself be used in innovative ways.

Traditionally, companies have assessed attitudes about telecommuting as well as patterns of telecommuting behavior and telecommuters’ needs, through survey processes. Surveys that were once costly projects involving printing, mailing, and compiling of hard copy questionnaires can now be performed much more cost-effectively electronically. Email can be used to distribute a survey to a random sample, or to request the respondents to download the survey. Results can then be tabulated electronically, analyzed, and then shared electronically with respondents or with the entire company. Intranet

web sites can be used not only to provide information, but also to solicit feedback about the program, about management attitudes, and about telecommuters’ needs that may not be effectively addressed. Internal newsgroups can be used to generate on-line discussions of telecommuting issues. Chat rooms can be implemented to gather information in real-time, substituting for live focus groups.

Your company’s network can provide useful statistics about remote access as well, including how many employees are using remote access, how often, how long their online sessions last, from where they log in, what times of day they log in, how frequently they connect successfully, how frequently they get a “busy signal”, how frequently they get dropped, and any other useful metrics that you can imagine. It is likely that such information is already being collected about your network usage, and the network performance data already being gathered may need only minor tweaking in order to separate remote access from on-site access. These data should also be utilized in your overall evaluation of your telecommuting program. One important point to remember in evaluating your progress is that feedback to users and participants is extremely important. When participants receive feedback in the form of final results and recommendations, they are much more likely to continue providing input. This has always been an issue with surveys. However, with electronic methods of gathering and sharing information, it should be easier to provide feedback to participants. Smart companies will therefore make sure that participants are involved in the entire evaluation process, not just in providing information.

## Case Study – Cisco Systems

Cisco Systems of San Jose, California developed a program for telecommuters in order to address a number of major business needs. As a rapidly growing company, there was constant pressure to expand office facilities, and alternatives to adding new space were considered (such as telecommuting arrangements). Product development initiatives required the hiring of many new engineers, and the local labor market in the Bay Area could not meet all of the needs.

Many technical experts were sourced in other regions of the United States, but these individuals were not willing to relocate to the Bay Area. So a number of key engineers were hired from remote cities under telecommuting arrangements where they could make major contributions while maintaining their current residences. A side benefit to Cisco was major savings on relocation expense. Another business reason for allowing telecommuting resulted from the desire of some key engineers to move to remote locations. By allowing telecommuting arrangements, Cisco was able to retain the services of these valued employees while allowing them to meet their personal need to relocate.

Telecommuting Guidelines and a Telecommuting Agreement were developed in 1993 to standardize the way that full-time telecommuters would be treated.

The Human Resources Department drove the development of this process with input from line managers, telecommuters and a number of other department personnel (including Facilities, Telecommunications, Tax, Travel, and Risk Management). Previously many engineers and technical writers had received approval from their managers to telecommute, but there was significant variability in areas such as:

- type of equipment allocated for home use
- reimbursement for travel to the Headquarters work site
- office facilities provided to telecommuters at the Headquarters work site
- approval process

The Telecommuting Agreement is signed by any employee who desires to telecommute on a full time basis. Two levels of management approval plus Human Resources approval are required. There are currently about seventy full-time telecommuters at Cisco. Surveys of Cisco full-time telecommuters and their managers indicate about a 20 percent increase in productivity as a result of eliminating commuting time, ability to focus on projects, etc.

Another four thousand Cisco employees regularly telecommute on a part-time basis, and this is considered part of the normal working relationship at Cisco (and therefore a signed Telecommuting agreement is not required). Part time telecommuters typically log onto work from their homes on evenings and weekends to complete projects or read email. Some may also typically work from home for one morning or for one day per week. A Workplace Task Force was established at Cisco in 1995. It was made up of representatives of Workplace Resources (Facilities), Telecommunications, and Human Resources. Meetings were held every two weeks to discuss strategies for telecommuting, virtual offices, etc. A major "Workplace" initiative currently is focusing on the conversion of field offices to allow more shared workspace, and allow employees to work effectively from their homes, from customer locations, or at Cisco facilities.

## Chapter Three

# The Telecommuting Project Manager

## The Telecommuting Project Managers' Activities

The primary role of the Telecommuting project manager is to be the single point of contact for the organization. The size of your organization will dictate how much responsibility the project manager will have. Telecommuting is more effectively implemented when several people share the responsibility and have an opportunity to feel ownership for their individual contribution to the program. The Telecommuting project manager will probably obtain support for the program from senior management either at the beginning of the program or after a pilot program has been implemented and evaluated. Other key activities for a successful program are:

### *Pursue and Promote a Champion of Telecommuting*

If there is a department currently using Telecommuting to meet any specialized needs of your business, pursue that group and persuade them to join the effort in formalizing Telecommuting for the whole organization. They can become a control group to evaluate the success of your program.

### *Emphasize the Value of Telecommuting to the Corporation and the Individual*

Have an understanding of the strategic impact of Telecommuting. Explain to your organization the individual value of working for a company that provides work flexibility.

### *Become Involved with Telecommuting Professional Associations*

Keep your eyes and ears open for all information pertaining to Telecommuting and research how it is being used around the world.

### The Telecommuting Project Managers' Activities:

Pursue and Promote a Champion of Telecommuting

Emphasize the Value of Telecommuting to the Corporation and the Individual

Become Involved with Telecommuting Professional Associations

Provide Vision

Determine an Administrative Structure

Establish a Timeline

Assume a Leadership Role in the Selection Process

Training Requirements

Determine and Recommend Support Materials

Steward the Evaluation Efforts

Practice What You Preach

Provide Status Reports to Upper Management

### *Provide Vision*

Telecommuting is an educational process. Resistance may exist because of a lack of understanding. Be aware of the changing needs of your working environment and how Telecommuting can meet those needs. Be creative in developing new Telecommuting applications for your organization.

### *Determine an Administrative Structure*

The Telecommuting implementation committee can help decide how the program is to be administered. If the company is a large organization, a Telecommuting coordinator could be appointed in each department to interface directly with the Telecommuting project manager. The coordinators would have decentralized positions, managing the Telecommuting program in specific departments. Smaller organizations may want to conduct a centralized program with a single project manager.

### *Establish a Timeline*

It is imperative to have a plan. This is a task for the Telecommuting implementation committee. The group can identify activities and assign responsible parties to complete them. All activities must have an assigned completion date. When building the timeline, understand that life is unpredictable. Be flexible enough to allow for dates to be changed. Encouraging everyone to participate in the process will afford ownership and accountability to your prototype program.

### *Assist in Formulating Policy*

Large organizations will have many people involved in policy formation. In a small organization, this activity may be the responsibility of one person. Whatever size your organization is, design a policy which allows flexibility and freedom for individual customization.

### *Assume a Leadership Role in the Selection Process*

Your organization will require guidance in selecting the telecommuters and supervisors to participate in the pilot program. Provide insight to the implementation committee regarding selection criteria. Also, encourage the participants to use the selection survey process developed for the organization.

### *Provide Input Regarding Training Requirements*

You, the Telecommuting project manager, will know best what subjects should be covered during the training sessions. Be sure to address the requirements for supervisors, telecommuters, and office-based employees.

### *Identify Safety Considerations*

The implementation team should provide input regarding safety. If your organization has a safety policy, you may be able to enhance the current policy to encompass Telecommuting issues. If you don't have a safety policy, Telecommuting could be a catalyst for the development of one.

### *Determine and Recommend Support Materials*

The pilot program will need specific reference material to support it. It is recommended that a Telecommuting manual or guide be provided to assist the telecommuters when getting started.

### *Assist in Determination of Equipment Policy*

Your organization will need an equipment provision policy. Large organizations can delegate those decisions to the individual groups or departments. Small organizations can develop one equipment policy with which everyone complies.

### *Steward the Evaluation Efforts*

The success of a program cannot be determined without evaluation. It is critical for everyone participating in the pilot program to participate in the evaluation. The implementation committee can devise the criteria for measuring progress and ultimately, the success of the program.

### *Practice What You Preach*

You need to work at least one day a week at home in order to obtain first-hand experience about Telecommuting. Assign time on your own calendar for regular Telecommuting.

### *Provide Status Reports to Upper Management*

The implementation committee needs to identify milestones and benchmarks for the program. Both general progress and individual participation should be monitored. The resulting information can be shared with senior management in the form of a progress report.

### *Fine-tune the Program*

Be flexible enough to make changes when and where necessary. Be prepared to share the success!



## How to Implement a Telecommuting Program

Implementation of a Telecommuting program is a step-by-step process. You may not have to follow all the steps outlined in this chapter unless you work for a large organization.

The order of the steps may vary. Some Telecommuting administrators do not have to provide their senior management with a formal proposal. Instead, they implement their program by forming a steering committee. Others form their committee, complete their Telecommuting policy and agreement, define their evaluation criteria, then present a formal proposal to senior management. The implementation steps for a Telecommuting program are not cast in concrete and your program won't fail if you don't do all of them in the specified order. The steps are provided as a checklist to help you determine what needs to be done and who is best suited for the process. Using this list will also assist you in projecting how much time you will need to set up your program.

Implementation of a Telecommuting program is similar to implementing a compressed work week program or a flextime program. Individuals who have worked with you on those projects may be willing to assist you with your Telecommuting program. Don't re-invent the wheel. If you have resources already available to you — use them!

### Steps to Implementing a Telecommuting Program

1. Prepare and present a Telecommuting Proposal.
2. Establish a Telecommuting Implementation Committee.
3. Define program parameters.
4. Develop a Telecommuting Policy for the organization.
5. Develop a Telecommuting Agreement.
6. Develop evaluation criteria for the program.
7. Determine equipment and technology needs.
8. Develop resource and reference material.
9. Implement managing by objectives.
10. Present Telecommuting orientation sessions.
11. BEGIN TELECOMMUTING!
12. Administer Telecommuting evaluation.
13. Analyze and prepare the results of the evaluation.
14. Present the results.
15. Make adjustments where necessary.

## The Telecommuting Project Team

### The Telecommuting Project Manager

The management structure of your organization will determine when you need support from the top. Establish a Telecommuting implementation committee or team. As the Telecommuting project manager, you are responsible for putting the team together. Consider the participation of the following job functions:

*Chief Executive Officer/Chief Operating Officer/  
Chief Administrative Officer*

The actual CEO does not need to be directly involved with each implementation step; however, a representative from the CEO's office should be on the committee. Having such a representative will provide an avenue for information to the highest-ranking officer in the organization.

*Legal Counsel*

The legal representative of your organization is responsible for reviewing and customizing the Telecommuting agreement you have chosen. If you decide to use a Memo of Understanding, your legal counsel needs to provide input for that document.

*Human Resources*

The Human Resources Department is responsible for developing a Telecommuting policy for the organization. They may also take on the responsibility of measuring the productivity of the employees selected to participate in the program.

*Labor Relations*

A labor relations representative is essential when working with union contracts. If unions represent your telecommuters it is critical to have the labor relations department involved with your implementation committee. They may choose to interface directly with the union or advise you to include a union representative or steward on your implementation team. They can also clarify Telecommuting responsibilities for management.

*Unions*

Traditionally, unions have opposed telecommuting/work-at-home programs because they fear that such programs represent a return to cottage industry piecemeal. A distributed workforce makes it more

difficult for unions to organize, represent members, and police collective bargaining agreements.

For example, the 600,000-member Communications Workers of America (CWA) has taken the position of not allowing telecommuting until it receives more written guidelines, according to James Irvine, a CWA vice president, as reported by the Associated Press in 1997.

But times are changing. Recently the AFL-CIO produced a report on "The Future of Work," that identifies the need for unions to become more flexible and stay current with the interests of the membership. Many unions are now considering telecommuting programs because their membership wants to work from home. Some have even championed telecommuting.

#### *Training*

A representative from the training department should be involved with your team from the beginning to oversee development of a training program for telecommuters and supervisors.

#### *Ordinances/Regulations*

The Transportation System Manager or Employee Transportation Coordinator should be on the implementation team. If your organization must comply with transportation or air quality regulations, Telecommuting is a way to reduce the number of cars needed to conduct company business.

#### *Emergency Preparedness/Disaster Recovery*

The Business Contingency Planning Coordinator may have an interest in the Telecommuting program as a means of emergency preparedness planning. Telecommuting on a regular basis can assist your organization in preparing for emergencies.

#### *Telecommunications*

The Telecommunications Manager for your organization must be included on your committee. The telecommunications department is responsible for supporting telecommuters with the appropriate technology to be used at their remote locations.

#### *Information Technology/Management Information Services/Data Support*

This representative is responsible for assisting you with computer and software recommendations. This team member should also provide the team with information regarding data security.

#### *Research*

If your organization has a corporate research department, use it! Enlist a representative on your team immediately. They can assist you in writing your selection and evaluation surveys and provide you with an analysis of the results.

#### *Public Relations*

Telecommuting will have a positive impact on your organization. The public relations department will want to extol the virtues of the program, both internally and externally. Involve a representative from the public relations department on your committee.

#### *All Departments*

Once the plan is designed, select participants for a pilot program. A prototype is usually most successful when several different departments participate. If representatives from all departments are on the implementation team, you should have no difficulty finding participants for the pilot program.

## Chapter Four

# Managing Telecommuters

## How to Select Telecommuters

Telecommuting should be voluntary. No employee should be required to telecommute. If you have employees that you think would be good candidates for Telecommuting, discuss it with them. If they have needs that can be met by Telecommuting, they may choose to apply. Determining which of your employees will make good telecommuters requires consideration of the individual's work responsibilities and habits and, if applicable, whether their home situation is conducive to Telecommuting. The issues discussed here can assist you in evaluating potential candidates.

### Business-related criteria for selection of telecommuters

#### *Supervision and Feedback*

Working at a remote location decreases the amount of supervision and feedback immediately available to an employee. For Telecommuting to be possible, some amount of work must be done at home without feedback or approval. In many cases, the employee will benefit from spending time alone. However, if an employee plans to work at home over 50 percent of the time, he or she should be confident about making independent decisions.

#### *Social Interaction*

Isolation is a big adjustment telecommuters have to make. Eventually people must compensate for social breaks at the coffeepot by keeping in contact in other ways (phone, Email, etc.) or by catching up when in the office. However, some people may dismiss the possibility of Telecommuting right away, knowing that they need social contact on a frequent basis in order to work productively.

#### Criteria for Selecting Telecommuting:

Supervision and Feedback

Social Interaction

Organization and Time Management Skills

Self-Motivation

Performance

Tenure

Multiple Telecommuters in a Department

Family Members

Concentration

#### *Organization and Time Management Skills*

At the office, there are many subtle cues to keep a person on track. However, at home it is more difficult to manage time and stay organized. Some people might have a tendency to talk with friends or family or do things around the house, and the work area may not be as structured as the office. The more organized an employee is, the more productive he or she will be as a telecommuter.

#### *Self-Motivation*

It can be difficult for some employees to work when no one is checking up on them, or when co-workers aren't passing by the office to see them working. Telecommuters must develop regular routines and set deadlines for completion of work. Successful telecommuters are people who can reward themselves for being productive.

### *Performance*

Telecommuters should be good performers. On the employee's last performance evaluation, were there specific problems or developmental needs that were evident? Think about how these might relate to Telecommuting.

### *Tenure*

Employees who have been on the job a long time are naturally more familiar with their tasks as well as their co-workers. If co-workers are unfamiliar with the telecommuter they are less likely to call when they need assistance or input. The telecommuter may also be less likely to contact people that he or she doesn't know.

### *Multiple Telecommuters in a Department*

If there are jobs in your department suitable for Telecommuting, more than one employee is likely eligible for the program. Be aware of how many telecommuters you can manage at any given time. When too many people in one department are working at home, scheduling meetings becomes difficult. More telecommuters will put more demands on you as their manager, especially if remote supervision is new to you. Before you approve too many Telecommuting arrangements, you might want to gain experience with a small number of them.

If an additional telecommuter would be a burden on the department, explain to the group that it is not feasible at this time. Current telecommuters may need to return to on-site work. If not, work out a rotating schedule or have them work fewer hours at home.

## Home-Related Criteria

### *Work Space*

Telecommuters must be comfortable and able to mentally separate themselves from the work space at quitting time. In addition, the workspace should give family members a message that the teleworker is not to be disturbed.

### *Family Members*

Some people choose to telecommute so that they can spend more time with their family, and some

so that they can be more productive. If an employee has a spouse at home who attends to the children, that spouse may expect the employee to take on more of the care giving because they are home. Specific arrangements should be made.

### *Concentration*

If a high amount of concentration is required on the job, then Telecommuting could increase or decrease productivity depending on the situation at home and in the office. If space is limited and employees are sharing an office, working at home may decrease interruptions for employees on and off-site.

## Employees not suitable for Telecommuting

When some people think of Telecommuting, the first thing that comes to mind is "Great, I get to stay home one or two days a week with the kids." Those who are not familiar with Telecommuting may tend to think of it as a way to escape the office.

Telecommuting involves hard work, dedication and adjustment. True, there are many advantages to Telecommuting; however, there can also be disadvantages. Some Telecommuters may have to adjust to being isolated from co-workers. They no longer have an office mate close by to ask for feedback or talk about what they did that weekend. Instead, they have to discipline themselves to get started and stay on track.

Not everyone is suitable for Telecommuting. If an employee is unsuitable, discuss any characteristics the employee could change, such as organization skills or the need for supervision and feedback. The option can be re-evaluated in six months.

Keep in mind that Telecommuting is not only for star performers. It should be available for all employees; however, high-performance employees are going to be more suitable. Explain this to the employee. It may provide motivation for them to improve weak areas. If an employee is not performing at an adequate level in all aspects of the job, telecommuting should not be considered as an option. Also, an employee who is currently telecommuting and has dropped below adequate levels should work on-site full time until his/her performance has improved.

### *The Manager's Role*

Schedule regular meetings with the telecommuter to assess needs, give feedback, discuss problems, and just catch up. By doing this you will not feel as if you are losing contact, and the telecommuter will be less isolated. If you hold regular meetings to set timetables and assess progress, employees will have deadlines to keep them on target. When face-to-face meetings are not possible, utilize other means such as mail and the phone to keep the lines of communication open. You may want to be a key contact person (see "Key Contact" below) to keep your telecommuters aware of happenings around the office.

### *Co-Workers*

Co-workers need to be sensitive to the telecommuter. As soon as an employee has set a start date for Telecommuting, discuss the arrangement with others in the work group to inform them of what times the employee will be out of the office and how to communicate during those times. Telecommuters should give co-workers their home phone number. If telecommuters will be working outside the standard work hours, co-workers should be informed of this. If a co-worker has a conflict with the schedule and needs the telecommuter present for face-to-face communication at a time when the telecommuter plans to be out, discuss how this might be corrected. If telecommuters remain flexible with their remote work arrangements, scheduling is easier and the transition smoother when they return to the office full time. However, there must be flexibility on both sides.

Telecommuters will have to stay in contact with people outside of the department as well as their work group. There should be a system set up so that people can contact them on the days they work at home. Telecommuters should be highly accessible. Their voice mail messages should indicate that they are out of the office, and provide a means by which they can be reached. Another option is to forward phone calls. Telecommuters may choose to make arrangements with co-workers who could take calls on the day(s) that they will be out of the office, or forward calls to their homes.

### *Key Contact*

Telecommuting should not put extra strain on the workers in the office. Communication is the best solution to this potential problem. Always keep co-

workers informed of schedules and projects that concern them. This will mean that the telecommuter's time spent in the office will probably consist of many meetings and face-to-face interactions. In any case, telecommuters should designate a key contact person in the office who can assist them and keep them informed of important events. These key contacts could be someone they work with on a project, administrative support people, or their managers. They could also assist with favors such as getting information from a file or sending a fax. If telecommuters have to depend on key contact people for numerous favors, they are probably not planning well, or the tasks they are doing at home may be unsuitable for remote work.

### *Administrative Support*

If there is an administrative person supporting the telecommuter, it is important that they know the details of the arrangement, such as the days that he/she will be out and how to stay in contact. The administrator should know how to handle situations when people call or come by looking for the telecommuter. Have the administrator explain to people that the employee is working off-site today and give them the number where he or she can be reached. Whether the administrative support person is the key contact or not, the telecommuter should communicate frequently with them as a vital link between the telecommuter and the office.

### *Clients*

Clients are people both inside and outside your company. Give them the same courtesy you would a co-worker. Telecommuters should let clients know they are working at home, and inform them of the schedule. It's good to remind them fairly frequently: "Call Mondays, Wednesdays or Fridays in the office; Tuesdays and Thursdays at home."

## **Managing Telecommuters**

Remote management is not much different from managing people on-site. It involves basic management skills that include setting goals, assessing progress, giving regular feedback, and managing by results. In fact, managers of telecommuters have reported that their own overall management skills increased as a result.

### *Management by Objectives*

You probably have already managed by objectives in one form or another by:

- Setting goals or objectives
- Action-planning to work on objectives
- Corrective actions
- Periodic reviews and performance appraisals.

For a telecommuter this may involve dividing the objectives into smaller parts and reviewing them more frequently. When setting objectives and giving performance feedback, remember the following:

- Employee participation promotes acceptance of the manager's observations, and employees who are allowed to voice opinions will be more satisfied with the feedback.
- Set specific performance objectives rather than general ones. This will clarify exactly what is expected of the employee. Productivity improvement is more likely if problem areas are discussed right away. Criticism triggers defensive reactions.
- Talk about how something can be improved, rather than spending too much time on the downside of an employee's work. Reward the employee for work well done! Employees respond much better to positive feedback than to criticism.

### *Measurable Output*

Close supervision isn't necessarily good supervision. In order to manage from a distance, there must be objective standards of measurement to assess progress, give performance feedback, and set timetables.

### *Measuring Performance*

Before you can review objectives, they should be clearly defined, with measurable output such as completed reports or written codes. These can be measured in quantity, quality, and time-to-complete.

Measuring productivity and performance should not be different for on-site and off-site workers. If you have a good system for measuring output, it should be equally effective for an employee working at home. If you feel the current measurement criteria are not sufficient, this is a good opportunity to develop them. Be careful not to over-measure; not every task can be evaluated in quantitative terms.

Evaluate individual work as well as group work. Telecommuters may sustain or even increase individual productivity levels, but their group work may suffer because they are not staying in touch with co-workers.

### *Management Resistance*

Some managers are resistant to Telecommuting. This is a natural reaction considering that, traditionally, jobs have been office based. Some managers feel a loss of control when their employees are not in close contact. Others feel that having telecommuters puts an extra burden on them.

Managing people off-site should be no different from managing people on-site. A good manager manages by results and not by activity. This is why it is so important to have clearly defined and measurable output. It can become a burden if too many people in your department are Telecommuting and schedules need to be juggled, or if the telecommuter's co-workers come to you with questions that the telecommuter should be answering. There are training and communication mechanisms that should be initiated to avoid these problems.

However, you will have problems to work out in any telecommuting arrangement. If the telecommuters' schedules are getting out of hand, assign a day or even two days out of the week when everyone is expected to be present for meetings. If co-workers are having difficulty getting their jobs done because the telecommuter is not accessible, investigate. Is the telecommuter making an active effort to get together with co-workers while he or she is in the office? Are co-workers reluctant to call the telecommuter at home?

Watching your employees sit at their desks and work does not assure that they are being productive or producing quality work. The only real test for productivity is to measure output. Are you satisfied with the quality and quantity of their work? Was the work completed on time?

### *Legal Issues Regarding Measuring Productivity*

Both state and federal wage and hour laws apply to telecommuting employees. That poses quite a challenge for both employers and employees, particularly with respect to the federal Fair Labor Standards Act (the FLSA or the Act).

If telecommuters are considered non-exempt under the Act, they will be covered by it. The FLSA requires employers to pay for all hours which employees are allowed to work, even if those hours were unauthorized. Employers lose money if they end up paying employees for hours they did not actually work. Conversely, employers can incur liability if employees underreport the number of hours they work.

Although it will not eliminate all wage and hour claims by telecommuters, a written policy designed to cover such matters will go a long way toward keeping employers from running afoul of the FLSA. Such a policy should spell out the number of hours per day which telecommuters are authorized to work. It also needs to require employees to

obtain advance approval from the appropriate supervisor before accruing any overtime hours.

The policy should also contain specific procedures governing how telecommuters keep their time records and report them to the employer. Provisions regarding timekeeping should be strictly enforced by the employer.

Besides monitoring the hours worked by telecommuting employees, employers also face the added challenge of measuring the productivity of those employees. The nature of the work being performed by the telecommuter will obviously dictate the type of technology, if any, available to monitor the employee's productivity.

## Chapter Five

# The Teleworker

## Are You Suited for Telework?

Successful telecommuters are disciplined self-starters who are comfortable working solo. Take the survey below to measure your chances for success. The more you answer “yes”, the higher the probability that you will be an effective teleworker.

- Are you well organized and goal-oriented? At the very least, you'll want to brush up on time-management skills.
- Are you effective at controlling distractions? Family, neighbors, and pets will compete for your attention.
- Do you work well with a minimum of supervision? Are the social aspects of the office environment relatively unimportant to you?
- Are you an effective communicator? You'll need to because most of your interaction will take place over phone or email.
- Can you set aside an area of your home to be used exclusively as an office?
- Are you comfortable with the idea of working solo?
- Can you get along without office support systems and personnel? (No more copiers, message-takers, typing pools. No PC guru or network administrator at your beck and call.)
- Can you easily get along without in-office reference material (or arrange to get copies for home)?

## How Can I Find a Telecommuting Job?

People asking this question tend to put the cart before the horse. The first step is to look for a company that needs the types of skills you have to offer. It helps if the job is one that can be done “anywhere”, jobs that require “face-to-face” contact such as warehouse operations or some customer

### Adjustments and Solutions:

Motivation and Structure

Overwork

Procrastination

Task-Oriented Systems

Reward Systems

Positive Reinforcement

Developing Systems

service jobs are not good candidates. It helps if the company is one that you know supports telecommuting, however many companies allow telecommuting that do not have a formal program.

Next, you need to develop a stellar reputation as a self-motivating, reliable, extremely professional worker. Demonstrate your value to your boss first (this will six months to a year) and then propose telecommuting a day or two a week.

Only a few companies offer jobs directly to telecommuters. Here are some web-based sources from June Langhoff's webpage that may help in your search. (Note: All but one of these are web-based and may change location. The listing of these sites does not constitute a recommendation.):

### *Jobs for Programmers*

(<http://www.jfpresources.com.jobtel1.html>):

This site lists telecommute programming jobs from all around the USA. Jobs postings are date-screened



and only those posted within the last 60 days are displayed. All fees are employer-paid.

*Workatorium* (<http://contractors.osbmall.com>): For a small fee, you can get listed on this site, designed especially for contractors who want to telecommute.

*Telecommuting Job* (<http://www.tjobs.com>): Contains listings for the following: artists, desktop publishers, engineers, photographers, programmers, sales, web design & writers. This site also contains useful news and information about telecommuting.

*Will Work 4 Food* (<http://www.2020tech.com/ww4f>): This site is designed to connect the cyber employer and the telecommuter. Businesses and potential telecommuters may post a free brief ad stating a job available or a quickie resume listing skills and abilities.

*Telecommuter's Digest* (<http://www.tdigest.com>): A monthly newsletter that lists companies that have telecommuting positions available. Some of the listings are for positions that have telecommuting potential only.

*The Cure Network* (<http://www.cure.org>): Lists telecommuting jobs for persons with disabilities.

*Telecommuting Technologies, Inc.:* Contracts with home-based independent contractors to handle overflow calls for organizations such as travel agencies. The company does not have a web site. They're located in Sacramento, California. Telephone: 916-973-4870

*CareerWEB* (<http://cweb.com>): Contains general career resources along with position openings, company profiles and a resume database.

*E-Span* (<http://www.espan.com>): A searchable employment database. You can search by keyword, date posted, since last visit.

*Career Mosaic* (<http://www.careermosaic.com>): Loads of useful resources including the J.O.B.S.database, online job fairs, college jobs, links to job opportunities around the globe.

*TELEMANutenciao* (<http://www.teleman.pt>): This international company, based in Portugal, hires telecommuters from around the world to perform a variety of services including desktop publishing, direct marketing and accounting.

#### *Teledynamics Advice*

(<http://visitweb.com/teledynamics/>): For virtual job hunters, a free listing service for people looking for telework, articles from the Canadian TeleWorker and other advice on "How to race with the rats while living with the wild geese."

*Escape Artist.Com* (<http://www.escapeartist.com>): Designed to help you find a job overseas, get help with immigration, find books about living abroad, locate help to get your stuff moved and on and on. A very rich site with loads of resources for the expatriate.

*Canadian Telework Job Board* (<http://www.ivc.com>): A joint venture between the Canadian Telework Association and Canadian Advanced Technology.

## Adjustments and Solutions

### *Motivation and Structure*

This section of the Guide is directed to the telecommuters in order to assist them in structuring and controlling aspects of personal management, which arise when working at home.

Obviously, working at home is different from working in the office. Each of these differences has a positive and negative side. There's the positive aspect of fewer distractions, for instance, but on the negative side there can be an increased tendency towards workaholism. Setting your own schedule on the days you work at home is one of the chief joys of Telecommuting. More flexibility is a plus; the self-management it entails can be difficult. If you don't make conscious decisions about your work-at-home routine, you may find that Telecommuting reduces your productivity instead of improving it. This section of the guide is planned to help you identify and design self-management systems that work for you, not against you.

Expect a 30-90 day acclimatization period when you start Telecommuting. It takes a while for even the most organized person to figure out how to manage time, space, communication systems, and projects while working in two locations.

### *Overwork*

Telecommuting is many things to many people. It may be the perfect way for you to balance your work with other parts of your life. It may be a way to get the quiet time you need for mentally intensive or creative work. It may be an opportunity to reduce stress and increase productivity. People who choose Telecommuting for these reasons are usually self-disciplined, conscientious workers who enjoy their work and want to give it their best efforts. These are also the workers who are most susceptible to overwork.

Once you start Telecommuting, you will have 24-hour access to work. The technology will be literally at your fingertips. Modems connect you to the office mainframe or LAN/WAN, perhaps you will have a printer or fax machine, or a better quality monitor than you could afford on your own. The projects you're working on will be designed for work at home. A darkened computer screen may start to look like a rebuke for work that you could be doing. You may be tempted to work at 6:00 a.m., at midnight, on weekends, just because it is so accessible.

At the office, there are routines that structure your time. There's a routine for arriving at the office and getting settled into work. You can hear co-workers gathering to go to lunch and to go home. When Telecommuting, you may not know when to stop. Simply putting in more hours does not make you more effective. In fact, it can have the opposite effect if you are fatigued, or when you become obsessed with minor details and can't call it a day until they are resolved, or when you delay turning in a project because it isn't perfect.

Working too much causes stress and stress-related illness, burnout, and reduced productivity. Some people mistakenly believe that the more hours they put in, the better their work is. Sheer quantity of hours does not make you more effective. The quality and effectiveness of your work are related to factors far more complex than clock hours. Knowing when to stop is essential to good job performance.

One way to get around overwork is to set business hours for yourself. Set firm starting and stopping times. Let your manager and co-workers know your work-at-home hours so they will know when it's okay to call you at home. The 9-to-5 schedule may not fit your preferences, but it's good to have

some overlap with office hours. That way, your manager or co-worker doesn't have to take time at home to call you during your working hours, nor do you get calls late at night from a co-worker who is working overtime and knows you work at home.

Even though you're at home and so is your work, you don't have to respond to every work-related request. You can decide to respond immediately to critical requests but not to less demanding ones. Establishing business hours for your work-at-home days, informing your co-workers of these hours, and sticking to them are major steps toward balancing work with other parts of your life. If you have a tendency to overwork, it will take practice and discipline to limit your working hours.

### *Procrastination*

The opposite of workaholicism is procrastination and lack of motivation. When you work at home, there's no one to supervise you or recognize that you've put in a good day's work. No one will know whether you've been glued to your computer all day or spent half the morning watching TV. Clearly, the motivation has to come from you.

At the office, you are expected to work most of the time. There's time to relax and chat with your friends, but there are lots of subtle cues when to get back to work. Certain distractions that aren't available at work are very available at home: the TV, the kids, doing things around the house, visiting with neighbors, etc. At the office, it's fairly easy to develop the discipline to go back to work after a period of relaxation. At home, it can be very hard to hit the desk again after taking time off to make lunch and eat it with the kids or play with the dog, etc. Your intensity level drops. With practice, you can develop control.

### Reasons Why People Procrastinate

Are you sometimes motivated to work and at other times procrastinate? Pay attention to when you procrastinate, what things act as distractions, what tasks you tend to put off. What do you do instead of work? Eat? Sleep? Do things you'd rather do? Waste time? These are self-defeating behaviors. Once you have an idea why you procrastinate, you can learn to outsmart yourself.

Fear of success – This is not as silly as it sounds. Think about the negative side of success. Is this what you are afraid of?

Fear of failure – This can be paralyzing. Some people use it to whip themselves and believe that if it weren't for this fear, they wouldn't have any success at all. But after awhile, it stops working as a whip, and paralysis sets in.

Rebellion – If you procrastinate to avoid doing tasks you don't like or feel are beneath you, you are probably expressing rebellion. Rebellion may be used as a means to avoid feeling powerless.

Anxiety – You may feel that working at home is a privilege you have to earn continuously. It's not a privilege; it's an option. It's not just for superstars, but should be available to all good performers. Don't worry about having the privilege taken away from you.

Loneliness – Your feelings of isolation may be expressed in procrastination. Maybe you miss the office social life more than you thought you would. Remember, you can always go back to work in the office full time if you want to, or find ways to get your social needs met while continuing to telecommute.

### Tips on How to Develop Workable Routines

One of the best ways to overcome a lack of motivation is to get into specific routines. Routine establishes the structure many of us need to get started.

#### *Motivation*

Setting a schedule is very helpful. Clear hours of business are good for overcoming both workaholicism and lack of motivation. Set firm deadlines for yourself. Your manager will help you set the deadlines for your projects, but you can set minor deadlines for the day or week, and stick to them.

If you have a task to do and simply cannot get motivated, try doing another work-related task that may prepare you for the original one. If that doesn't work, try doing something else entirely. Go for a walk, take a shower, run some errands.

Learn how to motivate yourself. Do you like to work in a clean, neat workspace? Tidying it up might help get you started. Set up your workspace

with all your equipment and materials within reach. Calling the office when you first sit down at your desk might help. Talking to others who are focused on their work will focus you. It will also remind them that you are working at home, not taking a day off.

#### *Task-Oriented Systems*

Perhaps you envisioned Telecommuting as a way to do your creative work at home and the mechanized tasks at the office where the interruptions won't bother you as much, but there are still times when you have to work on boring tasks at home. Some people feel they ought to do the least-liked tasks first, but there is no real reason to insist on the work-before-pleasure principle. If you are motivated to do a certain task now, don't wait until later to do it. When you're excited about a project and have great ideas, do it while you're motivated. When you've done as much as you can, or run out of energy, or come to a natural stopping point, then is a good time to do the parts you are less enthusiastic about. You can use the momentum of the fun project to carry you through the boring task. You don't have to finish it, but if you are productive, you'll have that much less to do at the end of the next day.

#### *Reward Systems*

If reward systems work for you, decide what rewards are most effective. Breaks are a time-honored reward system. Some people need a five-minute break every hour; others prefer longer breaks at longer intervals. Some people like rest breaks and some like activity breaks.

Here are some suggested rewards that might work for you:

- Coffee breaks
- Exercise breaks
- Phone breaks
- Work-related reading
- Food
- Kid time
- Outdoor breaks
- Game breaks
- TV break

Remember that the point of these rewards is to motivate you to work. Don't give yourself the

reward before you've achieved your goal. Some rewards are time-consuming, especially reading, playing computer games, or watching TV. Limit the time you spend rewarding yourself.

### *Positive Reinforcement*

Positive reinforcement is a good motivating tool. We're all familiar with negative reinforcement: putting yourself down, calling yourself names, and labeling everything in terms of success or failure. You're scaring yourself into working, not motivating yourself. Think of the things that you say to yourself when you use negative "self-talk." Now reverse them. Say them with conviction. Check your energy level and see how you feel. If you have put as much energy into this exercise as you have into negative self-talk, you should feel more energized and motivated.

Wouldn't you rather work with this energy than the anxiety generated by negativity? True, it may get you going, but a positive attitude is more powerful. It keeps you going and doesn't let you down once you've achieved your objectives. Try it.

### *Developing Systems*

Working at home means being able to create and follow effective structures that take the place of those at the office. Some people are most comfortable with systems and routines very much like those they use at the office.

Some telecommuters prefer to schedule their day with firm starting and stopping times. Others build in flexibility. They count backwards from project deadlines and make careful daily and weekly schedules for what they need to accomplish. They work until they've met their goals for each day, then quit. Others don't like schedules at all and on their telecommuting days they may not get started until afternoon, and keep working until late at night. Some people thrive on this. For others, the "un-schedule" becomes a source of stress as they waste productive hours, then rush frantically to stay on target.

To be successful as a telecommuter, you need to be aware of your goals and target everything you do toward meeting them. Be flexible enough to recognize that when something isn't working for you, it's up to you to change it until it does work. For

example, if you feel you need more input from your manager, ask for it.

When you structure everyday activities into routines, you save time and energy for decision-making at a creative level. Why waste time searching for information when you can devise a filing system that is easy to use? There may be times when your routine gets disrupted by an unanticipated event. That's fine, just get back to it as soon as you can. Periodically, check your routine to see if it's working. Are you following the system you set up? If not, it probably wasn't designed well enough to meet your needs in the first place. Systems should make your life easier, not more complex. If you are not getting the results you want from your routine, revise it.

Making conscious decisions about how you use your time will save both time and effort in the long run. You'd be surprised how much energy you can waste making the same decisions over and over.

### Questions to Ask When Defining Your Telecommuting Day

*How many hours will you work at home each day and week?*

You can limit your tendency to overwork or motivate yourself to work harder by deciding this up front.

*Which hours will you work?*

When working at home, 9-5 may not suit your needs. Set a schedule for your work-at-home days and inform those people who will be affected by that decision.

*How many breaks will you take during the day?*

Figure out if you work best with frequent short breaks or longer breaks at longer intervals, but do take breaks. Telecommuters tend to be disciplined and self-motivated. They often get so engrossed in their work that they forget to take breaks. Severe headaches, eyestrain, neck and back pain are the result of working too many hours without a break. If you have this problem, set an alarm clock to go off every two hours or so, when it goes off, force yourself to get up and stretch, look away from the

screen, or do some neck and back exercises. You can still think about work while you're stretching, but give your body a break.

*When will you do household chores?*

Some people feel they cannot work in a house that is less than spotless, so they spend time cleaning instead of working. This is a good reason to have a separate room for your home office. Try keeping just that room clean. Beware: the people you live with may expect you to do more housework "now that you're home anyway" Remind them that you are at home to work. You may find that doing one household chore per work-at-home day is a good compromise.

*When will you eat when you work at home?*

Make a conscious decision about this. Schedule regular lunch breaks to avoid excessive snacking or not eating at all.

*When and how will you dress when you work at home?*

Some people like to wear jeans and a T-shirt, but others find that if they dress too casually, their attitude seems to relax and they can't get down to work. Dressing for work at home the same as they do for the office may be the best solution.

*If you have children, when will you be available to them?*

Telecommuting is not a substitute for childcare. Children need a lot of attention, and have a right to expect it from you. But your work needs attention, too. Make arrangements for childcare, and set boundaries on your availability to kids and others. There's more about this in the "Family & Home" section.

*What interruptions will you allow?*

There will be phone calls from friends as well as co-workers, plus deliveries, repair service calls, neighbors, etc. It's better to define a policy in advance so you don't have to make individual decisions at each distraction. Setting a schedule for your work-at-home days and making careful decisions will help you be a successful telecommuter. Working at home can improve your productivity, but not if you let distractions or lack of organization get in your way. The flexibility of working at home a few days a week can be stimulating. Harness that flexibility and make it work for you.

## Adjustments & Solutions

### *Family & Home*

Many people choose to telecommute so they can spend more time with their families. Parents feel it is important to be the primary caregivers for their children, yet work is also important.

Telecommuting seems to be an ideal way to meet both of these needs. You'll discover that working at home creates new conflicts. However, they can be resolved if you make the effort to discuss them openly and give everyone time to adjust to the changes. When you work full-time in an office, there are clear boundaries between the office and home. The office is for achievement and peer interaction. Home is for rest, relaxation, and spending time with family members. You go home to recharge your batteries from the stresses at work, but when a significant portion of work is being done at home the boundaries are less distinct. Nevertheless, the integration of work and home can be very satisfying.

It does take some adjustment. Even if you feel comfortable with it immediately, your family may not. Working at home places constraints on everyone who lives there. For one thing, your family sees you in a different way. Your work is no longer an abstract thing you do at an office, but something real that changes what goes on at home. That's why it's important to sit down with your family and talk about how the situation will affect each of them. Do this before you begin Telecommuting, and you will resolve a lot of potential conflicts.

Discuss your plan to work at home with any other adults living there before you finalize the decision. When you introduce the plan to your kids, encourage everyone to discuss their concerns openly. Take each concern seriously, and plan solutions that can be revised until they work to everyone's satisfaction.

Conflicts may arise despite your best efforts to anticipate them. When this happens, keep the issues in perspective by remembering a few things. Conflict is temporary. You can do something to resolve it. Because these are the most important people in your life, win-win solutions are really the only option. Solutions that work for you alone are not really solutions. When an agreement is made, it should be clear to everyone exactly what is expected of them. And keep the lines of communication open so adjustments can be made.

## Family Issues Most Likely to Arise

### *Household Responsibilities*

Since you will be at home more, you may be expected to take over more of the housework. If extra chores around the house are okay with you, fine. If not, come to an agreement that is fair to everyone involved. Space may be an issue as well. Can family members turn on the TV or stereo, talk on the phone, have company, or play games whenever they want, or does that infringe on your work space? Working at home usually means at least one extra meal at home. Who will prepare it, clean up after it? Discuss these matters early in the Telecommuting arrangement.

### *Time Management*

You will save commute time on the days you work at home. Decide with your partner what responsibilities you will have on those days. Who gets the kids ready for day care or school? Who drops them off and picks them up? Who takes the dog for a walk? In other words, determine legitimate uses of your time.

Do you take time to visit with your spouse or play with the kids during the work day, or are you off limits until 5:00 or 6:00 p.m.? Can you be disturbed only for emergencies, or are you basically available to family members whenever they need you? Be sure to set aside time to be "at home" for the family.

Telecommuting may be the answer to your desire to be both a good parent and a good worker while reducing the stress of both roles. But it won't just work itself out. You need to work together with your family to manage the changes that Telecommuting will involve.

## Children's Needs To Be Considered When At Home

### *Child Care*

Presumably, you chose Telecommuting to enjoy more time with your family or increase work productivity. However, you cannot work effectively while trying to care for small children and you can't take very good care of them while trying to accomplish work tasks. If you try to do both at once, you won't be either an effective worker or an effective parent. This is a conflict that needs to be resolved before you begin Telecommuting.

It cannot be overemphasized that Telecommuting is not a substitute for childcare. You still need to arrange for someone to care for your children while you work at home. School-age kids are out of the house most of the day. Maybe the older kids (12 and older) can look after the younger ones. Most kids six and older can play by themselves or with friends without supervision, but not for long. Let them know exactly when you will be available to them, and be unavailable only for about an hour at a time. When you need uninterrupted work time, consider getting a baby-sitter. After-school day care is another option.

Most parents find that trying to work at home while caring for preschoolers or toddlers is frustrating. They really do need your attention, but so does your work. It is not realistic to expect little kids to behave in ways that are beyond their developmental abilities. Therefore, children under age six need day care or a full-time caregiver.

### *Helping Your Children Adjust*

It may take longer for your kids to adjust to the changes than it does for you. They need your support and direction. Start by introducing your plan for Telecommuting and explain how it will affect them. Tell them when you'll be working at home and what is expected of them. They may keep testing you for weeks or even months on issues such as interruptions or resentment. This is normal.

Respond consistently and be prepared to renegotiate the agreement if necessary.

## Chapter Six

**"Virtual Offices" and the "Virtual Organization"****Revolution**

Through the combination of advanced computer software, hardware and communication network technologies, collaborative intellectual work can now be done in a context that is almost free of the constraints imposed by the physical location of workers and their organizational affiliation.

Organizations can now create electronic workspaces or "virtual offices", where some workers may be co-located, but others can be remotely located anywhere in the world. Organizations can quickly assemble teams with required combinations of skills by putting together people from inside and outside the organization, creating a new "virtual organization."

Using these electronic workspaces, teams of people can "meet," exchange messages with rich content, chat, and hold real-time conferences supported by computer based applications. Workers can negotiate, decide, commit and vote. They can collaborate by accessing and sharing data and applications in real-time, fill in forms, file reports, and publish, share and store work product. Teams can share calendars and schedule time commitments.

Transactions can be arranged, committed to and paid for. Groups can design, commit to and monitor workflow, and they can track the progress of projects and quickly restructure work.

In these electronic workspaces, everyone involved can see everything. Work can be immediately updated and made available to everyone. Work can be taken off-line, and subsequently the group can be updated automatically. Where security is important, hierarchies of access can be easily created and modified. Access to work product can be limited to certain groups of files, to single documents, even to specific lines in a single document.

**Essentials:**

Internet Standards

Internet Access

Platform Independence

Management

Development Environment

Messaging

Security

GroupWare Functionality

To help people work together more quickly and efficiently, these technologies can bring the resources of large organizations to remote locations, groups, and individuals. Organizations can publish policies, press releases, financial results, marketing materials and catalogs of products. Remote workers can have full and instant access to critical applications, databases and information.

Beyond the notion of publishing content, many organizations are beginning to realize that they can capture knowledge and expertise, organize it and make it instantly available to everyone in the organization who needs it. Knowledge can be made active and instantly accessible, anywhere, anytime. This is a revolution in the way intellectual work can be done because technology is transcending the limitations of physical space, location and the human propensity to hoard knowledge and expertise.

## Drivers

This revolution in the way work can be done is being driven by a number of recent developments including:

- The rapidly developing suite of Internet standards (protocols) for messaging, security, transactions and directories;
- Related standards for document sharing, workflow, and application development;
- The web browser, a universal client interface to access network based resources and applications no matter what the computing platform, application type or connection facilities;
- Powerful, inexpensive, standards based software applications and associated development environments;
- Networking hardware and software technology incorporating Internet protocols and providing ubiquitous, inexpensive communications resources with ever increasing bandwidth and geographic scope;
- Powerful, inexpensive client (end user) and server (network resource) computers.

Until recently, many of these technologies were viewed as separate developments and implemented independently with proprietary solutions. It is the combination of these technologies with standards-based solutions providing interoperability that is driving the revolution in the way work can be done.

## Essentials

### *Internet Standards*

The value of collaborative applications comes from the implementation of standards. Major software vendors are rapidly moving to base their products on the use of the Internet and its standards and protocols. As appropriate, applications should support the following standards:

- The basic Internet protocols: TCP/IP;
- Text formatting and delivery protocols: HTML and HTTP;
- Email: IMAP4, MIME, POP3, and SMTP;
- Chat and newsgroups: IRC and NNTP;
- The Common Object Request Broker Architecture (CORBA) model and IIOP, a protocol that defines how distributed objects communicate;

- A simplified directory service protocol that defines a common way to identify users and groups: LDAP;
- Security protocols: S/MIME, SSL and X.509 certificates.

### *Internet Access*

All applications and data on corporate networks (Intranets) should be made accessible via the Internet/intranets (assuming appropriate access privileges and security can be established).

### *Platform Independence*

The major vendors are moving to interoperable software and hardware platforms. Eventually, it should not make a difference what kind of computer, operating system, or application the end user has.

### *Management*

System and software administrative functions are being integrated with popular network monitoring and management tools. These administration functions are becoming accessible from any workstation, local or remote, by using a web browser. Implementations should incorporate these features.

### *Development Environment*

Collaborative applications are being developed with and incorporate standards-based development environments that include libraries of basic functionality, cross platform support to provide quick and easy customization (by developers and end users) for specific work requirements. Organizations should avoid proprietary, or non-standard development environments.

### *Messaging*

Email facilities should support all of the Internet messaging protocols mentioned above and be accessible by browser-based clients. Email should provide integration with popular desktop applications through universal file viewers, so that files can be easily viewed, attached and transferred. Email should support the delivery of rich messages; content enhanced with graphics, voice, etc. The functionality should include message routing and message stores, hierarchical mail folders, full text search, indexing, "threaded" discussions, automation of repetitive tasks, message security, and customization facilities.



### Security

Applications must provide security functions including authentication, access control, digital signatures, and encryption (down to field level).

### GroupWare Functionality

Besides the "basics" outlined above, for teams to work together in these virtual offices, the environment should include a relevant combination the following platform independent capabilities:

- Calendaring/scheduling;
- Conferencing: including discussion forums, chat, white boards, application sharing, audio/ video internet telephone (assuming appropriate bandwidth is available for video);
- Connector services providing access to legacy applications and data;
- Contact management;
- Document management;
- Electronic forms design, submission and management;
- Project management;
- Relational database access and integration;
- Replication facilities;
- Workflow design, implementation and monitoring.

### Reality

Presently, all of the major vendors of GroupWare/ collaborative software applications, servers and development tools say they are implementing and offering Internet standards-based products that are deployable on the Internet/intranets/extranets and accessible by web browsers. Other major vendors of enterprise solutions (e.g. accounting, human resources, supply chain management, logistics, manufacturing, etc.) and vendors of analytical, design, graphics and a host of other applications are announcing support for Internet standards, web-based deployment and browser-based access. In addition, there are a number of ongoing efforts to devise Internet related standards for document sharing, workflow, audio and video conferencing, secure electronic transactions (SET), etc.

Current reality is that vendors are unable to deliver complete, Internet-based solutions that are easy to develop and deploy. Moreover, fast access and interoperability, platform independence, and strong

security are hard to achieve. Actual implementation of these systems is more difficult and yields more surprises than vendor marketing literature indicates. Continuing obstacles include:

- Insufficient bandwidth both in host-to-host connections and in dial-up access for home, remote or mobile users;
- Insufficient server processing power and access ports;
- Vendor implementations of Internet standards that are proprietary in nature or include proprietary enhancements or features;
- Lack of support for all of the necessary standards;
- Performance problems with interpreted languages and just-in-time compilers;
- Inconsistent behavior of "machine independent" code when executed on different hardware platforms;
- Implementation can require scarce, expensive consultants and specialists;
- Ongoing maintenance and user training takes longer and costs more than vendors acknowledge;
- Innovation of application features and functionality is running at a pace that seems faster than organizations and end users can absorb, understand and deploy profitably;

Despite these obstacles, there is an industry-wide vision projected by all major software and hardware vendors that the infrastructure supporting the creation of virtual offices and virtual organizations is being developed and made available now. White papers are currently available on the Internet from IBM/Lotus, Microsoft, Netscape, Novell, Oracle, Sun and other companies regarding collaborative work using the Internet. These visions are changing the way people can work now and in the future.

## Chapter Seven

# The Teleworker and Technology

## The Basics

An important step in deciding whether to telecommute is consideration of the work you will perform when not in the office. Think about the computing resources that you use in the office and the types of applications you use each day in your job. Perhaps you access a central computing system which provides the applications you use or you have a dedicated workstation with commercial application packages such as spreadsheets, word processor, etc. In many cases you probably use a combination of internally developed applications and the resources of your workstation.

To successfully telecommute, you must have access to the computing resources you need to do your job. Today's technology provides a wide range of solutions that can help you be an effective telecommuter. The key is to choose the right solution. In this section we will outline the process you should follow to make the right choice.

### Do I Need to Know a lot About Computers?

The short answer is no. Though telecommuting implies use of a computer and modem, there are a lot of job tasks that you can do from home...the simplest can be done with just an extra phone line. For computer users, setting up your system doesn't need to be a headache. Talk to your systems administrator, IT professional, or PC guru first. You may need email and network access from your home computer, and many companies will pay for or help subsidize this. As a first step, consider what type of equipment you will need to telecommute. In all likelihood you will need a personal computer or a communications link to the computing facilities at your office. If you normally use a terminal,

### Diagrams in this Chapter

Remote Access to Workstation at Office  
 Extending the Corporate LAN  
 PC Remote Access Diagram

### Special Thanks

Special thanks to June Langhoff for allowing us to include information from her book *The Telecommuter's Advisor*. June also has a very informative web site:  
<http://www.langhoff.com>

then the only issues you have to consider are what communications link to use and the associated costs. If this is the case, you should skip to the section below on communications links.

As a PC or Mac user, you have a few more items to consider, such as the type of computer, application software, and what sort of information will travel over the communications link.

Whether you use a "dumb" terminal or a personal computer, it's best to get the help of those who support your computing resources at the office. You will probably find they have already thought about remote access to company resources and have several solutions from which to choose. Computer magazines and trade press are another useful source of ideas for Telecommuting solutions. Magazines such as PC Week, MacWorld, InfoWorld and Network Computing frequently describe suitable products and periodically run feature articles on Telecommuting or remote access to corporate computing resources.

### *Personal Computers*

If you already have a personal computer of the same type used at the office, you have most of the equipment you'll need to telecommute. If not, you may find that your employer will loan you the equipment needed.

Don't automatically assume that you need exactly the same PC at home as you have at the office. Many application packages now run on several different workstations; for example, Microsoft Excel and Word both run on the PC and Macintosh and can interchange documents between both versions.

Today's trend toward an open computing environment means that more and more vendors have designed their products for a heterogeneous environment. Check with the department that supports your computing resources at the office. You may find they have already chosen software that works in this way. You can now make your choice of workstation based on compatibility or cost.

Most personal computers can run software that emulates a wide variety of other devices, even workstations. Software can turn a Macintosh into a PC, a PC or Macintosh into a variety of terminals (even sophisticated terminals such as X-Terminals), or a UNIX workstation into a PC or a Macintosh.

Things to consider include screen size, the speed of the workstation, disc space, and whether you regularly need to print information. If you have to store information on your home workstation, remember that you need to back it up.

### *Application Software*

Once you have decided on the workstation, determine which application software to use. If you have the same workstation as the one at your office then obviously you will use the same application packages. Before simply copying the software from the office, carefully read the vendors' license agreements.

Most license agreements today recognize that people use the packages both at the office and at home and so permit you to treat the software as a "book". In other words, you are permitted to install the software on both your office and home workstations as long as there is no possibility that two people will use the software at the same time. If someone is using your workstation at the office while you are Telecommuting, you must purchase

additional copies of the application package. Large companies often "site license" the application packages adopted as company standards, so check with the support department before you buy.

If your home workstation is different from your office workstation, your choice of software depends on whether you emulate some form of terminal or run application packages that support different platforms.

### *Printing*

Whether you need a printer or not depends on how much you print, what kind of information you print, and what percentage of time you telecommute. If you intend to telecommute one or two days a week, then you can probably manage without a printer. If you need to print only occasional information, you can probably defer printing until the next time you are at the office. Printing at the office not only reduces the cost of the equipment you need to telecommute but also reduces the space you need for equipment.

If you must print while Telecommuting, you have many different printers from which to choose. Ink jet printers and laser printers have both become affordable for home use. Choose a printer based on print speed, quality and cost.

Another option is to use a service provided at a copy center such as Kinko's which provides not only copy machines and services but also has personal computers and printers that are available for composing and printing documents and overheads. Generally they can print in either black and white or color. Of course there are charges for both computer time and printing.

### *Data Communications Link*

The choice of communications link depends on what kind of information you access and how frequently you access it. Technology has evolved to the point where one has a tremendous variety of choices in terms of link speed and cost. Start by thinking about the type of access (file transfer, terminal emulation, etc.), the volume of data transferred, how far you are from the office and how long you will need the link established each day.

The access and the volume of data you need to transfer will determine how fast a link you need, while your distance from the office and hours you

will be using the link will determine the most cost-effective technology.

#### *Assessing the Appropriate Access Method*

##### *Bit Rate*

The type of job and communications needs are essential in looking at bit rates or speed needed by the teleworker. Is this teleworker just checking email or are there large file transfers like those associated with software development? Another factor to examine is does this teleworker currently use the corporate LAN when in the office? If so, they may be used to the speed of the corporate LAN and may find anything slower unacceptable.

##### *Cost*

Unfortunately the issue of cost may determine the viability of telecommuting within a corporation. Dial and ISDN services from the Local Exchange Carriers (LECs) are normally usage and distance sensitive and may be unpredictable in their costs. It is the determination of job function which provide the most cost effective teleworking method.

(For a more comprehensive description of various data communications services, refer to Appendix IV.)

## Applications

The following sections provide examples of how you can use different types of communications technology to telecommute. Each example describes the communications technology required and gives examples of the different jobs that might use the technology to telecommute. You should consult with your computer support department and telecommunications provider in order to select the right technology for your situation.

As you read through the examples, think about the number of hours a day that you will need to access the computing facilities at the office. You may find that you need a normal telephone for talking with colleagues, calling customers, etc., in addition to the data communications link.

##### *Terminal Access*

If all your interactions with corporate computing resources use a terminal to access applications running on a central computer, then you will need a

terminal (or personal computer with terminal emulator) and a communications link.

The simplest communication link is a normal telephone line and a modem. You attach your terminal or workstation to the modem using a serial link or adapter. Modem technology has improved to the point where you can reliably transfer data at speeds up to 56 Kbps. You will probably find this speed comparable or slightly slower than what you are used to at the office.

Your distance from the office and the number of hours you use the link each day determines the recurring costs. If your office is more than about 30 miles from your home and you expect to use the link more than three hours a day, consider a dedicated line or a service that is not distance or time sensitive in its pricing. A dedicated line links you directly to the computing facilities at the office and is available 24 hours a day. Instead of charges based on minutes or hours of use, you incur a fixed charge per month based on distance.

##### *Combined File-Transfer and Terminal Access*

If you use a personal computer or workstation at the office, you probably use a combination of applications on your workstation from a central computer. Typically you may transfer files from the central computer system, then use a word processor or spreadsheet package on the workstation to manipulate the data. To successfully telecommute, you will need a suitable workstation, a telephone line and a modem.

The telephone line and modem are the basis of your communications link. Use a terminal emulator and a file transfer package to access the computing resources at the office. Use the same application packages used at the office to manipulate the data.

You may find file transfer over the communications link at home takes longer than at the office. Typical modems run anywhere from 9.6 Kbps to 56 Kbps. Transferring a typical spreadsheet or word processor document of 100 Kbs can take between one and three minutes depending on your modem and file transfer software.

There are several alternatives should you need to transfer large numbers of files or correspondingly large amounts of data. If you plan ahead, you can

transfer larger amounts of data using a floppy disk. Use the floppy disk to transfer files between the remote and office workstations. Alternatively, you can use a file transfer package that runs in the background. Some programs reduce the file transfer time by only updating the changes in the file. This approach is suitable for large numbers of small or medium size files but may prove frustrating for larger files. Most file transfer packages do not cope well with transmission problems on the communications link. For example, noise on the line may necessitate several attempts at transferring large files before succeeding.

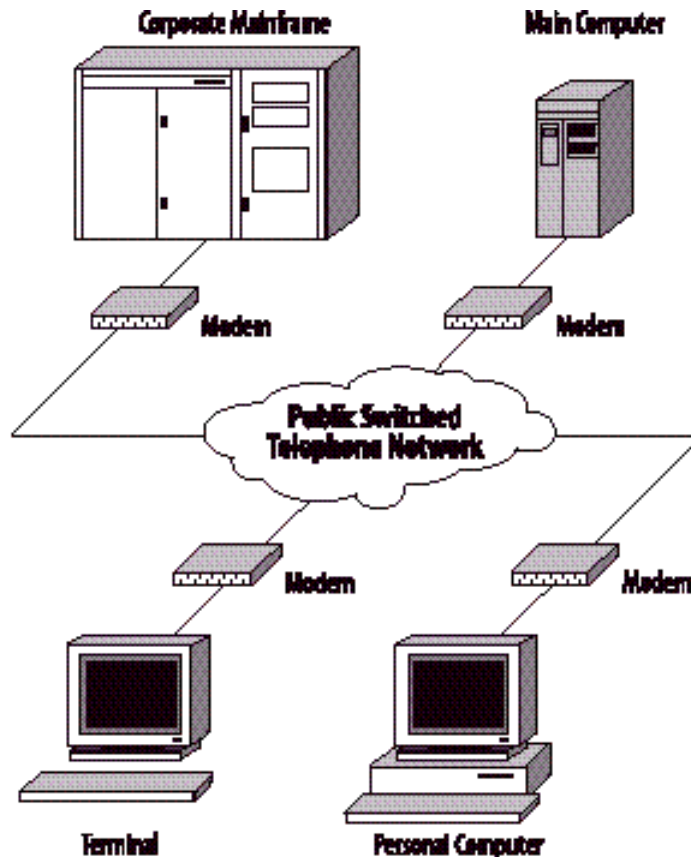
If you need to transfer larger amounts of data on a regular basis, consider a higher speed digital commu-

nications link. Your telecommunications and network service provider can supply you with various technologies depending on the equipment they have.

### Remote Access to Workstation at Office

Depending on the kind of workstation-based applications you use, remote access to a workstation at the office is an alternative to the problems of file transfer. Remote access to a workstation uses software running at each end to effectively remote the display and keyboard. You get the full advantages of the power of the workstation at the office and can use it to access data at the full speed of its connected resources. Software running on each workstation transfers keystrokes, mouse movements and screen updates to the other workstation. You don't

### Terminal Access



execute any applications on your local workstation; all the applications continue to run on the workstation at the office.

Software is available for different kinds of workstations and a wide range of operating environments. This type of access works well for applications that use character displays or simple graphics. Applications with complex graphics or bit-mapped graphics typically run very slowly due to the speed limitations of the communications link.

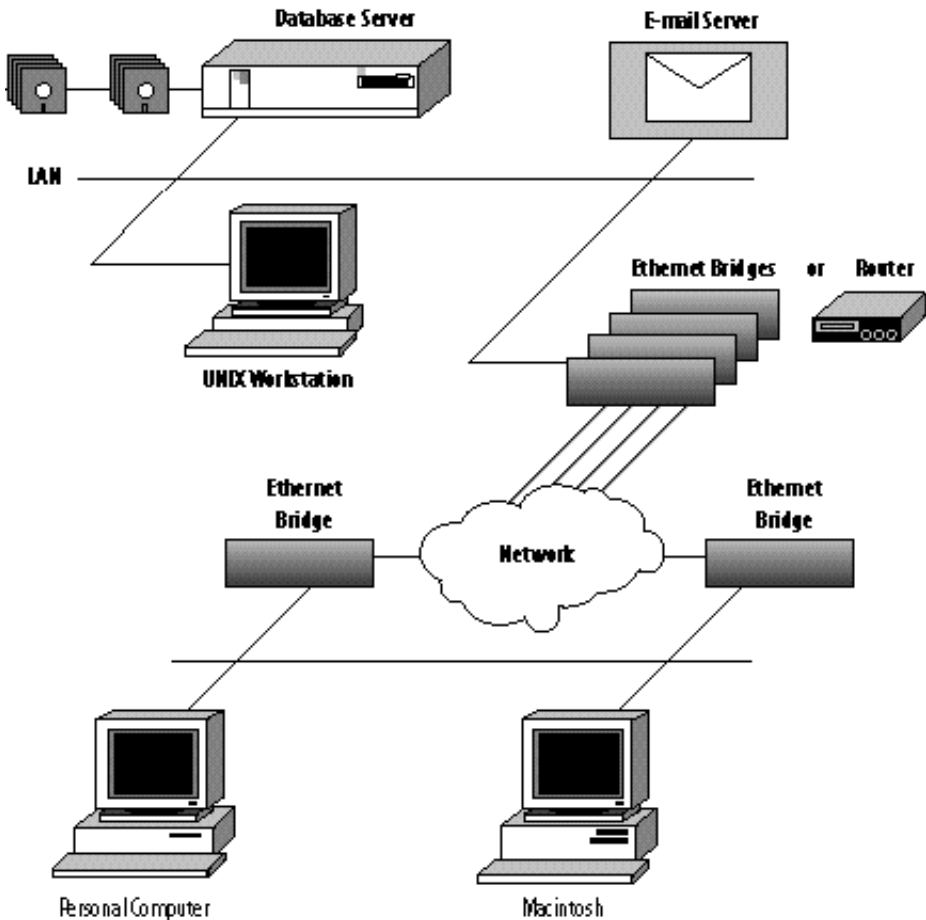
**Extending the Corporate LAN**

If you frequently use Local Area Networks to access file servers or distributed applications, you will

need a more sophisticated communication link. You can also use this link to access a UNIX workstation at the office.

You can effectively extend your corporate LAN by using a product that bridges two Local Area Networks over a communications link. In order to get adequate performance, you will need a communications line, such as an ISDN link, Switched 56 link or dedicated line. You can install an inexpensive LAN extension in your home using Ethernet over twisted pair also known as 10-BaseT. If you only need one workstation, then the LAN is as simple as a cable and two connectors. Supporting more workstations, as in a remote office, requires a 10-BaseT hub, a device that supports Ethernet over inexpensive cable. To extend the LAN to your

**Extending the Corporate LAN**



office location, connect a LAN bridge over the communications link to another bridge connected to the office LAN. The two bridges enable you to access the office LAN at speeds approaching 300 Kbps using compression. A dedicated line will support even higher speeds but at correspondingly higher costs.

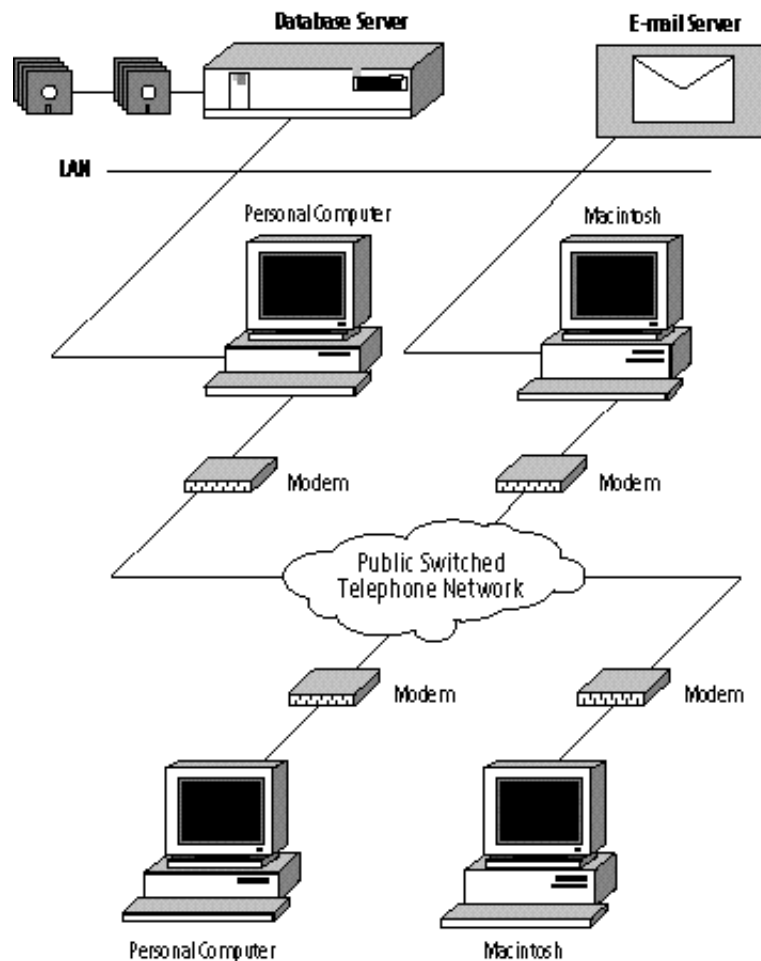
Today most remote LAN access can be accomplished through:

- Async dial-up with modem
- ISDN modem
- Frame Relay
- Cable Modem
- xDSL
- MMDS Wireless

Within the year, a number of DSL technologies will be available and may merge as “the high speed standard” for remote corporate LAN access over the next decade. Cable modem technology is also focused at providing high-speed access for the remote LAN access market. Wireless access through MMDS is another promising technology already available with ubiquitous coverage, high speeds and low latency in several markets including the SF Bay area.

You need an Ethernet adapter that supports 10-BaseT for your remote workstation and suitable software. In most cases the software you need for your workstation will be identical to that which you use on the workstation at the office. If your office uses a UNIX workstation, then you can still access it remotely by using your home workstation

### PC Remote Access



as an X-terminal. To do this, have a software package that supports the X environment for your workstation.

This type of access allows you to access practically everything that you can from your workstation in the office and with little perceivable difference in speed or response time. This approach should reduce ongoing costs since most of the products available on the market only establish the communications link when transferring data. Depending on your usage pattern you may find this is a reasonable alternative to installing a dedicated line.

### Advanced Telecommuting

Once you have a high-speed communications link, such as an ISDN, Frame Relay or other high-speed network service, you can use new technology to further improve your productivity.

The shared whiteboard is a software application that allows you to participate in distributed meetings. Each participant in the meeting uses a software application that displays a common whiteboard. Whenever someone writes or draws on the whiteboard, the software transfers the data to all other participants in the meeting. The software typically allows you to cut and paste information between other applications and the shared whiteboard, and identifies different participants by drawing their contributions in a particular color. Many types of meetings can benefit from this technology. A shared whiteboard and a telephone allow people to meet, no matter where they may be working.

Recently the cost of video conferencing equipment has fallen significantly through the use of personal computers. You can buy an adapter that allows your PC to function as a video conference terminal. The adapter uses the screen of your PC and adds a video camera and plug-in card. A videoconference requires compatible equipment at each end of the link. The adapters use special techniques as well as compression to reduce the amount of data represented by the video signal.

Desktop video applications typically run over ISDN. While there are standards for room-based video conferencing systems, a desktop standard is

under development. This means your videoconferences will be limited to like equipment. Lower quality video is also available over analog lines or the Internet but it is generally of too poor a quality for an extended business conference or meeting.

Video quality of non-moving images is comparable to that of broadcast television. Moving images results in a partially smeared or unfocused image until the movement stops. The smearing is a result of the technique used to compress the video information. The adapter typically transmits only the information that changes from one scan of the image to the next. The amount of data that changes due to movement may overwhelm the capacity of the communications link. You see this loss of information as smearing.

With video conferencing, you get both a video and audio link to the meeting. Many high-technology companies with offices in different parts of the country already use video conferencing to avoid staff travel. Productivity improves and money is saved through elimination of time loss due to travel.

### What if I Need Tech Support?

First find out who provides technical support within your company. Many companies have help desks within their MIS departments. If you are on your own, tech support hotlines and help files can get you out of a bind fairly quickly if you know what you're trying to find. Here are some tips on how to navigate and troubleshoot problems regardless of who is providing tech support:

#### 1. *Crack the books*

Over half of all tech support problems can be solved by looking in the manuals that come with the equipment or software.

#### 2. *Be prepared*

Note the machine name, model number, operations system version number, amount of Memory, monitor type, hard disk brand name and size, software titles and release numbers. Know what kind of modem you have and its baud rate (speed). Turn your computer on, have your disks and product registration numbers handy before you dial. Exception: If your disk drive is making grinding noises, turn it off immediately and don't start it up again. If you



have a special data communication line, have the information pertaining to it handy as well.

### 3. Search online

Two very good sites are Microsoft's Knowledge Base and Apple's Technical Information Library. Online services also provide a wealth of information. CompuServe has the most, with over 800 hardware and software firms represented.

### 4. Forage through fax facts

Many software companies operate fax-back numbers where you dial a special number and get technical documents faxed to you immediately. Call to order an index first if you haven't used the system before.

### 5. Sign up for premium support, when all else fails.

Many software and hardware firms offer special numbers where the call is charged to your credit card. These numbers have very short hold times but charge \$2 to \$3 per minute with a call cap of \$29 to \$50.

### Look Online

For information on keeping your computer in top networking shape, check some of the following websites:

- *HealthyPC.Com* (<http://www.healthypc.com>), is an online computer technical support service, through which users can browse computing advice columns, download software utilities and bug fixes, and get automatic upgrades for software from numerous vendors.
- *e.support* (<http://www.esupport.com>) takes users through a series of questions and then routes the problem to the correct vendor. It comes with CheckIt, a program that runs a computer system diagnostic and delivers a report card to the service technician.
- *TuneUp.com* (<http://www.tuneup.com>) offers anti-virus checkups and disk-drive optimization on a regular basis.
- *TeleAdapt's* (<http://www.teleadapt.com>) web site can assist you of modem configuration and connection.
- *Frank's Driver Page* (<http://207.18.181.161/windows/win95.html>) boasts an archive of printer drivers and updates for many brands.

Other corporate sites include:

- *Microsoft's Knowledge Base* (<http://www.microsoft.com/support>)
- *Hewlett Packard- FAQs*, (<http://www.hp.com/cposupport/eshome.html>) drivers and downloadable fixes
- *Apple's Technical Information Library* (<http://www.support.apple.com>)

## Setting up the Home Office Workspace

The space that you choose to work in is as important as the technical choices you make as part of setting up your telework environment. Remember you may be spending a lot of time in this space so pick something that will be comfortable yet conducive to productive work.

The first step is to once again think about the activities you will be performing while working at home and the equipment that will be used. This will help you visualize the space required as well as help in the creation of a list of furniture you might need. (See Appendix VII. for a Furniture, Equipment and Supply Checklist.)

### Your Space

A room/space of your own is the best case. Having a separate room allows you to set some physical boundaries for your workspace versus personal space. Other members of the household may be less likely to interrupt when they know you are working "in the office." Oftentimes, telecommuters use a guest bedroom as their office. Of course, it's not always possible to designate a separate room of the house as an office. Maybe there is a large walk in closet or a hallway area that can be retrofitted to accommodate your needs. If you simply can't think of an area for a permanent home office, some furniture companies are building portable workstations that fold up and can be rolled out of the way when not in use.

### A Word about Lighting

The mood of your office will depend in part on the lighting you choose. Make sure you have light that provides sufficient illumination during the day

and at night. Be aware that light shining behind or directly into a computer monitor can cause glare and eyestrain. Skylights and windows can create enough glare to make it impossible to read the computer screen.

### The Cost of Furniture

The furniture you choose doesn't have to be expensive, in fact many people make their own desks or bookshelves. A piece of plywood raised up with bricks, boards, or blocks can be used as a desk. You can use a similar idea for building bookshelves using 2x6 boards. Cardboard boxes make inexpensive filing/storage cabinets.

Another source for inexpensive furniture is thrift stores or flea markets. Occasionally the classified section may list office liquidation sales.

### Think Ergonomically

When it comes to choosing your chair, you may want to spend a little more money and make sure that it has a comfortable ergonomic design. It is worth it. Long hours at a desk can be painful if the chair does not provide the proper support. Remember, to work effectively you need to be comfortable. This also applies to the height of your keyboard. An attachment can be used to allow you to set your keyboard to the most comfortable level for typing so that you don't incur carpal tunnel syndrome or other repetitive stress problems.

## Chapter Eight

# A Corporate View of Telework Technology

## Communications Technologies Available:

Analog Modems

ISDN

Frame Relay

Leased Lines

Cable Modem

DSL

Wireless

## Remote Communications in the Corporation

### Telecomputing Trends

Information available anytime, anywhere. This has become the battle cry of the beleaguered masses of workers in today's information-based society. A mother or father tries to balance work and parenting by working from home a few days each week. A busy executive needs a file from one of his/her corporate file servers while on an airplane. Around the clock, corporate workers are depending upon remote access to information from hotel rooms, from their cars via cellular phones, or from home.

Telecommuting is on the rise. It involves partial or total substitution of telecommunications technology for the commute to and from the primary workplace. Computers, fax, advanced communications links, and dial-up access are enabling this new work paradigm.

### Analog Modems

A modem is a device or program that enables a computer to transmit data over telephone lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms. Fortunately, there is one standard interface for connecting external modems to computers called RS-232. Consequently, any external modem can be attached

to any computer that has an RS-232 port, which almost all personal computers have. There are also modems that come as an expansion board that you can insert into a vacant expansion slot in your computer. These are sometimes called onboard or internal modems and are more machine specific. Many new computers come equipped with fax/modem cards installed.

While the modem interfaces are standardized, a number of different protocols for formatting data to be transmitted over telephone lines exist. Some, like CCITT V.34, are official standards, while private companies have developed others. Most modems have built-in support for the more common protocols – at slow data transmission speeds at least, most modems can communicate with each other. At high transmission speeds, however, the protocols are less standardized.

Aside from the transmission protocols that they support, the following characteristics distinguish one modem from another:

*bps*

How fast the modem can transmit and receive data. At slow rates, modems are measured in terms of baud rates. The slowest rate is 300 baud (about 25 cps). At higher speeds, modems are measured in terms of bits per second (bps). The fastest modems run at 56,600 bps, although they can achieve even higher data transfer rates by compressing the data. Obviously, the faster the transmission rate, the faster you can send and receive data. Note, however, that you cannot receive data any faster than it is being sent. If, for example, the device sending data to your computer is sending it at 2,400 bps, you must receive it at 2,400 bps. It does not always pay, therefore, to have a very fast modem. In addition, some telephone lines are unable to transmit data reliably at very high rates.

*voice/data*

Many modems have a switch to change between voice and data modes. In data mode, the modem acts like a regular modem. In voice mode, the modem acts like a regular telephone. Modems that have a voice/data switch have a built-in loudspeaker and microphone for voice communication.

Modems are extremely price effective for the subscriber (\$50-\$300), the faster the modem, the higher the price. Since the modem utilizes a traditional dial-up connection, like a telephone call, it is billed in a similar manner. If you are calling a regular 7 or 10 digit telephone number then the normal toll charges would apply. If you are calling an 1-800 or other free telephone number, then that connection would be free.

While well deployed, analog dial-up modems do not provide the higher speeds desired, and almost required, by subscribers today. Because these connections are made over regular analog telephone lines, reliability may also be a problem for some subscribers.

At the other end of this connection the corporate Information Technology (IT) personnel would be responsible for establishing the modem (modem pool) for answering the incoming subscriber calls. Modem pools are expensive to maintain and have capacity issues since there must be a receiving modem for every incoming call. Ever-changing modem speeds and technology place an additional operating load on the IT department.

## ISDN

ISDN is an abbreviation of Integrated Services Digital Network, an international communications standard for sending voice, video, and data digitally over telephone lines. ISDN utilizes the copper pair already deployed to homes by the telephone companies and supports data transfer rates of 64 Kbps (64,000 bits per second) on each channel. Most ISDN lines offered by telephone companies give you two lines at once, called B channels. You can use one line for voice and the other for data, or you can use both lines for data to give you data rates up to 128 Kbps, faster than the data rate provided by most modems. Since the line is digital, the data is transferred more accurately.

Because ISDN has the ability to transfer voice and/or data, several companies sell call management equipment that manages all of your data and voice needs on the one ISDN line. This gives telecommuters more efficient use of the telecommunications services coming into the home and alleviates the need for a second voice line or the use of the home telephone for calling. Regardless of the application, ISDN requires special equipment called an NT-1 and a Terminal Adapter. Unlike other telecommunications services, it is locally powered so you must provide a power supply. Most ISDN equipment vendors today are packaging all of the necessary components together.

The original version of ISDN employs baseband transmission. Another version, called B-ISDN or Primary Rate ISDN, uses broadband transmission and is able to support transmission rates of 1.5 million bits per second. B-ISDN requires fiber optic cables and is not widely available for home use but is becoming increasingly popular for access to corporate hosts or ISPs.

## Breaking the Speed Limit:56-Kbps Modems versus ISDN

Performance of 56-Kbps technologies is highly dependent upon the physical condition of the phone lines. If you live in an older neighborhood, you may achieve well under this 56-Kbs theoretical maximum rate—possibly achieving only between 28.8 Kbps and 33.3 Kbps.

In addition to analog modem technology (like the 56 Kbps), consumers in many areas can choose to use ISDN services from their phone company. Integrated Services Digital Network (ISDN) converts voice, video, or computer networking services to a digital form all using the same physical connection. The data on ISDN is digital (that is, converted to databits in ones and zeroes) and is not using modulated analog carrier wave signals like consumer-brand modems. This translates to increased bandwidth and efficiency.

ISDN services offer a more reliable connection, greater speed, and better performance than their analog modem siblings do—albeit at a stiff price in some areas when you add it all up. If you elect for ISDN service, you will pay for an ISDN modem (called an NT-1/power supply and terminal adapter) (or router), setup fees, monthly service charges, and (in some areas) a by-the-minute usage fee while connected to the service. There is also an issue of availability, since in order to provide ISDN, telcos must make changes in their switching equipment and not every office has been equipped. Some Internet service providers (ISP) charge higher fees for an ISDN connection versus analog.

### Frame Relay

Frame Relay is a packet-switching protocol for connecting devices on a Wide Area Network (WAN). Frame Relay networks support data rates from 56kbps up to 1.544 Mbps (1.5 million bits per second). In fact, you can think of Frame Relay as a way of utilizing existing T-1 lines owned by a service provider. In order to enable connectivity, you must connect to a Frame Relay line using a piece of equipment called a FRAD. Frame Relay is a four-wire service therefore, deploying it to the home environment may involve additional trenching if the entrance facility bringing cable from the street is buried and there is no spare capacity. Typically there is a charge for adding facilities and the trenching. Frame Relay is a data only service at present.

### Leased Lines, Cable Modems and DSL

#### *Leased Lines*

If you need continuous, high-speed Internet access but aren't willing to pay several thousand dollars a month for it, buy ISDN. But if you have the budget and want all the possible bandwidth, all the time, then consider using a leased line to access the Internet. This technology offers the highest quality and the fastest connection. If your company leases lines for voice calls among branch offices, you may already have most of the infrastructure you need to make that connection. You'll just need to purchase a separate line to run between your headquarters and a local ISP.

Leased lines are dedicated, 24-hour-a-day circuits that the phone company runs directly from your door to your ISP's point of presence (POP). You can use them to send voice or data between two points. There are several flavors of leased lines, and they handle data rates from 56 Kbps up to 45 Mbps. Some leased lines consist of fiber-optic cabling, though they can be copper if the distance between you and the ISP's POP is under (roughly) 3.5 miles. If you want to run Web and mail servers that outsiders can access, have a large network with dozens of active Internet users, or upload and download multimegabyte files frequently, leased lines may be the most cost-effective Internet access solution for you. Unlike ISDN, your connection is active full-time—perfect for delivering surfers to your Web site. Unlike satellites, DSL and cable modems, you get the same bandwidth in both directions.

One of the advantages of leased lines is that you don't have to install any applications other than the TCP/IP protocols and Internet applications on each desktop. As far as each client computer is concerned, the Internet is a local-area resource. Once connected via a leased line, you don't have to worry about "dialing" into the Internet; it becomes a natural extension of the local-area network. You do have to connect to the leased line with a piece of hardware called a CSU/DSU. Like Frame Relay, Dedicated Lines are four-wire services meaning that entrance facilities may need to be added if they are deployed in the home environment. If the entrance facilities to the home are underground, there is generally a charge for trenching and augmenting the cable facilities.

### *Cable Modems*

Some people are tuning into the Internet Channel on their TV. Of all the high-speed Internet access solutions, cable TV systems are probably the most talked about. That's partly because they leverage existing broadband cable TV networks and partly because they promise to deliver high-speed access at an affordable price.

Internet access via cable won't be widespread for about five years. Although cable modems are available today, to date they have been primarily deployed in trials, not commercially. To reach the mainstream, cable operators face an uphill battle. Like phone companies offering ISDN service, cable operators must gain expertise in data communications if they're going to win, and keep, customers.

There are considerable technical hurdles: While satellites are only one-way devices, cable modems can work in both directions if cable operators make their one-way networks interactive. Once that's accomplished, the technology could offer the best price/performance combination of any Internet access method to date, delivering close to 10-Mbps speeds at less than \$50 per month—about twice the cost/performance factor of ISDN access.

Today, making the cable-to-PC connection requires a cable modem to modulate and demodulate the cable signal into a stream of data. The similarity with analog modems ends there. Cable modems also incorporate a tuner (to separate the data signal from the rest of the broadcast stream); parts from network adapters, bridges, and routers (to connect to multiple computers); network-management software agents (so the cable company can control and monitor its operations); and encryption devices (so your data isn't intercepted or sent someplace else by mistake).

Each cable modem has an Ethernet port that connects to the computer (or network) on one side and to the cable connection on the other. You install an Ethernet adapter in the PC, then connect it to the cable's Ethernet port via a standard RJ-45 connector; you configure the PC with standard TCP/IP software. As far as your PC is concerned, it's hooked directly to the Internet via an Ethernet cable. There are no phone numbers to dial and no limitations on serial-port throughput (as is the case with ISDN modems). What you do get is lots of speed: Downlinks vary from 500 Kbps to 30

Mbps, while uplinks can, potentially, range from 96 Kbps to 10 Mbps.

### *xDSL*

Digital Subscriber Line or DSL technology comes in a number of implementations and is viewed as having tremendous potential to deliver high-speed access to the home for an affordable rate. Like ISDN, DSL technology utilizes the copper telephone lines already deployed by local telephone companies. By adding equipment in the telephone company's switching office and at the home location the DSL line can deliver higher bandwidth data applications and in some implementations, voice communication as well. ADSL delivers asymmetrical data rates (i.e. more downstream than upstream) and other DSL technologies deliver symmetrical data. In California, Pacific Bell, General Telephone, and Covad Communications have ADSL offerings.

DSL is a technology that new telephone companies called Competitive Local Exchange Companies (CLECs) are investing in to open up the local telecommunications market to competition. By leasing parts of the existing telephone network, such as the line, and systems service components from the Local Exchange Carrier (LEC) and adding their own DSL equipment, CLECs are hoping to capture a portion of the growing Internet Access/Telecommuting market. Expect both your Local Exchange Carrier (former Bell company) as well as these new providers to offer different flavors of DSL offerings. Different flavors have different capabilities and some have relatively limited distance capability.

Because DSL technology utilizes existing telephone lines, it has the potential to be deployed more quickly than cable modem technology and more cost effectively for the user than traditional leased data lines.

### *Wireless*

Microwave Multipoint Distribution System or MMDS is not in itself new. It is based on free-space radio communication and designed (from a system perspective) to serve as distribution mechanisms, i.e. for access networks providing video, data or telephony to end users.

MMDS has in its basic form been around since the early 1980s, with limited area TV distribution as its main application. Back then, the first "M" of

MMDS "Microwave", related to the radio frequency band used, i.e., between 2 and 3 GHz. MMDS has until now been a one-way local broadcast system, using analog modulation (AM-VSB) on channels 6 MHz wide. According to (US) FCC rules, 33 such channels have been defined, most of them between 2.50 and 2.69 GHz.

In the San Francisco Bay Area, MMDS Internet access at high speeds is available through leading ISPs who are partnering with a locally based firm, Wavepath. As of the publication of this guide, two transmit/receive sites are in place, at San Bruno Mountain near San Francisco and Monument Peak overlooking the Silicon Valley. Advantages cited for this MMDS technology by providers are a cost effective delivery method and its wide spread coverage. The installation at the end user site is simple and there is no time consuming, costly wiring or other infrastructure to put into place. MMDS boasts very low latency and supports video conferencing, and other applications critical to teleworking and corporation LAN use.

### Technology-Related Factors Significant to Telecommuting on a Corporate Scale

#### *Equipment*

Practical arrangements for equipment need to be made between the company and the employee prior to implementation of the program. How much premium equipment (hardware, software, printers, etc.) will be needed? What company-owned equipment can be loaned without inconvenience to the office-based workers?

In order to implement a well-managed and effective program, you must seriously assess the quality of the equipment provided to telecommuters, and ensure that the equipment is appropriate to the needs of the job and the individual telecommuter. Many employers have run into trouble in this area by providing "surplus" equipment to telecommuters, i.e., equipment considered obsolete for in-office use, or discarded after in-office workers upgrade to a new system. In order for telecommuters to be as productive as they would be in the office, they need to use equipment and software that is as high quality and up-to-date as they would use in the office. In the current environment, employers are finding that providing laptop computers is a good

solution for any employee who needs mobility or remote access. This is also a good solution in order to avoid duplication of equipment at home and increased cost of such duplication. Many telecommuters and virtual workers have only a laptop, with a docking station at the work location, instead of a desktop system at work and a similar system at home.

#### *Desktop Standardization*

As employees become more mobile and access to the company network becomes more critical, companies are finding that in order to manage effectively, there must be company-wide standards for equipment and software. This is especially important for mobile workers, who may need to access the network from home, from a satellite office, from a co-worker's office, or from a company-supported hoteling area. For instance, the mobile worker, carrying a laptop, needs to find a docking station compatible with his or her laptop. If different departments support different brands and types of equipment, valuable time could be wasted searching for a compatible docking station. Standardization contributes to productivity in these situations. Likewise, productivity will be enhanced to the extent that everyone in the company has access to the same "core" set of basic computing software. Individual departments can certainly enhance their available software with the specialized tools they need to do their work, but standards will help to ensure effective information sharing within the company.

#### *Technical Support*

With increased utilization of remote access, technical support must evolve in order to ensure that employees can stay productive. When everyone is on-site, the technical support staff can fix computing problems conveniently with a walk down the hall and a personal visit to the problem computer. However, when the computer and the user are located somewhere else, support issues become more complex. Companies need to explore various ways of addressing the technical support issues that arise as work becomes more mobile, in order to maximize productivity while ensuring that costs stay reasonable. Help desks, user training, and support personnel training are all options to be considered, and the ideal solution will be different for different companies.

### *Security*

Data and network security is a significant issue for companies that provide remote access to sensitive information. This issue takes on added significance when users access company resources through public networks such as the Internet. Simple password and ID is probably the least secure method used. Consider this, PPP connections, which are the primary connection method to a remote access device, send user id and password "in the clear" allowing a hacker to sniff passwords and get in to networks with very little difficulty. Challenge response products, encryption products and more secure protocols have to be employed if true security is to be accomplished. Many of these are implemented in an unobtrusive manner. (See Appendix III. for a Security Policy Checklist)

### *Asset Management*

Implement a tracking system to handle asset management. Telecommuters may have significant amounts of equipment in their homes that need to be accounted for. The Telecommuting Agreement in Appendix II is a useful tool for tracking company-provided assets.

### *Billing*

Set up a system to track equipment charges and line costs so that the appropriate departments can be billed.

### *Using the Internet*

If your company is already connected to the Internet, consider using an Internet service provider as your Telecommuting technology. Many service providers have local access points that allow you to dial into Internet services at the cost of a local phone call. Some Internet providers also supply access to higher speed services such as ISDN or leased lines. Once connected to the local service provider you can use Internet to access your company's computing facilities almost anywhere in the world.

You should also check with the department that supports your Internet and the computing services within your company. Many companies have extensive security precautions (firewalls) between

internal company networks and Internet. These precautions are often necessary because of the tremendous number and variety of users on Internet worldwide. These precautions prevent access to the internal network by Internet. So while it is technically feasible to use Internet for Telecommuting, company policies may not support this option. (See Appendix I. For Voicemail and Email Policy Suggestions)

### *Mobile Workers*

Mobile workers and Telecommuters have many of the same needs and concerns regarding access, security, and productivity. In fact, people who are mobile are extremely likely to be telecommuters, based on our definition - people who are working from home either during or after business hours. Of course, there are differences. If someone is working at home 3-5 days a week, it may be more reasonable to set them up with a more permanent home office including dedicated or ISDN service, etc.

People who are completely mobile need tools that allow them to connect to the office from many different locations where analog phone lines and 14.4/28.8 modems may be the lowest common denominator. Cellular connections offer greater mobility but generally offer somewhat slower speeds. There is a better way than using the mobile version of "Sneaker-Net". With the right Remote Access Software, mobile workers can access the office network or desktop computers to get the latest files, synchronize directories, run applications remotely, and even get support from the helpdesk if they run into a problem. Access can be extremely fast. PcANYWHERE from Symantec, for example, has a feature called speedsend, which transfers only the parts of a file that have changed.

For example, if the mobile user needs to download the latest price and parts list that may be a 10MB file, this could take some time if the transfer were to take place over a 9.6KBPS cellular modem line. However, if only 5 percent of the file actually changed, this capability would provide a fast and accurate file update where only the "delta" records would be transferred over the line.



# Appendix I:

## The Telecommuting Policy

A Telecommuting policy will provide your organization with clear, consistent guidelines. The policy should be broad enough to allow individual work groups to customize it.

It is recommended that the Human Resources Department or Personnel Department steward the development of the policy. A draft policy can be submitted to members of the implementation committee for review and enhancements

Employers should treat telecommuting as any other term and condition of employment. The procedures, which govern the relationship, should be clearly set out in writing. Naturally, the language of a telecommuting policy will vary from employer to employer, depending on the nature of the employer's business. The following items should be addressed in any telecommuting policy, regardless of the employer's particular situation:

- Define telecommuting
- Make it clear that telecommuters are still subject to the Company's employment policies and procedures
- Set out the work hours and days for telecommuters
- Advise telecommuters that the employer retains the right to cancel the telecommuting arrangement at any time, without cause or advance notice
- Assign the telecommuter responsibility for maintaining a safe workplace and an ergonomically correct workstation
- Grant the Company the right to inspect the telecommuter's work area and state when such inspections can occur
- Reaffirm that the employer's workers' compensation insurance applies to telecommuters and require telecommuters to immediately report work-related injuries
- Explain where telecommuters can hold business meetings

- Assign liability for any injuries to third parties which occur in the telecommuting workplace
- Detail what equipment the telecommuter will be using, who will be providing it, who is responsible for maintaining it, where the equipment will be located, who is responsible for loss or damage to the equipment, and for insuring it, and when any Company-owned equipment must be returned to the Company if the employment relationship ends
- Impose upon the telecommuter a duty of confidentiality and set out any procedures telecommuters must follow to ensure that confidentiality
- Require telecommuters to immediately report to the employer any acts of workplace harassment or violence

### Safety

Employees working at home or at remote locations remain protected by state workers' compensation laws, as well as applicable federal and state occupational health and safety regulations. For California employers, the health and safety arena includes the state's newly enacted ergonomics law, which went into effect July 3, 1997.

Employers are legally obligated to provide their employees with a workplace that is free from hazards that might cause serious harm or injury. To meet this obligation, an employer might even need to periodically inspect the telecommuter's "office." If so, personnel policies should clearly set out the hours and days when such inspections can occur, and identify by title or position which company personnel can be expected to make such inspections. As an alternative to site visits, some employers require the employee to provide a clear photo of the area to be used for telecommuting.

An initial inspection at the beginning of the telecommuting relationship might be performed so the employer can identify any unsafe conditions in the workplace, and assist the employee in responding to such conditions. The employer should also impress upon the employee the importance of maintaining a safe workplace and educate the employee with respect to what it will take to do so.

California employers must also consider whether the state's new ergonomics regulation applies to their telecommuters. The regulation requires employers to develop an ergonomics program if two or more employees have experienced a repetitive motion injury within a 12-month period from an identical work activity.

In California, a workers' compensation injury can include any injury arising out of the employment relationship. Employers with a telecommuting workforce run the risk of not knowing if a workers' compensation claim truly resulted from a work-related injury or some other event. Requiring employees to log in and out regularly may help pinpoint whether the activity at issue was work-related or not. Employers should also require employees to report work-related injuries and submit to an immediate workplace inspection. Obtaining an explanation of exactly what occurred at the accident site will enable the employer to fully and fairly investigate claims.

### **Email and Voice Mail Policy Considerations**

For those employers who do not yet have an email/voice mail policy in effect, the "before" policy which follows may seem a bit futuristic. However, this policy is rapidly becoming outdated. Due to the meteoric rise in the popularity and use of the Internet, as well as the recent trend in lawsuits over Internet and email related abuses, a new policy is required. What follows is a sample policy only and does not constitute and is not a substitute for consultation with legal counsel. The law in this area constantly changes and must be reviewed before implementing any policy in this regard. The following sample policy should not be implemented or executed except on the advice of counsel.

### **Sample Policy**

The Company maintains a voice mail system, an electronic-mail (email) system, and numerous Internet-connected terminals to assist in the conduct of business within the Company. These systems, including the equipment and the data stored in the system, are and remain at all times the property of the Company, whether they are located in your home, at a remote location, or in the office. As such, all messages created, sent, received or stored in the system as well as all information and materials downloaded into Company computers are and remain the property of the Company.

Messages must be limited to the conduct of business at the Company. Voice mail, electronic mail, and the Internet may not be used for the conduct of personal business. Employee use of the Internet for reasons unrelated to the Company's business is a violation of this policy unless approved in writing by an authorized manager. The Internet may only be accessed from one of the designated Internet access terminals at the Company.

The Company reserves the right to retrieve and review any message composed, sent, received, or downloaded. (Please note that even when a message is deleted or read, it is still possible to recreate the message; therefore, ultimate privacy of messages cannot be ensured to anyone.) Further, the Company reserves the right to monitor, at any time, your Internet usage including the Web sites that you have accessed, and any information that you may have downloaded. (While voice mail, electronic mail, and Internet may accommodate the use of passwords for security, confidentiality cannot be guaranteed.)

Someone may review messages and downloaded data other than the intended recipient. Moreover, all passwords must be made known to the Company. (The reason for this is simple: your system may need to be accessed by the Company when you are absent.)

Messages and downloaded data may not contain content that may reasonably be considered offensive or disruptive to any employee. Offensive content would include, but would not be limited to, sexual comments or images, racial slurs, gender-specific comments or any comments that would offend someone on the basis of his or her age, sexual orientation, religious or political beliefs, national origin, or disability.

Employees learning of any misuse of the voice mail or electronic mail system or the Internet or violations of this policy shall notify the Company president (or other designated manager) immediately.

# Appendix II: Sample Telecommuting Agreement

I have read and understand the attached Management Telecommuting Policy, and agree to the duties, obligations, responsibilities and conditions for telecommuters described in that document.

I agree that, among other things, I am responsible for establishing specific Telecommuting work hours, furnishing and maintaining my remote work space in a safe manner, employing appropriate Telecommuting security measures and protecting company assets, information, trade secrets, and systems. I also understand and have completed Exhibit A, attached hereto.

I understand that Telecommuting is voluntary and I may stop Telecommuting at any time. I also understand that the company may at any time change any or all of the conditions under which I am permitted to telecommute, or withdraw permission to telecommute.

\_\_\_\_\_

Dated

\_\_\_\_\_

Employee Signature

\_\_\_\_\_

Dated

\_\_\_\_\_

Supervisor Signature

## Exhibit A

### 1. Remote work location:

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
City State Zip Code

- Employee residence
- Company premise

Description of work space at remote work location:  
\_\_\_\_\_

### 2. Telecommuting schedule:

- On a weekly basis as follows: \_\_\_\_\_  
(Regular telecommuting days)
- On a monthly basis as follows: \_\_\_\_\_  
(Regular telecommuting days)
- No regular schedule. Separate permission for each Telecommuting day.

### 3. Regular Telecommuting work hours:

From: \_\_\_\_\_ To: \_\_\_\_\_  
Meal break/other breaks: \_\_\_\_\_

### 4. Company assets to be used at remote work location (if any):

Description	I.D. numbers
_____	
_____	

### 5. Company information systems to be accessed from remote work location (if any).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### 6. Non-company equipment, software, and data to be used at remote work location (if any).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### 7. Other

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Appendix III:

# Telecommuting Security Policy Checklist

Consider the following questions and use them to structure your telecommuting security policy.

### Policy and Guidelines

- Does a remote access security policy exist?
- Is the security policy frequently reviewed and revised to reflect technology changes, outmoded approaches, or new product or service offerings affecting company/customer relationships and system interaction?
- Does the remote access policy specify guidelines for the selection and implementation mechanisms that control access between authorized users and corporate computer and networks?
- Does the remote access policy conform to all existing corporate communications guidelines?
- Does the remote access policy address the physical protection of the communications medium, devices, computers and data storage at the remote site?
- Does the security policy require the classification of the functions, applications and data to determine the levels of security needed to protect the asset?
- Does a policy exist to obtain access to important proprietary information at remote sites?
- Does a policy exist which defines who is responsible in case of theft of hardware, software or data at remote sites?
- Does a policy exist for reporting unauthorized activity?
- Does a policy exist for "appropriate" personal use of company equipment?
- Do remote access users have to sign a form stating they know and understand the remote access policies?
- Is there a formal, complete and tested disaster recovery plan in place for the remote sites?

### Identification & Authorization

- Do the remote access security controls require that users be identified before the requested actions are initiated?
- Does each user have a unique identifier (user ID)?
- Does the corporate site maintain and use authentication data for verifying the identity of a user?
- Can the security controls uniquely identify each remote access user, device and port?
- Are there automatic time-out or lock-screen capabilities on the remote site equipment to control access during periods of non-use?

### Access Control

- Do the remote access security controls limit the unauthorized sharing of users' access rights?
- Does the access control mechanism support the customizing of privileges for each user ID at remote sites?
- Do the remote access security controls protect audit records from unauthorized access?
- Are users provided with last log-in session information?
- Are banners displayed regarding unauthorized usage?
- Are banners displayed regarding the usage of monitoring policy?
- Are there controls to prevent the uploading of unauthorized programs (e.g., virus programs) from remote site equipment to the corporate site?
- Does the remote site have the capability to encrypt sensitive information including authentication information?
- Are users allowed only one remote connection to the corporate network (per user ID or address)?

## Auditing

- Does the remote access security mechanism record alarms and authentication violations as a default?
- Does the audit record for each recorded event identify:
  - Date and time of the event?
  - User or entity?
  - Origin of the event (e.g., network address, originating phone number)?
  - Type of event?
  - Success or failure of the event?
- Is the audit trail information retained long enough to support reviews and analysis by security personnel and to meet corporate policy?
- If dial-up access to the remote site is possible, does the audit mechanism record the details associated with each user access?
- Can the security controls uniquely identify each remote access user, device and port?

## Integrity

- Are there virus-scanning capabilities required on remote sites?
- How often are they updated?
- Is access to public bulletin boards allowed?
- Are there capabilities to perform network and server congestion management in terms of monitoring, detection and enforcement functions?
- Are measures in place to ensure the proper disposal of confidential data (paper, fax, digital, etc.) at remote sites?

## Physical Security

- Are the remote sites in physically secure locations?
- If equipment is stolen, can the perpetrator access proprietary information?
- Is a full physical inventory of remote site equipment and user systems maintained and periodically verified?
- Are backup tapes and media available and secured on-site for remote site equipment?
- Does a policy exist addressing fire, smoke, water and hazardous material contamination damage at a remote site?
- Is all paper data (proprietary, confidential, etc.) physically secure at the remote site?
- Is all computer data (floppies, hard drives, etc.) physically secure at the remote site?

- Is all media destruction (proprietary, confidential, etc.) at the remote site consistent with corporate security policies?
- Is there a process for return of equipment and proprietary data upon termination of employment or necessary company access?
- Does a policy exist for repair of equipment that contains proprietary information?
- Is there insurance for liability and personal injury at the remote site?

## Security Administration

- Are organizational responsibilities for remote access security defined?
- Is there a remote access security administrator?
- Is security a part of the defined responsibilities for the personnel who monitor, maintain and control various remote site equipment?
- Is there a process for authorizing new remote users, authorizing and updating remote user access capabilities, and deleting access when no longer needed?
- Are there periodic reviews of remote user privileges to ensure that capabilities remain commensurate with job functions?
- Do security event triggers generate alarms to provide administrator notification?
- Are security alarms properly categorized in terms of severity?
- Are the triggers modifiable by the administrator?
- Do the remote access security controls permit only authorized users (administrators) to grant access privileges to remote site equipment for new, authorized users?
- Do the remote access security controls allow network devices to be isolated when there is a compromise?
- Are there defined administrator responsibilities to isolate a compromised device?
- Do the remote access security controls include test, detecting and reporting communication errors (e. g., high retransmission rate)?
- Is there a way to prevent bypass of the audit and alarm mechanisms by resetting remote access devices to invoke an insecure default configuration?
- Is periodic testing for unauthorized access, denial of service or other security weaknesses performed?
- Is there a defined practice of reviewing audit information on a periodic basis?
- Are there reporting capabilities to provide information on user profiles and access rules?

- Are there adequate controls to restrict access to and use of network troubleshooting equipment (e.g., protocol analyzer)?
- Are there adequate controls to restrict access to and the use of network management software tools?
- Is there a capability to force re-authentication after the server has been unavailable?
- Is there a capability to force sign-off and prevent sign-on during system maintenance?
- Is there the means to run scheduled unattended backups of the remote site equipment?
- Are all security functions and software changes made only by an authorized administrator?
- Is there a way to ensure that only authorized legally acquired software (e.g., applications, and tools) are installed and used on remote site equipment?
- Are backup copies of authorized software and documentation available?
- Are purchasing records and other proof of licensing requirements for software properly maintained?

### Architecture and Topology

- Is there network equipment in place that can separate traffic according to user communities?
- Is the remote access equipment interconnected with less trusted or untrusted (e.g., Internet) networks?
- In a multiple remote site environment, are all sites maintained at the same security level?
- Are the remote access physical topology and network maps documented, verified and kept up to date?

### Education/Awareness/Enforcement

- Are users aware of the signs of a virus or worm?
- Are users familiar with the use of virus scanners?
- Are users aware of the dangers of software engineering?
- Are users aware of the remote access security policies?
- Do remote access users and their managers receive security training prior to using remote access?
- Do remote access users and their managers receive annual security training?

### Modem Access

- Is there a single point of entry into the network, i.e., modem pool or terminal server?
- Are all modem phone numbers unlisted?
- Is dial-out allowed at the corporate site?
- Do modems exist on individual corporate site systems?
- Is auto-answer on dial-in access allowed at remote sites?

The approaches, principles and ideas expressed in this Checklist are merely recommendations to assist the reader and the reader's organization in establishing plans for dealing with information security. This Checklist is not a statement of rules or regulations, nor will following it ensure compliance with any federal, state or local codes or regulations. Specific issues should be addressed to the appropriate federal, state, local agency, or risk management personnel.

## Appendix IV: Digital Data Communications Services

Unlike Plain Old Telephone Service (POTS), these services have been designed to transmit digital data signals over and between networks. The costs vary depending on speed, technology and service provider. Their applicability to telecommuting depends on the needs of the telecommuter and the willingness to pay. Some services are more appropriate for the host or corporate side of telecommuting. Other services, such as ADSL or cable modems are relatively new and not yet widely deployed. All of these services require additional hardware be connected to the line.

### Switched 56

Switched 56 is a digital, symmetrical, 56Kb/s dial-up alternative to leased lines or analog services. Pricing structure is similar to regular phone service, a flat monthly charge plus usage with time-of-day discounts. Primary applications for Switched 56 are similar to those for ISDN, Telecommuting, screen sharing, desk-top video conferencing, large file transfer and Internet access.

### ISDN

ISDN uses the transmission capability of existing copper wires, allowing for the simultaneous transmission of voice and data over a single connection. It offers 128 Kbps of symmetrical data transmission when both channels are utilized. ISDN calls are usually (in USA) charged by the minute, even for local calls, but this varies from state to state. Its applications include: remote access to LAN, screen sharing, desktop video conferencing, large file transfer and Internet access.

### Dedicated Lines

Dedicated Digital Service (DDS) lines have a variety of product names and are basically a digital, private line, data transport service. Uses include

LAN-to-LAN interconnection, Telecommuting, point-of-sale transactions and video-conferencing. Also, it has the advantage of being a flat-rate service. There is no usage or toll charge associated with this type of service, only a recurring monthly charge plus a fixed mileage charge from your “home” telephone office to the telephone office connecting to the host location. This is especially important for telecommuters who live a considerable distance from their host or main office location. Dedicated lines are available from the telephone companies and range from 56 kbps to 45 mbps.

### Frame Relay

Frame Relay is a fast-packet switching technology that offers the benefits of private lines and shared network products. For smaller businesses with expanding networks, Frame Relay offers cost-effective advantages in the areas of LAN interconnection, Internet access and SNA network transport.

Frame relay connects over Permanent Virtual Circuits (PVCs) rather than physical circuits. At each end of a PVC there is a physical circuit; but unlike a leased line, this physical circuit only runs from the customer site to the service provider's frame relay network access point. From that point on, the service provider network is a mesh of physical switches and fiber lines that statistically multiplexes data from multiple PVCs over the same infrastructure, making better use of resources and lowering costs to the customer. With dedicated lines, to connect four sites you need at least three leased lines at each site to communicate with the others. This would add up to 12 leased lines per month without the ability to share either ports and bandwidth. Installing Frame Relay at the same four sites would mean a company only needs six lines. Costs for network equipment such as routers and modems would also drop, because half as many port connections would be needed.



Computer data applications require lots of bandwidth for very brief intervals, leaving dedicated lines idle much of the time. Frame relay switches multiplex data on shared lines asynchronously. Rather than giving each end user a fixed time-slice of the line, each is allowed to attempt to transmit whenever it needs to, at a burst rate much higher than would be feasible with a synchronous time-slice.

## ADSL

ADSL started out as the telephone company's way to compete with cable TV by delivering both TV and phone service on your plain old copper phone line. It offers the promise of high-speed transmissions yet allows the phone companies to use the copper wiring that already connects to each home. Now it's also a good candidate for high speed Internet access and remote LAN access. Because ADSL works over a pair of ordinary phone wires, you can use your existing analog phones and maintain a high-speed data connection at the same time.

The "A" stands for "Asymmetric", meaning the telephone service provider can send lots of data to you, but you can't send much to them. Originally, an uplink of 16 or 64kbps was supported; recent flavors of ADSL support up to ten times that much. To do this, ADSL carries three separate frequency channels over the same line. The first set of frequencies carries plain old telephone system (POTS) conversations. Another series of frequencies transmits a 16- to 640-Kbps data signal (different products use different speeds) that carries information upstream from your home to the Internet. Like ISDN, this is a digital signal; but unlike ISDN, each channel goes in only one direction. The third signal is a high-speed downstream connection, which can run anywhere from T1 speeds, 1.5 Mbps, on up to 9 Mbps.

ADSL is one member of a continuum of last-mile transport systems called DSL, or Digital Subscriber Line, which can carry about 1 to 6 megabits/sec over copper lines. It does not include any way to make long distance data calls, or even local calls. ADSL was originally designed so you still can use it as a regular phone line when the power goes out, which is a big improvement over BRI ISDN. To use ADSL, you'll need an external ADSL modem; there will also be one in the phone company's central office. While ADSL modems are still being developed, one model has three connectors on the

back of the unit: One goes to the wall jack and then out to the phone company; one is for a standard RJ-11 phone jack for analog phone service; and one is an Ethernet twisted-pair RJ-45 connector that hooks the ADSL modem to your computer equipment.

This means that once you install an ADSL modem, you won't need special interface electronics to run your analog phones. That's a big plus, one that could speed ADSL's adoption as a single solution for home PC users and small businesses that don't want to install and pay for an extra data line. Also, most home PCs are located near phone wall jacks, which will make ADSL easier to install than cable modems.

## SMDS

SMDS (Switched Multimegabit Data Service) is similar in capability to ATM switching technology, but provides users with a scaled approach when purchasing high-bandwidth services. It provides an excellent migration path to ATM services as a business' application requirements increase. Its uses include high-speed LAN interconnection, computer-aided design, imaging and multimedia authoring.

## Cable Modems

Cable TV is another technology looking to be the Internet access method of choice. To accomplish this, the cable system operators must upgrade their wiring plants to enable two-way communications. Cable modems come in all varieties, with uplink speeds from 99.6 Kbps to 10 Mbps and downlink speeds from 500 Kbps to 10 Mbps. The maximum downstream speed is limited by the connection via Ethernet to the PC. While the technology is still in development, monthly prices of around \$50 and low initial hardware costs are being widely touted

Straight comparisons of cable modem and ISDN Internet access services are difficult to make for a few reasons. First, ISDN Internet access fees typically include the basic line costs for voice calls; cable modem services don't cover switched voice traffic. Second, cost-per-bit comparisons are virtually impossible. Cable modem service is based on a shared network topology, which means the amount of bandwidth available to a customer depends on traffic volumes at any given time. In contrast, ISDN basic-rate service delivers 128 kbit/s of dedicated bandwidth to customers. Cable providers contend that their shared networks operate as fast

as 10 Mbit/s, which should give customers at least as much bandwidth as basic-rate ISDN under normal traffic loads.

Another fundamental difference in the pricing of cable modems and ISDN concerns equipment. Cable companies typically include the cost of leasing a cable modem in their monthly fees. With ISDN, subscribers have to buy their own connection equipment in the form of an ISDN terminal adapter. One cost that cable modem service subscribers have to bear that ISDN customers do not is the price of a network card and software.

### Satellite Service

Today, there's only one widely available satellite system, from Hughes Network Systems. It requires a dial-in line to transmit data at 28.8 Kbps, but it receives at around 200 Kbps — good for downloading huge files, but overkill for reading email interactively.

The basic kit includes a two-foot- or three-foot-wide dish, mounting hardware, an ISA adapter card, and manuals. You supply the modem, an analog phone line, and the RG-6 coaxial cabling that connects the dish to your computer (which should be less than 150 feet away).

Why do you need the analog line and modem? The satellite dish is a non-powered receiver: It can't transmit information back to the Internet. So every time you type at the keyboard, your modem needs to dial your ISP and send that information back to the Internet. The information you requested is then relayed via the satellite back to your computer.

The monthly charges for this service vary depending on the amount of data you download. Then add in the monthly dial-in access fees and telephone charges to your local ISP. The costs depend on where you live and the cost of the call to your ISP.

The connection between the dish and the PC is straightforward. The coaxial cable connects directly to an ISA adapter card, which is set up like a network adapter card.

### Wireless Service

Wireless access service provides portable, two-way access to email, corporate host resources, collaborative GroupWare, as well as Internet service providers. One provider utilizes a frequency-hopping technology based on a spread spectrum network first created for military security. This MCDN (Micro Cellular Data Network) does not require costly tower-based infrastructures. Advanced intelligence is embedded throughout the secure network, and can be expanded by adding toaster-sized radios on pole tops and buildings. This MCDN technology is a major factor in keeping costs reasonable in comparison to cellular telephone service.

Another wireless service using MMDS (Microwave Multipoint Distribution System) also delivers high speed data access to the Internet and corporate Intranets.

In the San Francisco Bay Area, a service called "iSpeed" is offered by Wavepath, a subsidiary of Le Groupe Videotron. "iSpeed" is designed to easily reach teleworkers, small businesses, and home offices throughout the service area. Subscribers are offered speeds faster than ISDN and DSL and the benefits of quick and easy installations.

An MMDS customer is connected to the Internet Point of Presence through a special, constant wireless connection.

Requests for information are sent from the PC, Mac or LAN through a conventional 10BaseT Ethernet link to a special modem. The modem then forwards the request to a digital transceiver (transmitter/receiver antenna) at the customer's location. Next, the request is transmitted through the airwaves over the MMDS private spectrum to transceiving tower sites, and routed to the POP.

The data is then retrieved from the Internet over a high-speed backbone connection.

The information is then sent back, from the transceiver over private, dedicated frequencies to the digital transceiver installed at the customer's location. The transceiver downloads the data to the special modem, passes the information to the PC, Mac or LAN.

A high speed download service with an analog telephone return, similar to satellite service, is also available in many markets.

#### *Equipment Needed*

The equipment required for MMDS based wireless Internet access consists of a small, unobtrusive transceiver which is mounted to the exterior of your home or office building. Coaxial cable is then installed to computer or LAN location. A special modem connects to the coaxial cable and to the LAN or computer through a 10BaseT Ethernet connection.

Computer requirements are Win 95 or OS7.1 or later, 8M RAM, and an Ethernet connection.

## Appendix V: Glossary of Common Terms

This glossary contains terms frequently used in the discussion of data communications, computers, computer networking and the Internet. It is not all-inclusive.

*10Base-T* – 10 Mbps Ethernet running over unshielded twisted pair copper cabling

*100 Base T* – 100 Mbps Fast Ethernet

*ASCII* (American Standard Code for Information Interchange) – It is a way of representing ordinary text as a stream of binary numbers. A code set of 128 characters. The first 32 characters are control codes & the remaining 96 are upper & lower case letters, numbers & special characters.

*ASCII Text File* – The most common File Format found on PC's. They are basically text files, which contain no formatting information at all. They do not require special programs to access them.

*Back Up* – A Back up is a duplicate copy of some data or a disk or some software that is made by the user as a safeguard against the loss of the original information. Should this happen then the information can be recovered by restoring or copying the information from the backup.

*Bandwidth* – Bandwidth is basically the maximum speed at which data can be transmitted between computers in a network.

*Baseband* – All communications are in digital form and share the use of a single cable. One signal is transmitted over the cable at a time.

*Bit* – A bit is the smallest unit of information understood by a computer. A bit can take a value of 0 or 1. A byte is made up of 8 bits which is large enough to contain a single character. For example the character 2 would be equivalent to

"00000010" when represented in bits. A Kilobyte is equivalent to 1024 bytes. A Megabyte is equivalent to 1024 Kilobytes. A Gigabyte is equivalent to 1024 Megabytes. A Megabit is 1048576 bits.

*Bridge* – Connects two LANs of the same type and provides a boundary that localizes LAN traffic.

*Broadband* – Signals may be either analog, such as used in broadcast television, or digital. Multiple signals use the same wire simultaneously.

*Browser* – Short for Web Browser; it's the tool (program) that allows you to surf the web. The most popular Web Browsers right now are Netscape Navigator and Internet Explorer.

*CLEC* (Competitive Local Exchange Carrier) – Used to reference new communications companies that are entering the local telecommunications market to compete with the incumbent Local Exchange Carriers as a result of opportunities created by the Telecommunications Act of 1996.

*Cable Modem* – External PC device that receives cable signals. Cable modems do more than modulate the signal. They include pieces of routers and hubs, and they run network-management and diagnostic software.

*Category 5 Wiring* – Twisted pair, unshielded copper cabling used to connect Local Area Networks.

*Chat Room* – A place on the Internet where people go to "chat" with other people in the room. There are many of these Chat Rooms. The rooms are usually organized by topic. For example in a Michigan Room you would expect that most of the participants in the room are probably from Michigan. When you're in a Chat Room you can view all of the conversations taking place at once on your screen. You can also get into a private chat room where only you and one or two others may talk.

*Client Server* – Client/Server distributes the processing of a Computer Application between two computers, the Client and the Server - the principle being to exploit the power of each. The Client is normally a PC. The application program will access data and perform processing on the server and using the data obtained via the server more processing tasks will be performed on the Client. The Application can be used by more than one user.

*Cookie* – A file that is written to your Hard Disk when you access certain Web Pages. The file contains certain information, often information that you entered when you displayed the page.

*Counter* – A number on many web pages that will count the number of hits. Basically it counts the number of people that have visited that page.

*Cyberspace* – Term used to describe the Internet; science-fiction novelist William Gibson in his book, *Neuromancer*, published in 1984 coined the term.

*DSU/CSU* (Data Service Unit/Channel Service Unit) – A device that terminates the digital line at the customer premises; the phone company uses it to diagnose the line and other technical chores.

*DDS* (Digital Data Service) – An umbrella term for digital connections available from the phone company, including Switched 56, T1, and T3 lines.

*DNS* (Domain Name System) – How the Internet links together thousands of Networks. The DNS is utilized whenever you send an Email or access a particular Web Page. Each computer on the Internet has a one or more Domain Names. Standard conventions used in Domain Names include:

- ac - Educational institution
- co - Commercial organization
- com - Commercial organization
- edu - Educational institution
- gov - Non military government organizations
- int - International Organizations
- mil - Military government organizations
- net - Networks
- org - non profit organization

These DNS convert the Domain Names to a unique number known as an IP address (the IP stands for Internet Protocol). You will often see the IP address displayed by your Web Browser when you are connecting to a particular computer.

*DSL* (Digital Subscriber Line) – A continuum of last-mile transport systems called DSL which can carry 1 to 6 Mbps over existing copper lines.

*Download* – The transfer of information from the Internet to your computer. Every time you instruct your computer system to retrieve your mail, you are downloading your mail to your computer. You may also download programs to your computer. However, be careful about downloading files or programs from a site in which you are not familiar. You could download a virus and never know it until it's too late.

*Email* – Electronic-mail. This tool is usually provided by your ISP. It allows you to send and receive mail (messages) over the Internet.

*FAQ* – FAQ is exactly what it sounds like: Frequently Asked Questions, with the answers of course. FAQ usually serves as a mini-help file.

*FRAD* – A device used to interface with Frame Relay lines.

*FTP* (File Transfer Protocol) – The tool used to transfer files through the Internet from one computer to another. For example, you would use an FTP to upload your web page from where you built it (like your computer at home) to a web site.

*GIF* (Graphics Interchange Format) – The most common type of image file used on the Internet. These files are compressed so they take up the minimum amount of space and can therefore be downloaded a lot quicker than other graphics file. GIF files are typically used for backgrounds, displaying banners, advertisements and buttons. The files unlike other graphical file types are limited to 256 colors. GIF Files are stored in a number of different formats. The interlaced versions are designed to allow the image to be gradually revealed as it is downloaded. GIF Files can also be: Animated - gives the impression of a video or Transparent - Blends in with the background

*Gopher* – Invented at the University of Minnesota and named after its mascot, this is the direct precursor, in both concept and function, to the World Wide Web.

*HTML* (*Hypertext Mark-up Language*) – HTML is not really a programming language, but a way to format text by placing marks around the text. For example HTML allows you to make a word bold

or underline it. Early word processing programs used to work this way. HTML is the foundation for most web pages.

*http* (Hypertext Transfer Protocol) – A protocol that tells computers how to communicate with each other. You will notice most web page locations begin with "http://"

*Host* – The computer on which a web site is physically located.

*Hoteling* – A bank of workspaces at the company location for employees who need a workspace for a limited, temporary time.

*Hub* – Provides a means to create group-oriented networks supporting one or more network segments and providing an easy interface to inter-networking devices.

*IEC* (Inter Exchange Carrier) – Used in reference to companies that provided services Interstate or between Local Access and Transport Areas (LATAs) following the AT&T Divestiture Agreement in 1984. Major IECs include AT&T, SPRINT & MCI.

*IIOP IMAP4* (Interactive Mail Access Protocol) – The intent of the Version 4 (IMAP4) is to allow a workstation, personal computer, or similar small machine to access electronic mail from a mailbox server. Since the distinction between personal computers and workstations is blurring over time, it is desirable to have a single solution that addresses the need in a general fashion. IMAP4 is the "glue" of a distributed electronic mail system consisting of a family of client and server implementations on a wide variety of platforms, from small single-tasking personal computing engines to complex multi-user timesharing systems. Although different in many ways from the Post Office Protocols (POP2 and POP3, hereafter referred to collectively as "POP") IMAP4 may be thought of as a functional superset of these.

*IRC* (Internet Relay Chat) – A system which allows users to talk to each other in real time (rather than after a delay).

*ISDN* (Integrated Services Digital Network) – A fast, digital, data communications line that can be provided by most telephone companies. To be able to reap the benefits you will need to add a spe-

cial card to your PC or attach an external device and your Internet Service Provider must be able to provide an ISDN connection. You will also need an NT-1 and Power Supply. (See NT-1)

*ISP* (Internet Service Provider) – This is your connection to the Internet. You use an ISP to connect onto the Internet every time you log on.

*Icon* – An Icon is a small picture which is displayed on the screen. It is intended to depict pictorially a task. By clicking the icon with the mouse will invoke the task. It is an essential component of a Graphical User Interface. Examples include:

- A folder with a magnifying glass to depict Windows Explorer
- A book with a question mark to depict a help file
- A blue notepad to depict Windows Notepad

*Internet* – Originally called ARPANET after the Advanced Research Projects Agency of the U.S. Department of Defense. This electronic network connects the hosts together so that you may go from one web page to another efficiently. The electronic connection began as a government experiment in 1969 with four computers connected together over phone lines. By 1972, universities also had access to what was by then called the Internet.

*Intranet* – An internal or Company Internet that can be used by anyone who is directly connected to the companies computer network

*Java* – A programming language that developers use to create applets, small programs that are embedded in Web pages and that run when a user accesses the page or clicks on a certain area. If you have visited sites that play sounds, have animated figures trotting across the screen, or display scrolling text, you have already seen Java.

*Keyword* – A word you might use to search for a Web site.

*LAN* (Local Area Network) – A group of PC's, other Computers & Peripheral Devices which are linked together where each device is located in close proximity to all the other devices. LANs typically consist of a number of PC's, shared printers & Shared Directories & Files.

*LDAP* (Lightweight Directory Access Protocol) – Is Netscape’s strategic directory protocol. It defines a simple mechanism for Internet clients to query and manage an arbitrary database of hierarchical attribute/value pairs over a TCP/IP connection.

*LEC* (Local Exchange Carrier) – Refers to the Local Telephone Companies that provide telephone and data communications services under a local franchise. Most often used in reference to the Regional Bell Operating Companies (RBOCs) but also applies to some Independent Telephone Companies such as General Telephone.

*LATA* (Local Access and Transport Area) – An arbitrary boundary created by regulators to distinguish where services would be provided by the RBOCs and the IECs as a means of dividing the telecommunications marketplace as part of the AT&T Divestiture Agreement.

*Laptop* (also called a Notebook) – A computer small enough to sit on your lap.

*Link* – A link will transport you from one Internet site to another with just a click of your mouse. Links can be text or graphic and are recognizable once you know what to look for. Text links usually will be underlined and often a different color than the rest of the text on your screen. A graphic link usually has a frame around it.

*Load* – Short for download and upload. If someone asks “how long did the page take to load” he/she is referring to the time it takes a page to appear on your screen. If a web page is loading slowly it means that it’s taking a long time to fully appear on your screen. You can often scroll through a page and look at the parts that have loaded while the rest of the page continues to load. Also, you can usually click a link on the page you are loading and link to another page without waiting for the current page to fully load.

*Location* – An Internet address. While you are in your browser, you will see a section at the top of the page that is titled “location”. If you type in the address of someone’s web page and hit enter, your browser will take you to that page. However the address you type in the location bar must be an exact match.

*MIME* (Multipurpose Internet Mail Extension) – Used to send anything other than straight text through email. Many email programs support MIME.

*Megahertz* – The measure of how fast a Chip can work.

*Memory* – Chips which hold information that is connected directly to the Processor. There are two types of Memory Chip:

1. RAM - Random Access Memory is a storage area which the processor uses to execute Programs and hold Data. Information is put into RAM and held there. Once the RAM becomes full, information has to be removed to make space for the current task being performed. A PC with limited RAM will take a long time to perform the simplest task as the information in the RAM is constantly being replaced. RAM requires a constant electric supply to keep the information intact.

2. ROM - Read Only Media. ROM chips cannot be written to. Therefore they contain information which never changes. All PC’s have ROM chips. When the PC is switched on the Information in the ROM chip is used to test the RAM. ROM does not require a constant electric supply to keep the information intact. Different areas of RAM include:

- Conventional Memory
- Expanded Memory
- Extended Memory
- High Memory

*Modem* – Modems allow computers to transmit information to one another via an ordinary telephone line. Modem comes from the two words Modulation and Demodulation. A Modem converts information from Analog to Digital and vice-versa.

*Microwave Multipoint Distribution System* (MMDS) – A wireless delivery system operating on privately licensed spectrum in the 2.1GHz, 2.5-2.8GHz range. This uncluttered and robust spectrum is suited to deliver data and Internet connectivity, and can also be used to provide video programming, voice over IP and more.

*NNTP* (Net News Transfer Protocol) – A protocol for transferring Usenet messages.

*NT-1* – A Network Termination Device used to enable ISDN Basic Rate Service. Frequently it is packaged with the Power Supply unit that is required to power the ISDN line.

*Neighborhood Work Center* – Provides workspace for employees of different companies.

*Net* – Short for Internet.

*Network* – A network is basically a series of wires and cables, which connect a number of computers. Data is exchanged between computers via these cables. The maximum speed at which the data can be transmitted is called the bandwidth.

*Newbie* – A new user.

*Newsgroups* – Also called usenets, newsgroups are ongoing discussion groups among people on the Internet who share a mutual interest. The categories of News groups (represented by the first three or four characters of the name followed by a "." are:

- rec - recreational activities
- biz - business related groups
- comp - computers including technical discussion and support
- soc - social issues
- sci - scientific discussions
- alt - alternative groups

*Node* – A node is any device such as a PC that is connected to a Network.

*Online* – Having access to the Internet. Often people will say they are online meaning they have access to the Internet and have an email address, but may not necessarily be connected to the Internet at that moment.

*POP* (Points of Presence) – The numbers (access locations) your modem dials to access the internet.

*POP Server* (Post Office Protocol) – One of two Internet mail server protocols. The POP server receives and stores email text files. When checking email for new messages received, the email client (the email program) logs onto the POP server and asks to see the messages in a mailbox.

*POTS* – Plain old telephone service is what most residential customers have: a single analog phone line carried over two copper wires.

*PPP* (Point to Point Protocol) – Standard for using a modem and telephone line to connect to the Internet using TCP/IP.

*Ping* – A method of checking to see whether or not a particular system is on-line by sending packets of data to test the connection.

*Plug-ins* – A type of Browser Add-on. Plug-ins are programs that plug into your Web browser to greatly extend its capabilities. They literally work within your browser; and without a browser, can't run. Plug-ins, therefore, display their information directly in your browser window. Examples of plug-ins include Quick Time, Real Audio, Java apps, Shockwave, and Virtual Reality Modeling Language (VRML).

*Protocol* – A set of rules that lets computers agree how to communicate over the Internet.

*QuickTime* – A plug-in. Movies load when the downloading begins.

*RS232* – The industry standard for the transmission of data between Serial (one bit at a time) Devices. The RS stands for Recommended Standard.

*RealAudio* – A plug-in. The .AU format of audio file starts playing sound soon after you start downloading.

*Router* – A communications device which routes data between Networks.

*SCSI* (Small Computer Systems Interface) – Introduced by the American National Standards Institute (ANSI). A SCSI connects PC's to Peripherals & to other PC's & LANs. Up to 7 devices excluding the PC can be attached through a single SCSI connection, linking them together (known as a daisy chain). Only 1 device at a time can transmit through the SCSI connection - the devices are prioritized.

*S-MIME* (Secure/Multipurpose Internet Mail Extensions) – A specification for secure electronic mail designed to add security to email messages in MIME format. The security services offered are authentication (using digital signatures) and privacy (using encryption).

*SMTP* (Simple Mail Transfer Protocol) – The method by which Internet mail is delivered from one computer to another.

*Satellite Office* – Remote office locations allowing employees at a single company to share common office space and reduce the time and expense of the commute to and from the main office.



*Scroll* – To look at the parts of the page that fall below (or above) what you see on your screen. The long bar at the far right of the screen is a scroll bar.

*Search Engines* – Searchable databases that "key-words" are typed into to locate specific web pages, Usenet Newsgroups, and FTP sites.

*Server* – A computer, or software package, providing specific services to client software (e.g. a Browser) that runs on other computers. The term "Server" can refer to either a particular piece of software, such as a WWW server, or to the actual machine on which the software is running.

*Shareware* – Software that you can obtain for free. The author of the software does request a small fee to pay for registration, documentation etc.

*SLIP* (Serial Line Internet Protocol) – A standard which enables a user to connect to the Internet using a modem & a telephone line.

*SSL* (Secure Sockets Layer) – A security protocol that provides communications privacy over the Internet. The protocol allows client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, or message forgery.

*Site* – A place on the Internet. Every web page has a location where it resides which is called it's site. Every site has an address usually beginning with "http://."

*Spam* (or Spamming) – The Internet version of junk mail. Spamming is sending the same message to a large number of mailing lists or newsgroups usually to advertise something.

*Surfing* – The process of "looking around" the Internet.

*Switched 56* – Often the least expensive high-speed digital service, it operates at 56 Kbps and is used for point-to-point connections. It consists of a line which is provided by the telephone company at a fixed monthly rate and usage charges on a per minute basis.

*T-1* – A leased line provided by a communications company. The speed at which data can be transmitted is 1.45 megabits per second. The line is made up of 24 separate channels of 64 Kbps each, plus one 8-Kbps channel for signaling and control. T1 is used mainly for bulk connections, typically among ISPs or for private corporate networks.

*T-3* – A leased line provided by a communications company. The speed at which data can be transmitted is 45 megabits per second (equivalent to 30 T1 lines). Used for Internet backbones and large corporate networks. These lines are fiber optic based and make up the majority of links in Public Switched Networks deployed by telephone companies.

*TCP/IP* (Transmission Control Protocol/Internet Protocol) – A standard set of protocols that govern the basic workings of the Internet which was implemented in 1982. The TCP ensures that data is transmitted correctly between two computers. If any errors occur these are detected and the data is retransmitted. The data transmitted is split up into small portions called Data packets. The IP part of TCP/IP is how these data packets are moved from one point to another. Each computer on the Internet has a unique IP address and the data packets are moved from the source to the destination through many different computers and this is controlled via TCP/IP. This protocol is used on the Internet and also by computers which are part of a LAN.

*Telecommuter* – Someone who works remotely utilizing telecommunication/information services to link them with their main office.

*Teleworker* – See Telecommuter.

*Telnet* – Telnet is a program, which is part of the TCP/IP protocol. Its purpose is to allow a user to logon to a computer from a remote location.

*Terminal Adapter* (TA) – A piece of equipment or computer card that provides the ISDN feature functionality. This is required in addition to the NT-1 and Power Supply. Some manufacturers combine all of the functionality into one piece of equipment (e.g., 3Com Impact IQ).

*Trojan Horse* – Trojan Horse viruses pretend to be one thing when in fact they are something else. Typically, Trojan horses take the form of a game that deletes files while the user plays.

*UNIX* – A Multitasking Operating System developed in 1969. There are many versions of Unix. Written in the C Programming Language, it is very portable. Unix is the main operating system used by Internet host computers.

*URL* (Uniform Resource Locator) – It's the address of each web site. It usually begins with "http://"

*Upload* – The process of transferring information from your computer to another computer through the Internet. Every time you send email to someone you are uploading it.

*Usenet* – Usenets are ongoing discussion groups among people on the Internet who share a mutual interest.

*User ID* – This is the unique identifier (like your logon name) that you use to identify yourself on a computer.

*V.35* – The interface digital data lines use to connect to computers and routers.

*Virus* – A virus can wipe out information on your computer and create major havoc. Viruses usually originate from malicious people. You can unintentionally download a virus from a web site or get it from a disk that someone has lent you. There are virus-checking programs, but there are new viruses popping up every day. The best defense against a virus is to be very careful not to download programs or data from a site you're not familiar with.

*WAN* (Wide Area Network) – A network configuration that provides connectivity between separate LANs or workstations over longer distances.

*WWW* – An acronym for the World Wide Web.

*Web* – Short for the World Wide Web.

*Web Browser* – The tool (program) that allows you to surf the web. The most popular Web Browsers right now are Netscape Navigator and Microsoft Internet Explorer.

*Web Page* – Every time you are on the Internet World Wide Web, you are looking at a Web Page.

*World Wide Web* – A full-color, multimedia database of information on the Internet. Like the name implies the World Wide Web is a universal mass of web pages connected together through links.

# Appendix VI: Cost/Benefit Analysis Worksheet

Please modify the inputs that are in bold and italic.

Project Name: *"Facilities-Motivated" Strategy*

## Results Summary—Reference Case

Description	Value	Unit	Skip
NPV	749.1	\$K	

## Input Data—Uncertainties

Data Modified on:

Description	Name	Selected	Units	Index	High	Base	Low	Override	AND	Skip	Comments
Start Year	start year	1996		2		1996					
Tax rate	tax rate	40%	%	2		40%					
Discount rate	discount rate	6%	%	2		6%					
Years in study	years in study	3	years	2		3					
<b>Who Telecommutes</b>											
No. of People	# of people	120		2		120					
No. of Telecommuters	#of telecommuters										
First Year		10		2	15	10	6		+		
Second Year		25		2	35	25	20		+		
Third Year		50		2	100	50	25		+		
<b>Expenses</b>											
<b>HARDWARE AND COMMUNICATION</b>											
Equipment Assist Cash	equip. assist cash	1.5	K/employee	2		1.5					
<b>TRADITIONAL SUPPORT FACILITY</b>											
Facility Conversion	facility conversion	20	\$K	2	30.0	20.0	15.0				Total conversion cost =60/40/30

Description	Name	Selected	Units	Index	High	Base	Low	Override	AND Skip	Comments
<b>Expenses (cont'd)</b>										
<b>NETWORK INFRASTRUCTURE</b>										
Modern Costs	modern costs	20	\$K	2		20				
No. people supported by a modem	# supported	5		2		5				
<b>HELP DESK</b>										
Tech Support Salary	tech support salary	70	\$K	2	80	70	50			
Years to hire tech support	years to hire	2	years	2		2				
<b>HR PERSONNEL</b>										
HR salary	hr salary	60	\$K	2	65	60	50			
Min. people to hire HR	min. people to hire	25		2		25				
<b>NON-TRADITIONAL SUPPORT</b>										
Groupware Cost	groupware cost	100	\$K	2		100				Initial cost
On-going groupware cost	ongoing g/w cost	25	\$K	2		25				
<b>Benefits</b>										
<b>EMPLOYEE PRODUCTIVITY</b>										
Productivity change	productivity change	10%	%	2	20%	10%	-5%			
Revenue per employee	rev. per employee	250	\$K	2	325	250	200			Based on last 5 years
<b>RETENTION</b>										
Turnover Rate Improve.	turnover improve.	1.00%	%	2	2%	1%	0%			
Cost to train new person	cost to train	100	\$K	2	125	100	80			For 2 years
<b>WORKER'S COMP CLAIMS</b>										
Change in wrk comp clms	change in wrk comp.	0%	%	2	1%	0%	-1%			
Worker's Comp	worker's comp	27	\$K/employee	2		27				
<b>OFFICE SPACE</b>										
Office space unit cost	off.space unit cost	3.28	/sq.ft./month	2		3.28				
Avg. size of office/person	avg. size off./person	100	sq. ft.	2	150	100	80			
No. of telecommuters sharing office space	# of tele-sharing	2	person	2	4	2	1.25			
Lease increase rate	lease increase rate	4%	%	2		4%	2%			

## Appendix VII: Furniture, Equipment and Supplies Checklist

This list is designed to give you ideas of what you might consider for your home office.

### Furniture

- Desk
- Chair
- Filing Cabinet
- Bookcase
- Credenza
- Floor Lamp
- Side Chair
- Printer Table
- Sofa
- Coffee Table
- Stereo
- Pictures
- Conference Table
- Cork Board
- White Board
- Plants
- Keyboard Extension

### Equipment

- Copier
- Fax Machine
- Computer Printer
- Calculator
- Stapler
- 2-line Telephone
- Cordless Telephone
- Clock
- Pencil Sharpener
- Rolodex File
- Scanner
- Answering Machine
- In/Out Baskets
- Caller ID Equipment
- Coffee Pot
- Television
- Typewriter
- VCR
- Micro Recorder
- Surge Protector
- Extension Cords

### Supplies

- Hanging Folders
- Stationery
- Tape
- Pen, Pencils
- Printer Paper
- Rubber Bands
- Paper Clips
- Large Envelopes
- Ring Binders
- Note Pads
- Dictionary
- Thesaurus
- Computer Disks
- Sticky Notes
- Ruler
- Calendar
- Staple Remover
- Correction Fluid
- Mailing Labels
- Highlighters
- Felt Tip Markers
- File Folders
- Copier Paper
- Fax Paper
- Push Pins

## Appendix VIII: Other Resources

In creating this guide, we have attempted to collect in one document a number of topics pertaining to Telecommuting in order to present as complete an overview as possible for both Teleworkers and Corporate Decision-makers.

There are a number of resources available that address many of these topics in more depth and detail. A partial list is as follows:

### Books

- *101 Home Office Success Secrets* - Lisa Kanarek. Hawthorne: Career Press, 1994
- *Home Offices & Workspaces* - Sunset Books & Magazines. Menlo Park: Sunset, 1991.
- *Making Telecommuting Happen, A Guide for Telemanagers and Telecommuters* - Jack M. Niles. New York: Van Nostrand Reinhold, 1994
- *Managing the Home Based Worker* - Philip E Mahfood. Chicago: Probus. 1992
- *Teleworker Guidebook, There's No Space Like Home* - Charlotte Damato. Scottsdale: Marshall-Qualtec. 1997.
- *The Joy of Working from Home* - Jeff Berner. San Francisco: Berrett-Koehler, 1994.
- *The Telecommuter's Advisor* - June Langhoff. San Francisco: Aegis, 1996
- *The-Work-At-Home Sourcebook* - Lynie Arden. Boulder: Live Oak, 1994
- *Working Smarter from Home* - Nancy Struck. Menlo Park: Crisp, 1995.

### Articles

- Kiss the Office Goodbye! *PC World* - October, 1994. Pp. 143-145, 150, 155-157.
- Telecommuting Boosts Employee Output. *HR Magazine* - February, 1994. Pp.51-53
- Telecommuting Tips. *PC World* - December, 1995. Pp. 170-178

### Studies & Surveys

- Smart Valley, Inc.® Telecommuting Pilot Results. Gemini Consulting & Smart Valley, Inc.® Telecommuting Project. October, 1994 \*
- Telecommuting, Two Years Later. Strategic Decisions Group for Smart Valley Telecommuting Project. February, 1996\*
- Telecommuting – 1997. Decisive Technology for Smart Valley Telecommuting Project. November, 1997\*

\* Available only on the World Wide Web at:  
<http://www.svi.org/telework>

### Decision-Making Tools

#### Publications

Celona, John and Peter McNamee, Decision Analysis for the Professional with Supertree®, available through Strategic Decisions Group, Menlo Park, Calif.

#### SDG Courses

- Decision Analysis with Supertree®
- Excellence in Strategic Management
- Strategic Marketing: Creating Agile Marketing Strategies
- Strategic Management of R&D
- Professional Decision Analysis
- Decision Consulting Workshop

#### Decision Analysis Software

- Sensitivity® and Supertree®
- Risk Detective©
  - More information about Risk Detective is available at the Rythm Technologies website at [www.cris.com/~rhythmte](http://www.cris.com/~rhythmte)
- DPL™