TELECOMMUTING
AND
THE ROAD TO SUSTAINABILITY

by

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Abstract

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The United States contributes about 25% of the world’s CO₂ to the atmosphere annually, 20% of that is from driving cars, and 16% of that is from commuting, making the American commute responsible for roughly 1% of the world’s annual CO₂ emissions. Furthermore, as sprawl continues to envelope the countryside surrounding our major urban areas, public transportation systems have not kept up, and the distance between worker and workplace continues to grow. The information and communication technology revolution of the late 1990’s has enhanced the sensory experience that can be delivered via electronics, allowing coworkers to communicate and interact live via video, text messaging, shared white boards, and other technologies. From the convergence of these two trends – a workforce that lives farther and farther away from work, and the advent of internet and communications technologies - the concept of “virtual work” should’ve gained popularity, but its adoption rate by corporate America has been sluggish. There are myriad reasons for why Americans, and their counterparts all over the world still choose the dreaded commute over virtual work. Relatively low gasoline prices throughout this period, until two or three years ago, and America’s love affair with the automobile are part of the problem, but corporate culture, human need for interaction, and technological shortcomings are also contributing to the problem. This masters project will discuss how the commuter carbon footprint is largely being ignored by organizations that seek to improve their sustainability and reduce their impacts on the environment, and how, with the right approach and better technology, reducing the CO₂ emissions of employees can become one of the easier, less costly components of an organization’s sustainability strategy. Through case studies and a variety of research, this masters project will attempt to demystify the process of virtual work and act as a “telecommuter’s handbook” of sorts for employers and employees alike who seek to establish a telecommuting policy in their place of work.
1 Introduction

Every workday millions of people who live in one location get into their cars and drive to their jobs in another location, and then reverse the trip. The reasons are many why this daily ritual has endured into the twenty-first century, where information and communication technologies allow us to communicate with anyone anywhere instantly, virtually for free. Many jobs simply can’t be “telecommuted.” Many organizations rely on their tried-and-true hierarchical structures, which make face-to-face work and management a difficult model to depart from. One of the biggest culprits in the anemic growth of telecommuting is management reluctance, often based on a reliance on line-of-sight management styles, a lack of training, discomfort with flexible workplace programs and a lack of information regarding telecommuting's effect on productivity and profitability. And then there’s the psychology of work, the need to go to work, and the need to work with others. Finally, as a practical matter, many can’t work at home, and telecommuting centers or the local office rental market, cannot fill the need for a workspace close to home.

1.1 Statement of Purpose

This Master's Project (MP) will critically examine the commuting culture and suggest that we as a society are at a point of evolution where we have the technological tools and the societal acceptance to embrace this alternative working arrangement more fully. This MP is intended to be the first draft of a “telecommuter’s handbook,” for both workers and managers. It will attempt to demystify telecommuting, and enable organizations to better understand the issues involved so as to encourage more adoption of telecommuting in the U.S. Briefly,

* The term “telecommuting” will be favored in this paper. However, other terms such as “virtual work,” “distant work” and “telework” have been used interchangeably in the research literature encountered in this project.
“telecommuting” refers to the practice of performing one’s job through the use of information and communication technologies (ICT) in a location that is different from one’s physical location. This location may be home, a telecommuting center, a client’s office, or a hotel room. Regardless, the concept remains the same. ICT allows us to have a rich media experience with those whom we work with, eliminating the need, at least some of the time, to transport oneself, not to mention one’s automobile, some distance to be in the same room as one’s coworkers.

The environmental benefits of popularizing the practice of virtual work is the ultimate motive behind this project. Towards that end, the environmental issues that an organization should be concerned about will be explored at length. Corporations around the world are feeling the pressure of demands on their sustainability, from financial, political, and societal forces. As these organizations strive to reduce their carbon footprints, they prioritize their sources of carbon emissions based on two criteria: 1) how difficult is it, and 2) is it mandatory yet? To the first criterion, difficulty is measured primarily in terms of cost, but to a lesser extent it also has something to do with how much of a direct connection can be drawn between that carbon source and that organization. The carbon emissions that occur upstream and downstream of the supply chain are much more difficult to manage, thus they become less of a priority in an organization’s sustainability strategy. At this stage, most organizations are picking the “low-hanging fruit;” they are eliminating those carbon emissions that are directly associated with their products or their business operations. To the second criterion, mandates on carbon reductions for American firms doing business exclusively on American soil have not yet been officially implemented, due to the U.S. refusal to be a signatory to the Kyoto Protocols. Nevertheless, voluntary reductions are moving ahead at full speed because a) many organizations feel compelled to do so, b) many
see the mandates coming, and c) many must comply with the Kyoto Protocols if they do business in signatory countries.

Despite the fact that commuting is an activity that can be clearly linked to an organization’s operations, and despite the fact that the GHGs from such activity can be easily measured, the environmental impact of the commuting habits of an organization has not become a common line item on that organization’s carbon balance sheet. There are many reasons for this, and they will be explored in this paper. The intent is to thoroughly familiarize the reader with current environmental trends, incentives, and policies, and provide a brief summary of the key elements and issues surrounding the practice of telecommuting in its current form, as well as suggest specific ways that it can be improved and made more popular.

While telecommuting is increasing in popularity, most telecommuters take an *ad hoc* approach to their arrangements. There are a many books on the subject of telecommuting and virtual work, but they are mostly written from the perspective of the telecommuting employee, and do not address distant working issues from the perspective of management, nor suggest ways to restructure the corporation to make distant working a functional reality and a normal corporate practice. For most companies, distant working is something that is tolerated if the employee is sick, or the weather is bad, or some other circumstances make coming to the office impossible. Furthermore, the emphasis of this paper will be on the environmental implications of telecommuting, and what organizations can expect in terms of regulations and mandates in the near future, which is a topic that has very little space devoted to it in the canon of virtual work manuals. The intended audience of this written report consists of corporate, government, and non-profit management personnel interested in implementing telecommuting practices within their organizations. Hopefully, after reading this master’s project, a CEO will be able better
understand how telecommuting fits into his or her organization’s sustainability strategy, and how it will help that organization comply with the mandatory carbon reductions that are right around the corner on the American legislative agenda. This MP will argue that if management concerns are addressed, and supervision and privacy issues are openly discussed, and “old school” corporate structure is reexamined, telecommuting, when complemented with physical proximity, can become nearly a transparent element of doing business.

2 Materials and Methods

A variety of quantitative and qualitative research has been conducted to meet the objectives of this Master’s Project. Several Washington DC-area organizations that use telecommuting as a regular business practice have been chosen as case studies. This study will provide a detailed analysis of their habits, tools, corporate structure, and effectiveness. Furthermore, several well-documented case studies will be provided from larger corporations in order to lend some diversity to the case study pool.

A qualitative survey has been administered to the case study organizations. Organizations whose corporate culture is against telecommuting will also be examined in order to determine what barriers there are to telecommuting. The survey was designed for both managers as well as workers, for those who telecommute and those who don’t, to better understand organizational attitudes towards the practice. Survey responses were evaluated to identify the following:

- Are organizations adopting telecommuting for the benefit of the employee, for better profitability, to foster a green image, out of concern for climate change, to foster sustainability, or because they are being compelled to do so because of government mandates.
• What management challenges and issues have been experienced that are unique to telecommuting?
• Do certain types of employees lend themselves better to telecommuting than others?
• Do employees prefer telecommuting, or do they prefer to come to the office?
• Has telecommuting improved the morale of employees?
• Would the organization encourage more telecommuting among its employees?

Commercial software specifically designed to enable off-site working and collaboration, as well as network and security issues will also be evaluated. Products such as WebEx, which provides Web and video conferencing; Citrix, which enables collaborative computing; Polycom and Optelecom, which enable multiple-node videoconferencing; and iLinc, which provides web conferencing applications, are in common use in the practice of virtual work. General consumer-oriented software tools such Skype or iChat video are also being used, and these tools will be examined as well.

3 Results and Observations

Research and survey results reveal that the majority of telecommuters in the United States fall into one of three categories:

• For office workers it is a stopgap way to have a presence at work in the event of bad weather, sickness, or other extraordinary circumstances.
• Certain unique occupations, namely computer programmers, stockbrokers, consultants, and others whose work is almost entirely ICT based, and whose productivity is easily benchmarked.
• Senior managers (those who manage managers).
Beyond these three prevalent categories lie the individual early adopters and employees of organizations that have collectively adopted telecommuting ahead of most of society. The reasons why certain organizations have successfully implemented a telecommuting policy while others have not are myriad and not comprehensively documented. In other words, much literature has been produced with regard to the technologies, the corporate policies, and work-at-home strategies. However, this body of knowledge falls short of a comprehensive examination of all the issues that are associated with the organizational decision to implement a telecommuting policy. Distant management issues, privacy issues, as well as the psychological issues of working at home, away from co-workers, are less well documented, and so, the magnitude of their effects on the organization’s decision to adopt telecommuting is not measured accurately.

3.1 Current Practices

Telecommuting experienced its first wave of adoption when the Clean Air Act Amendments of 1990, which required the nation's most polluted regions to reduce the number of single-occupant vehicles by up to 13\%. However, by the mid 1990s, the adoption of telecommuting seemed to reach its limits with Corporate America, and by 1996, the total number of telecommuters in the U.S., defined as employees or contractors who work at home one or more days per month during normal business hours, had actually decreased\(^3\). In the late 90’s, several trends were converging to create a groundswell for the resurgence of the popularity of virtual work. The internet had become ubiquitous, and with it, broadband access. Hand in hand with the internet revolution came the business software revolution, and the combination of the two: the ability to do business – collaborate and communicate - via ICT. A second major trend was demographic. A younger, more computer-literate generation was assuming its role in
American business. This generation was not only more comfortable with ICT, it had also embraced the mentality behind “virtual presence” and virtual communities. This was a generation that could feel at home with avatars and online relationships. A third entirely different trend was that of land use. More and more people were chasing cheaper real estate farther from the city centers where they worked. With suburbanization, and exurbanization, came longer commutes. And, as people became more distant and scattered, opportunities for carpooling became fewer, and the average number of cars per household increased. According to a recent survey, there is a direct relationship between the number of workers in a household and the number of cars. About 93% of one-worker households have one or more vehicles; 87% of two-worker households have two or more vehicles; 73% of three-worker household and 55% of four worker households have three or more vehicles.

Better technology, a more tech-literate workforce, and longer commutes all should have laid the groundwork for the exponential growth of telecommuting, but the reality, thus far, has played out differently. A 2005 Dieringer Research Group's Survey found that 22.2 million Americans, or about 16.5% of the workforce, work from home at least once a week. Though this number may seem larger than what many would expect, the aging of the workforce, the suburbanization of land use, and the transition from a manufacturing economy to a service and information economy has created a greater demand for employers to offer the telework alternative. A survey released in 2001 by online benefits company LifeCare found that such flexible work arrangements were the No. 1 coveted employee benefit, beating out even health care.
3.1.1 Commuting’s Carbon Footprint

A year 2000 survey measured 128 million commuters in the United States in all forms of transportation. American commuters traveled an average of 16 miles each way to get to and from their jobs. The environmental consequences of this societal pattern are enormous. Of the close to 1.6 billion metric tons of CO$_2$ released annually by the U.S., the total contribution of personal vehicles is about 20%, or 320 million metric tons. Since the U.S. accounts for about 25% of the world’s CO$_2$ emissions, the percentage of CO$_2$ contributed by U.S. drivers is 5% of the world total. It is estimated that nearly 16% of driving in the U.S. is categorized as work-related. Thus, nearly 1% of the entire world’s annual CO$_2$ emissions is generated by Americans driving to and from and for work. The numbers become even more compelling if one were to include U.S. business travel, namely air travel, in this total. And, finally, since commuting and business travel are worldwide phenomena, it is reasonable to argue that a major source of GHG emissions can be attributed to the need for people to be in physical proximity to their place of work.

3.1.2 Societal & Personal Costs

It’s difficult to determine which came first, the commute or the sprawl, since they have had a synergistic relationship for the last five decades. Commuting enabled sprawl, and sprawl necessitates commuting. The environmental and societal consequences of sprawl are enormous and beyond the scope of this project. It suffices to say that inefficient land use in America is probably our biggest single environmental and societal problem, from which innumerable other environmental and societal problems arise, including the necessity to drive to go anywhere. This paper will assume that existing sprawl is a reality of our infrastructure, and that cutting down on the need to take to the highway every morning is both good for the environment, and potentially
good for the community where the telecommuter lives. Some other societal costs of commuting include increased traffic accidents, increased wear and tear on vehicles, and increased wear and tear on infrastructure. There have been many studies done on each of these costs, but this paper will merely mention them here as simply part of a greater argument for the reduction of commuting beyond the environmental reasons.

According to the U.S. Census Bureau, in 2004 the average commute time was about 24 minutes, which equates to a total of 4 to 7 days a year the average American spends commuting, depending on the region. This loss of productivity is enormous. Using the US Census data, 128 million commuters averaged 24 minutes per commute, equating to 51,200 hours of American worker time per commute, twice per day, Monday through Friday. What proportion of this time is lost work and what proportion is lost free time is difficult to assess. Intuitively, it’s reasonable to conclude that commuting is done on one’s personal time; we generally have to show up at the office at the designated beginning of the workday and leave at the designated end. However, studies cited later in this paper will indicate that teleworkers will devote at least some of their found time to additional working hours.

Further, we can all relate to the stressful, time-consuming nature of commuting on a personal level. The psychological problems associated with commuting are beyond the scope of this project. Nevertheless, in summation, it is reasonable to conclude that if a significant fraction of the 51,200 human hours spent commuting were to be eliminated, beyond the environmental benefits, the societal, economic and personal benefits would be significant.

3.2 Policies and Standards

The first step in the long process of reducing GHGs in as fair a manner as possible is for the international community to agree on how to measure emissions, or more specifically, how to
require entities to truthfully measure and report their own emissions. In the last 5 years, there have been innumerable initiatives aimed at developing a system to account for GHGs emitted by organizations, sectors, regions and countries. Various regulatory schemes and incentive programs are being tried throughout the world, such as trading, taxes, voluntary incentive programs, international treaties and carbon sequestration projects. The California Climate Action Registry, the EU’s GHG Emissions Trading Scheme, the US EPA’s Climate Leaders program, North America’s The Climate Registry, Climate Neutral Network, Australia’s GHG Challenge, the World Wildlife Fund’s Climate Savers program and the UK’s Emissions Trading Scheme, are some of the more recognizable schemes that attempt to encourage the accounting of GHGs. The following schemes discussed below are the ones that most effect, or will most effect corporations in the United States in the near future.

3.2.1 ISO 14064

The International Organization for Standardization’s ISO 14064 came about in 2002 precisely because the GHG accounting landscape was so fragmented and inconsistent. With its international jurisdiction over industrial standards, it established a framework to standardize how GHGs for organizations and projects were accounted for and verified, in order to make existing and emerging regulatory and voluntary GHG schemes more comparable and credible. ISO’s GHG accounting standard is intended to represent an international consensus on best practices in GHG quantification, monitoring and reporting. It has 3 parts:

- Part 1.1 – Organizations and entities. Verifiable requirements for organizations to design, develop, maintain and report on organizational-level GHG inventories.
- Part 2.1 – Projects and project-specific emissions.
• Part 3.1 – Requirements for validation, verification and certification bodies providing assurance against GHG claims from organizations or projects

Organizations interested in ramping their compliance to international standards, which many believe will be a good proxy for the U.S. standards to come, can begin to structure programs and projects using the ISO 14064 requirements. The ISO Standard breaks emissions into three categories: 1) Direct, 2) Energy Direct, and 3) Other Indirect. Currently, the way the ISO Standard is written, emissions from commuting employees are not considered to be within the defined “operational boundaries,” and would fall under the Other Indirect category, and Other Indirect emissions are not required to be measured and reported under the current scheme.

3.2.2 Greenhouse Gas Protocol Corporate Standard

Currently, the Greenhouse Gas Protocol Corporate Standard (GHGPCS), developed in 1998 under the auspices of the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage GHG emissions. The GHGPCS focuses only on the accounting and reporting of emissions; it does not require emissions reporting. The GHGPCS and ISO 14064 are not competing standards; ISO 14064 is intended to make the adoption of the GHGPCS by corporations more attractive by giving its participants a standard set of rules and requirements.

The GHGPCS provides standards and guidance for companies and other organizations preparing a GHG emissions inventory. Like ISO 14064, it establishes “operational boundaries” within which the emission of GHG’s should be accounted for. There are three categories of emissions.
• Scope 1: Direct Emissions: emission sources owned or controlled by the organization, such as a power plant or a generator or a company car.

• Scope 2: Indirect Emissions: for example, upstream emissions from use of purchased electricity, heat or steam.

• Scope 3: Other Indirect Emissions: all other emission sources, including CO2 emissions from business travel and from transport or mobile sources.

GHG emissions from employees who commute to an organization would fall under the Scope 3 category. The GHGPCS provides relatively simple accounting modules downloadable from its website for free that assist organizations in developing an accounting system for the GHG emissions. Their accounting module for calculating commuter emissions is in Appendix II. It is essentially a spreadsheet that allows the business manager to estimate the organization’s CO2 emissions of its employees’ commuting.

3.2.3 The Clean Air Act

The original Clean Air Act, passed by Congress in 1963, was prescient, and remarkable for the fact that it became law over 40 years ago in an era when pollution, sprawl, resource depletion and climate change were unheard of. The opening three paragraphs of the Clean Air Act read as follows:

(1) that the predominant part of the Nation’s population is located in its rapidly expanding metropolitan and other urban areas, which generally cross the boundary lines of local jurisdictions and often extend into two or more States;

(2) that the growth in the amount and complexity of air pollution brought about by urbanization, industrial develop-
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ment, and the increasing use of motor vehicles, has resulted in
mounting dangers to the public health and welfare, including
injury to agricultural crops and livestock, damage to and the
deterioration of property, and hazards to air and ground trans-
portation;
(3) that air pollution prevention (that is, the reduction or
elimination, through any measures, of the amount of pollutants
produced or created at the source) and air pollution control at
its source is the primary responsibility of States and local gov-
ernments;

The Act, and its many extensions and amendments over its nearly 45-year lifespan, was, in
the opinion of many, adequate legislation to address the environmental concerns of today.
However, the recalcitrant position of the Bush Administration has dominated America’s
sustainability strategy virtually since before climate change became a global issue. In April of
2007, the Supreme Court, in its Massachusetts v. EPA decision, concluded that the Bush
administration failed to follow the requirements of the Clean Air Act when it refused to regulate
greenhouse gas emissions from motor vehicles. In response, President Bush issued an executive
order directing that four Federal agencies create regulations that increased the U.S. renewable
fuel production targets, and increased the Corporate Average Fuel Economy (CAFÉ) standards
for motor vehicles. The goal of the President’s “20-in-10” bill was to cut greenhouse gas
emissions from motor vehicles by 20% over the next ten years. It’s likely that sometime in the
next decade, regulation of GHGs emitted by organizations will be promulgated through the
authority granted by the Clean Air Act, but thus far, the Act does not attempt to regulate or require the accounting of GHGs for organizations operating in the U.S.

3.3 Telecommuting and the Workplace

In order for the practice of telecommuting to gain in popularity, it must become something that is not perceived as an accommodation to those employees who prefer to work at home. The material benefits of telecommuting must be measurable in terms of employee productivity and corporate profitability, as well as a reduced carbon footprint. Specifically, the argument for telecommuting must focus on how it will benefit the company, not the employee; put a dollar amount on the benefit; and establish a way to measure the benefits once the program is in place.

3.3.1 Virtual Work & Virtual Organizations

When one speaks of the virtual workplace, two categories of organization come to mind. There’s the traditional workplace, wherein a telecommuting policy has been implemented successfully, and in its success the process of virtual work in virtual teams is being done. It is, essentially, any ordinary company taking advantage of ICT to save commuting time as well as to reach out to a larger geographic area for its talent pool. The second model is the organization whose fundamental business model could not exist before the ICT revolution, like Wikipedia, an organization that integrates the editorial contributions of literally hundreds of thousands of “employees” all over the world. This paper will examine the different needs of both models, but focus on the former model, the legacy organization making the transition to supporting a virtual workforce.
3.3.2 Best Candidates

Some will argue that the only candidates for telecommuting are those with jobs that are easily and objectively measured. The reality is that almost all jobs can, or should be, objectively measured\textsuperscript{16}. Figuring out how to assess the productivity and performance of an employee is the most important first step in any employment arrangement, telecommuting or otherwise. What the telecommuting relationship lacks is the ability of the manager to know what time the employee shows up for work, and the ability to see the employee in his peripheral vision. The fundamental difference, therefore, is one of trust, an issue that will be discussed later.

Most low- to mid-level jobs can be broken into collections of tasks, and this is an exercise that is necessary when sizing up an employee’s capacity to telecommute. Certain tasks are done alone. As a matter of fact, the employee is better off left alone when doing these tasks. Examples are writing reports, memos, estimates and emails. Other tasks require a high level of interpersonal contact, such as client and staff meetings, or employee reviews. Also, some tasks require access to corporate resources. -The matrix below summarizes the key characteristics of a job, and allows the manager to place that characteristic on a spectrum ranging from “onsite only” to “fulltime telecommute.” This evaluation method can be used by managers to help them decide whether an employee’s job and/or work ethic are a good fit for telecommuting. The method, which consists of articulating each task and then assigning a score to it based on its requirements to be onsite or not, looks something like this:

<p>| Job Task Analysis\textsuperscript{17} |
|---|---|---|---|---|
| Nature of Task | Onsite Only | Telework Center | Part-time telework | Fulltime telework |
| High level of face-to-face interaction | Best | Moderate | Poor | No |
| Interaction that is mostly done via | Good | Good | Good | Good |</p>
<table>
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<th>telephone</th>
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<tr>
<td>Fragmented tasks, many “fire drills” requiring staff coordination</td>
<td>Best</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
</tr>
<tr>
<td>Tasks requiring extended concentration</td>
<td>Poor</td>
<td>Good</td>
<td>Good</td>
<td>Best</td>
</tr>
<tr>
<td>Need physical access to resources</td>
<td>Best</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Involves sensitive information</td>
<td>Best</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Involves sensitive information that can be protected</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
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The vast majority of low- to mid-level jobs are a basket of tasks, some more suited to onsite working and some more suited to telecommuting. In this situation, the task matrix is a valuable tool for determining the right mix of telecommuting: how many days per week should one commute to work? Tasks that scored high in the need for either interpersonal contact or physical proximity to resources are those tasks that should be scheduled for the onsite days. For a traditional organization attempting to implement a telecommuting program, this exercise often leads to a rapid abandonment of the program because reorganizing a job that has evolved in a traditional work environment into onsite days and home days is extremely cumbersome, especially when multiple employees must be considered. Oftentimes, certain tasks must be reinvented or reassigned to different employees. One of the case studies, Predicate Logic, Inc., has successfully broken its employees’ workdays into onsite days and telecommuting days. According to Kevin Esser, Predicate’s director of information services, the task requires more organization up front, and a more detailed job description is necessary, but since Predicate’s end product is primarily intellectual capital, components of work can be broken into times when
meetings and onsite interaction is required, and times when technology can handle the interaction needs.

Perhaps most important, according to a variety of sources, is that those employees who qualify to telecommute should want to do it. According to Timothy Kane, president of the International Telework Association and Council (ITAC), a nonprofit organization dedicated to telework, “a common scenario is a company looking for a way to reduce its overhead costs “push their people out the door and give them nothing but a DSL line.” Kane further points out that "most of the programs that work well have telecommuters on a voluntary basis."

3.3.3 How the Work is Different

How a telecommuter’s work is different, and how managers and coworkers perceive it to be different are equally important issues. The major differences in the telecommuter’s work are:

- Telecommuter’s rely on ICT to project their presence at the office, and are, therefore, heavily reliant on it functioning properly.

- Telecommuters are unable to be present on short notice. It is often during short-notice crisis events that teamwork is built and leadership qualities are displayed. Being absent for these events could have a negative effect on the telecommuter’s career.

- Telecommuters cannot participate in team projects to the same level as onsite workers.

How a telecommuter’s work is perceived by others to be different is an issue that must be managed by both the telecommuter and the manager. Most importantly, if the telecommuting policy is transparent and applied uniformly, telecommuting will be perceived less as a benefit and more like a work alternative available to all who qualify. Further, telecommuters must be
required to attend the same meetings, and perform the same tasks - such as writing the meeting minutes - as onsite workers. Some 27% of the workers at the Washington State Energy Office complained that their workloads increased once their colleagues began telecommuting\(^9\). Better scheduling, training, and technologies that will make the teleworker’s presence continuous rather than something that requires a query, should help to alleviate this problem.

3.3.4 Policies & Procedures

Hand in hand with performance benchmarks is a detailed agreement that spells out the expected arrangement between telecommuter and manager. Arrangement details should include the following\(^{20}\):

- How many days per week/month that the employee intends to telecommute, or preferably, a set schedule of which days of the week will be spent where.
- A trial period (three months is suggested by many sources\(^{21}\))
- An ICT arrangement that assures frequent or constant communications
- A list of equipment and furniture that the employer will be providing
- A list of who pays for what in terms of cell phones, internet connections, utilities, etc.
- Security procedures, or how the company information will be kept safe.
- A description of tasks that will be performed at the place of employment, and those tasks that will be performed off site (at home, at the telecommuting center, etc.)

3.3.5 Incentives

Current policies in the United States do not compel domestic organizations to reduce their carbon footprints; all reductions are voluntary. Some U.S. organizations have embraced the concept for a variety of reasons. If the corporation is doing business in Europe, then it must meet EU requirements. Also, the organization gains a reputational asset, and this usually does not go
unnoticed by its marketing department. Finally, many U.S. organizations, such as Patagonia and Herman Miller, are compelled to reduce their emissions because of the philosophical leanings of their founders or their board members. Patagonia, for example, has a policy of “beyond compliance” in striving to reduce its carbon footprint, a corporate ethos established by founder Yvon Chouinard, a passionate environmentalist. If Europe and California are harbingers of federal policies in the coming years, U.S. corporations will be in a position where reducing carbon emissions is not only good public relations and philosophy, but also sound financial strategy because they will be reducing their regulatory risk profile.

A common way for an organization to reduce carbon emissions is through the purchase of carbon offsets from retailers such as Terrapass. Terrapass has just recently launched its Carbon Balanced Business Program, which helps businesses calculate their carbon footprints, based on the GHGPCS. Terrapass’s use of the GHGPCS accounting method is a significant step toward acknowledging the GHGPCS as the carbon accounting standard for industry. The TerraPass Business online calculator considers five aspects of a typical organization’s carbon footprint: on-site energy use, off-site server energy use, company vehicles, business travel and employee commutes. According to Terrapass’s business carbon footprint calculators, based on GHGPCS logic, an organization’s commuting emissions total can be a significant component of its overall GHG emissions. This ratio, of course, is highly dependent on the nature of the business. Nevertheless, for a typical business whose capital equipment consists of low-intensity energy-use devices such as fluorescent lights and computers, the employee commute can contribute the lion’s share of that organization’s GHG emissions.

As policies in the United States evolve toward mandatory cuts in carbon emissions, with fines for corporations that don’t comply, the employee commute will become the obvious first target for carbon reduction. This argument becomes more compelling if carbon markets are
established that allow the organization to trade the carbon credits earned by reducing employee commuting. Since these markets are currently inchoate or nonexistent in the U.S., putting a hard number on the value of the carbon credits earned by reducing employee commutes is difficult. Nevertheless, it is reasonable to postulate that in the not-too-distant future, organizations in the United States will have an opportunity to save money or make money from the policies and mechanisms that will likely evolve from current trends in California and the EU.

There are a variety of ways that a corporation could reduce its carbon emissions once given the mandate to do so. Some examples are:

- Improving facility energy efficiency
- Improving corporate vehicle efficiency
- Reducing business travel
- Reducing upstream and downstream energy consumption

Many of the methods above require considerable effort or expense on the part of the organization. Improving facility energy efficiency involves changing light fixtures, adding insulation, installing renewable energy technology such as solar panels, and changing heating and air conditioning systems. Improvements in corporate vehicle efficiency cannot be made without changing the vehicles, perhaps before their useful lives are over with. Business travel can be supplemented by the virtual work methods addressed in this paper. Upstream reductions in energy use will require the sourcing of different, more energy efficient production materials, and downstream reductions will necessitate the redesign of the output of the corporation itself. For example, John Deere would have to make more energy efficient tractors to reduce its downstream carbon footprint. When compared to all of the alternatives above, reduction of commuter miles is clearly the “low hanging fruit” in the choices that an organization faces when
tasked with reducing GHG emissions.

If a firm is faced with reducing commuter miles, it has alternative solutions. Technology that allows virtual interaction and presence is one approach. Another approach would be to select a site that is, on average, closer to more employees. Generally, sites such as this are more costly than sites that are not central. In a large metropolitan area, for example, in order for a firm to be equidistant to the most number of its commuting employees, it needs to be located in the city center, where rents are sometimes two or three times that of suburban locations. Another approach to would be to provide incentives for employees to live closer to work, or even provide housing for employees. Employee housing is common in the developing world, and in this country during the 19th century, but it is fraught with problems as a concept. It would be marginally feasible with younger, unmarried employees, however this group generally changes employers frequently, making relocating with each job change impractical.

3.3.6 Technology

Opinions vary widely with regard to the importance of technology in the effectiveness of a telecommuting program. ICT in its current form is adequate for most of today’s telecommuting. Many so-called “collaborative technologies” are very cumbersome to use, even in this era of big bandwidth and wireless connectivity. In many instances, the sheer effort of using the interface takes time, concentration, and energy away from the actual collaborative tasks. A major problem with high-overhead software that requires fast connection speeds is that virtually all consumer-level internet connections, including DSL and cable, offer high download capacity and very low upload capacity. This is because the average internet consumer is watching videos, not creating them. Therefore, a fundamental problem with any software that demands a lot of upstream bandwidth is that it is simply does not perform well at the telecommuter’s home unless
a special connection is established, such as a T1 line, which can be prohibitively expensive. This problem is a good argument in favor of using telecommuting centers close to home, assuming they have set up a high-bandwidth internet connection that is symmetrical (download capacity = upload capacity).

There are a host of online video and teleconferencing and collaboration software products currently on the market that all create a collaborative environment in a multimedia format. Some popular products are:

- WebEx, which provides Web and video conferencing
- Citrix provides shared desktop capabilities for enterprise platforms.
- Symantec’s PCanywhere links two desktops
- Polycom provides teleconferencing capabilities.
- Optelecom-NKF, Inc., is a global supplier of network video equipment
- iLinc Communications provides Web conferencing software and audio conferencing solutions

Most collaborative software packages feature multi-user video web conferencing, voice-over-internet protocol (VOIP), whiteboards or slideshows, and text messaging.

Most software is designed to simulate a group meeting experience, and would be considered presence-on-demand technology rather than continuous presence technology. Certain continuous-presence products, such as Citrix, enable a telemanager to monitor the desktop activities of a teleworker. Other technologies allow a telemanager to call up the desktop activity, including URLs visited, of a teleworker. This kind of electronic supervision is not popular with either managers or workers because of privacy issues. Telemanagers should not rely on electronic eavesdropping technology but rather create the kind of structure that allows the
telecommuter’s output to be measured without encountering privacy issues.

Ultimately, the most useful tool for the telecommuter is the internet browser, the email/scheduling application, and the telephone. Videoconferencing is used sparingly, but the additional visual cues and other information that accompanies a videoconference is not worth the technological problems it usually creates. Skype is the favored video conferencing software of most telecommuters, since it’s proven technology, free and ubiquitous. iVideo Chat is another free, consumer-oriented software that allows up to six participants, and is sometimes used to create virtual meetings.

Corporate intranets must be designed to accommodate telecommuters, so that information architecture allows access to timesheets, company calendars, message boards, employee handbooks, announcements and other internal information. Virtual private network technology allows the organization to create access to its intranet from points outside of its firewall, and is commonly used. Revamping the organization’s intranet and information architecture generally creates efficiencies internally as well. One of the many benefits of a telecommuting program that reveals itself on the technology side is that both employee and technology become more sophisticated and efficient in the process.

3.3.7 Security

There are a number of security issues that accompany work-at-home employment arrangements. The most common security breach, which is also potentially one of the most serious, is the loss or theft of the company laptop computer. Data loss, rather than data theft is also a greater risk with telecommuters because they work beyond the protective umbrella of the corporate IT department, which takes responsibility for in-house data back-up and equipment integrity. Data loss can also occur as a result of events unique to the home environment, such as
a spilled drink, an accident caused by children or pets, or a lighting strike, to name a few. Finally, the third kind of data corruption has more chance of occurring in the home office environment is caused by viruses and hackers.

Because teleworkers are beyond the reach of the security of the in-house IT network, there are several precautions that they must proactively adopt and practice on a continual basis. The teleworker must:

- Regularly back-up data, either to the company server or to an external drive.
- Use common-sense precautions against theft of the laptop
- Consider integrating a system that requires a security device to use the laptop.

The use of security devices, a common practice with government employees, particularly in the military, come in two forms: a card, or an encoder. The card must be inserted into the laptop, similar to how a CD is inserted, in order for it to be powered up. An encoding device would consist of a fob that displays a random number, which is synchronized with the company server. In order to log on, the user must match the fob number with the server number, and the server will grant access.

3.3.8 Safety, Legal & Insurance Issues

Telecommuters currently are not a protected class of workers, thus, if the employer decides that they want to pay telecommuters less because they are telecommuters, there is no legal precedent that implies that if the employer is guilty of discrimination24.

In regard to occupational safety, most employee insurance policies extend to the home. The bigger question is whether the teleworker is eligible for worker’s compensation insurance if he is injured at home during work hours, as if it happened at the place of work. In 2000, CSC Credit Services, a Texas company, asked OSHA for rules on home-based employees. The agency
responded that "All employers, including those which have entered into work-at-home agreements with employees, are responsible for complying with safety and health standards. A firestorm soon erupted on Republican-dominated Capital Hill, with House Majority Leader Dick Armey calling it "an outrageous extension of the Washington bureaucracy." The Labor Department quickly withdrew the OSHA letter, saying it was not a broad policy statement, and that it did not intend to extend its jurisdiction to homes all over the country. Nevertheless, it set in motion a debate that lasts to this day. On the subject of worker’s compensation, although it varies from employer to employer, as telecommuting grows in popularity, the extension of the home as a workplace is becoming more and more the standard. The flip side of this extension is that employers, or their insurance carriers, reserve the right to inspect the home office for safety compliance.

Telecommuting could very well help employers better comply with their obligations under the Americans with Disabilities Act and Family and Medical Leave Act. Having a telecommuting program is particularly helpful in accommodating injured and disabled employees, and continuity of their employment has fewer, shorter disruptions.

3.3.9 Corporate Structure

The traditional corporate structure of top-down management is periodically shuffled and redesigned to accommodate new trends and attitudes towards maximizing productivity. The “flat” corporate structure, wherein the organization was less hierarchical, has gradually come into vogue, particularly in technology companies, where the flow of new ideas from the bottom up needed to happen as rapidly as possible. Within flat organizations, managers talk about “empowering” employees so that they can perform their jobs with the flexibility of an entrepreneur. This relatively recent evolution in corporate structure reflects a host of societal
trends, including improved worker rights, the need for companies to detect trends and adapt quickly, a bias towards youth as an asset instead of a liability, and the fact that many organizations now have multiple sites in geographically dispersed locations that need to work together.

If an organization has made strides towards this flat structure, then integrating a telecommuting program is relatively easy. The employee entrepreneur who has been empowered to reach certain performance goals in however manner he or she sees fit will be able to adapt to a telecommuting environment much more easily than a worker from an organization with a traditional hierarchical structure.

3.3.10 Managing Telecommuters

According to telecommuting expert Cynthia Frogatt, the *sine qua non* of managing teleworkers is mutual trust. Trust, according to Frogatt, is built through relationships, reinforced through project structure, and reinvigorated by face-to-face interaction. Considering the work environment is usually the employee’s home, it’s important as a manager not to dictate every detail of the teleworker’s workday. According to Charles Handy, “The rules of trust are both obvious and well established, but they do not sit easily with a managerial tradition that believes efficiency and control are closely linked and that you can't have one without a lot of the other.” At Sun Microsystems, managers were skeptical of the iWork initiative—until they saw the results. "Middle management expressed serious doubts—'We don't know what they're doing;' 'They're not working;' 'They're not productive;"" says Ann Bamesberger, senior director of the company's iWork Solutions Group. "But we found that our remote employees were among our most excellent performers."

Managers of onsite employees have a relatively simple yardstick to measure work effort.
Is the employee there, at his or her desk, or in a meeting, or somewhere else under the roof, “working”? Of course, all of us have had jobs where certain coworkers have developed the uncanny ability to look busy and yet never really work. In the long run – and the long run might mean a few weeks to a few years, depending on the organization – that employee’s productivity will ultimately be measured by benchmarks and deliverables. Managers must be explicit about those deliverables up front, and progress towards those benchmarks must be periodically reviewed. "Supervisors are not comfortable supervising someone they can't see," says George Piskurich, author of *An Organizational Guide to Telecommuting*. "They tend to develop mechanisms to check on what people are doing at home rather than checking on the work being done, and that's a killer for telecommuting." Indeed, a common theme to all remote management literature encountered in doing this paper is that managers of distant workers must manage and evaluate the end product, not the means of getting there.

Kimball and Maureen Fisher, in their book *The Distance Manager*, tabulated some of the key differences between managing a traditional workforce and a virtual workforce. The differences center around control, in the traditional environment, verses commitment in the virtual environment:

<table>
<thead>
<tr>
<th>Control Paradigm</th>
<th>Commitment Paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Believes supervision guides behavior</td>
<td>Believes education guides behavior</td>
</tr>
<tr>
<td>Focus on hierarchy</td>
<td>Focus on the customer</td>
</tr>
<tr>
<td>Bias for functional organizations</td>
<td>Bias for cross-functional organizations</td>
</tr>
<tr>
<td>Believes in selective information sharing</td>
<td>Believes in open information sharing</td>
</tr>
<tr>
<td>Believes bosses should make decisions</td>
<td>Believes workers should make decisions</td>
</tr>
<tr>
<td>Emphasis on means</td>
<td>Emphasis on ends</td>
</tr>
</tbody>
</table>

In managing virtual teams, time can create distance between team members more than geographical space. In other words, communication is vital, and frequent communication is what
keeps virtual teams working together. According to telecommuting expert Jeff Zbar, the three keys to managing a virtual team are managing technology, process and culture. Processes that work well in a traditional work arrangement will probably have to be changed. A weekly, two-hour staff meeting may have to turn into daily, individual, succinct emails. A successful telecommuting program requires that employee assignments are made more explicit and follow-up is done on a regular schedule. Supervisors need to make a conscious effort to interact with remote staff both in order to keep the milestones in focus, but also to counteract the sense of isolation that can accompany telecommuting.

3.3.11 The Telecommuting Manager

Telecommuting managers who supervise onsite employees have a completely different set of issues, guidelines and conditions with how to approach their telecommuting. Some lessons learned are:

- The manager’s competence and leadership abilities must be proven, and teams must be built through onsite managing before any telecommuting should be considered.
- The team should always have the “big picture.” Rather than assigning specific tasks to specific team members, tasks should be given to the team as a whole, and individual responsibilities should be worked out at meetings.

Jeff Zbar recommends that the telemanager should designate an in-office liaison to stay informed of workplace social activities, new hires and fires, and other items that may not be discussed at meetings or on the network.

3.3.12 The Downsides

The following are the most common criticisms of the practice of telecommuting and some comments that put these criticisms in perspective:
• Telecommuting destroys teamwork. The best way to mitigate this problem is for the telecommuter to divide his work into work that is best done in an isolated environment (writing reports, creative thinking) and teamwork. Having a schedule that blends telecommuting with commuting is best, if teamwork is a concern.

• Out of sight, out of mind. This is a different concern with many of the same issues as above. When employees are not onsite, they do not have an opportunity to spend casual time with coworkers, bosses, and employees, and this could have a negative impact on career, promotions and bonuses.

• Out of sight, impossible to verify. Specific milestones must be determined between manager and telecommuter. Also, moonlighting and domestic duties should not be considered during work hours.

• Security breaches.

• Increased local traffic congestion. This is a legitimate concern, however the flipside is that the local economy tends to benefit as more people stay within their communities during the workday. A more critical question would be whether the GHG emissions saved by not driving to work is offset by the increase in local driving. No studies exist on this subject.

• Increased home utility consumption. This is debatable beyond the obvious telephone and internet service. Teleworkers are allowed to claim a portion of their home, and its costs, as a tax deduction, and there is a depreciation benefit as well. Depending on the teleworker’s tax bracket, this can more than offset any marginal increase in utility costs. However, on an environmental level, the concept of heating and lighting a hundred little spaces instead of one big space brings up legitimate questions with
regard to the energy efficiencies of the traditional work environment. No studies exist on the subject of utility consumption and the home working environment. Intuitively, most homes are heated or cooled even when they are empty, or for the benefit of children or pets, so quantifying the additional utility consumption of telecommuters is difficult.

3.4 Psychology of Virtual Work

According to Erik Andriessen, an expert on virtual work and communities, telework is a form of organizing or performing work, not a separate form of employment relationship\(^{36}\). In short, virtual work is work, oftentimes alone. The isolation of virtual work is an aspect of the arrangement that remains one of the biggest barriers to its wider adoption, and whether isolation can be mitigated by continuous-presence technology remains to be seen. With an older generation of worker, technology is unlikely to provide any tangible difference.

3.4.1 Generational Differences

It is a generally accepted observation from sociologists as well as untrained observers that there exists a significant generation gap between those who have not embraced personal computers or the internet, or even cell phones, those who do, and those who have completely integrated it into their lives. Generally, those employees under about 30 years of age have come to look upon virtual communities as much more of a literal extension of their reality than those who did not grow up with the internet. As a consequence, virtual work and virtual meetings are perceived by younger employees as being much more of a suitable substitute for physical proximity. The growth of online communities such as Second Life and Facebook supports the assertion that the younger generation is much more comfortable with virtual relationships. Second Life in particular has become such a popular virtual reality site that some corporations
have actually used it as a platform for virtual retreats and global meetings. It’s difficult to predict how this new perspective on electronic interaction will affect the evolution of the corporate structure, but it’s safe to say that virtual work groups will become much more prevalent as the under-30 set assumes management positions.

3.4.2 Dynamics of Virtual Work Communities

Some entire business sectors are “going virtual” at a much faster pace than others. Consultancies in particular are well suited to become more virtual, or purely virtual. Point B consultancy, for example, has no physical office. Point B has 223 employees mostly in the West. Employees work only for local clients, spending two or three days a week at home and the rest at their time in clients' offices[^37]. The lower overhead allows Point B to charge less for its services, and the localized approach has become a key selling point. The biggest challenge, say its founders, is maintaining a corporate culture among a diaspora of employees. So the company relies on corporate retreats and smaller gatherings to reinforce interorganizational relationships.

E-mails and phone calls, however efficient, cannot substitute for face time, warns Charles Ehin, a management professor at Westminster College's Gore School of Business in Salt Lake City and a longtime researcher on the subject of virtual organizations. "There are certain chemical reactions when we go face to face," says Ehin, “[and] that can't happen at a virtual organization."[^38] Like traditional companies, preserving Point B's culture will become more difficult as the company continues to grow. "Everyone has different chemistry and everyone needs to have input," says cofounder Tim Jenkins. "It's hard to go beyond 150 people without splitting up the company into smaller units," observes Jenkins. Non-traditional, non-hierarchical organizations seem to have a natural limit to their growth, as greater size demands more structure. This is a distinct disadvantage of virtual organizations that should be kept in
mind by managers looking to grow beyond bricks and mortar.

3.4.3 Proximity and Distance

Research by Jonathon Cummings points to advantages and disadvantages of physical proximity. According to Cummings, “when people are in the presence of coworkers, or even others doing unrelated tasks, their performance changes. For people working on easy tasks, the presence of others increases their alertness, motivation, and speed. However, when people are working on difficult or unlearned tasks, the presence of others can be distracting, reduce accuracy, and increase feelings of stress.” Regardless of one’s age or generation, human nature is such that behavior is altered in the presence of groups, sometimes for the better and sometimes not. Cummings goes on to point out the following differences between people in proximity and people at a distance:

<table>
<thead>
<tr>
<th>Groups</th>
<th>Isolated Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>More obedient to requests</td>
<td>Less obedient to requests</td>
</tr>
<tr>
<td>Less likely to free ride in a group project</td>
<td>More likely to free ride in a group project</td>
</tr>
<tr>
<td>More cooperative</td>
<td>Less cooperative</td>
</tr>
<tr>
<td>Tend to reach consensus quickly</td>
<td>Tend to form own opinions</td>
</tr>
</tbody>
</table>

Most of the results of Cummings’ research points to the conclusion that when people work in close physical proximity, they tend think more as a group as well as be more concerned about group welfare.

3.5 Benefits & Costs

A cost-benefit analysis is included at the end of this section. The various major line items of that analysis are discussed below.

3.5.1 Cost Reductions
Cost reductions for the Organization: The Clark County Credit Union, headquartered in Las Vegas, had a choice: either construct a new building for $4 million, or find another way to accommodate its growing staff. It decided to implement a telecommuting policy, obviating the need for new construction. The concept of virtual work, when extended to the concept of the virtual organization, holds the promise of even more benefit to the environment than fewer cars on the road and less CO2. Land use intensity may decrease as home spaces, which have traditionally sat empty during the workday, are used more.

Cost reductions for the Employee: The obvious cost savings for the employee is transportation costs, more so if they were driving themselves as opposed to taking public transportation. The other obvious savings, the time otherwise spent commuting, is a little more difficult to put on a balance sheet. In most employment circumstances, commuting is done on the employees time, so the extra time is generally considered found personal time. Nevertheless, the lack of a commute will often allow an employee to work later in the day than they would ordinarily work were they to face a long commute home. Whether or not this personal cost savings should be reflected in a lower salary is a matter for individual negotiation. One logical argument states that in a traditional work arrangement commuting circumstances and salary are unrelated: employees with longer commutes, and ostensibly higher costs, don’t get paid more. Thus, the same logic should hold true for telecommuters. Further, if an organization wants to reduce its carbon footprint through a telecommuting program, salary should not be part of the equation.

3.5.2 Organization: Increased Productivity

According to studies done by the Telework Advisory Group, teleworkers maintain or surpass productivity levels of onsite workers. Surveys of both managers and employees at
Merrill Lynch show productivity gains of between 10% and 25%\textsuperscript{44} (See the Merrill Case Study in Appendix I). Similar results have been reported in other organizations such as CDC and Aetna Life; their productivity gains have been in the double digits. There are many reasons for these productivity gains, and they are closely related to increases in employee satisfaction\textsuperscript{45}.

3.5.3 Organization: Employee Moral & Retention

Studies show that just over half of telecommuters surveyed reported that telecommuting had reduced their job-related stress. The factors related to stress reduction are varied, and include\textsuperscript{46}:

- The ability to choose or control their office environment
- Increased flexibility in child or elder care arrangements
- Less time in traffic and more time with family or community
- Fewer disruptions
- More control over personal schedule

A legitimate question to ask is whether the stress reduction is restricted to certain personality types who do not function well in a group environment. What is certain is that personality types on the spectrum from gregarious to introverted adapt to telecommuting radically differently, but nevertheless, even for the gregarious end of the spectrum there are benefits to telecommuting at least some of the time.

Regarding employee retention, a telecommuting policy has provided benefits for a wide range of employees regardless of personality type. The ability to offer telecommuting as an alternative work arrangement is key to retaining certain important employees, such as computer programmers, analysts, or consultants whose skills are a unique contribution to the organization. In a poll of telecommuters conducted several years ago, 23% had indicated that they had
seriously considered quitting instead of telecommuting. Of that number, a large majority indicated that the ability to telecommute had played a significant role in their decision to stay\(^47\). Common reasons for the need to telecommute are young children, disabilities, or simply living far from the office.

Furthermore, an ABC News/Time magazine/Washington Post poll on commuter attitudes confirms what we all already know, that commuting brings out the worst in us. According to the poll, about a third of commuters can be classified as aggressive drivers, 6 in 10 concede they sometimes go well over the speed limit, 62% occasionally get frustrated behind the wheel, more than four in 10 get angry and two in 10 sometimes boil into road rage\(^48\).

### 3.5.4 Organization: Reduced Vulnerability to Disruptions

The terrorist attacks of 9-11, Hurricane Katrina, or tomorrow’s ice storm are all examples of how an entire organization, even an entire city or country, can be brought to a virtual standstill as a result of an unexpected external disruption. Although terrorist attacks and hundred-year storms are not part of any organization’s contingency plan, inclement weather or a closure due to fire should be. Disruptions of this magnitude can be absorbed much more easily by organizations that have a distributed, virtual workforce, or that have the ability to distribute their workforce in extraordinary situations. "Telework has become more important than ever for continuity of operations," says Dan Green, deputy associate director for employee and family support policy at the U.S. Office of Personnel Management (OPM). "It's a very important tool to allow operations to continue while dealing with emergency situations, or a pandemic should there be one\(^49\)." Thus, even for the organization that doesn’t embrace a telecommuting program as an alternative working arrangement, it should have a program in place as a contingency work arrangement. In one of the case studies in Appendix I, fire control consultant Nate VanderRoest
makes virtual work an essential part of his clients’ incident management plan.

Weather and fire contingency plans are adequate for single organizations, however, as a national security measure, many experts assert that the nation’s ability to make the economy function is perilously dependent on the ability of its citizens to drive to work. It has been suggested that, in a post-9-11 era, a workforce that is less dependent on oil and gasoline would be in the best interests of national security. In a worst-case scenario, a terrorist attack on a major oil hub, such as in Cushing, Oklahoma, could have devastating consequences for the economy.

3.5.5 Cost-Benefit Analysis

The following table is a cost-benefit analysis for employers to consider when implementing a telecommuting program. The values in this analysis are based on studies done by Jack Nilles, the author of *Managing Telework* who coined the term “telecommuting” back in 1973. Through his consultancy, Nilles has been setting up telecommuting programs in major corporations for over 30 years. In the Nilles analysis, the sample employee’s annual salary is assumed to be $40,000, and the number of days per week of telecommuting is set at 1.5.

<table>
<thead>
<tr>
<th>Cost-Benefit Analysis of a Single Telecommuter&lt;sup&gt;50&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs to Organization</td>
</tr>
<tr>
<td>Training</td>
</tr>
<tr>
<td>Tech Support</td>
</tr>
<tr>
<td>Technology – hardware: laptop, printer, modem</td>
</tr>
<tr>
<td>Technology - software</td>
</tr>
<tr>
<td>Telecommunications</td>
</tr>
<tr>
<td>Furniture</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
</tr>
<tr>
<td>Benefits to Organization</td>
</tr>
<tr>
<td>Reduced office space, parking, and other overhead</td>
</tr>
<tr>
<td>Increased employee productivity</td>
</tr>
<tr>
<td>Reduced absenteeism</td>
</tr>
<tr>
<td>Increased employee retention</td>
</tr>
<tr>
<td><strong>TOTAL BENEFIT</strong></td>
</tr>
</tbody>
</table>
Discussion and Conclusions

4.1 Designing the Optimal Telecommuting Program

According to the Green Business Network, the following are some key elements of a telecommuting program for an organization that has a bricks-and-mortar footprint and is looking to make a partial transition into being virtual:\(^5\):

- Identify job types best suited to telecommuting, some or all of the time.
- Select the best candidates for a telecommuting program. These candidates should be selected from a pool of employees who *all want to telecommute*.
- Identify metrics by which the telecommuter’s productivity will be evaluated, and iron out other details of the arrangement in the form of a telecommuting agreement. Make sure telecommuting principles have been incorporated into the company handbook and are accessible via the intranet.
- Investigate the potential state and federal incentives.
- Purchase the necessary ICT elements, and set up training sessions for their use.
- Establish distant work training sessions for both manager and employer.
- Establish a trial period of three months with a small test group. The group should be big enough to warrant the changes necessary to build the program. Accommodating *select, ad hoc* arrangements are not productive
- Monitor, evaluate and make necessary changes. This not only includes monitoring employee satisfaction, but also productivity and greater organizational benefit.
- Grow the program with further volunteers, train everyone in order to have a operations disruption plan.
4.1.1 The Technology Platform

The development of an adequate distributed collaboration platform is the fundamental technological need in this sector. An adequate software system that creates a continuous presence instead of presence on demand would go far towards making the telecommuter less isolated. The functionality and usability of a system are measured by its ability to create the values of social presence, information richness, and salience. The development challenges are primarily on the software side, although bandwidth remains an issue on the hardware side. Research on human-to-human collaboration has identified the following key factors that are essential to quality interaction, and that must be reproduced in any future collaboration software: verbal communication, phatic communication, spatial regulation, proxemic skills, turn taking, peripheral awareness, trust building, reciprocity, indexicality, and gaze patterns. According to research by Daft and Lengel, the more complex the task, the “richer” the media that are needed, and the more structured the task is, the more effective “poor” media is.

Collaborative software that improves on the technology of the present should have the following features:

- Continuous presence connectivity, preferably via video. (One promising device that is under development is referred to as a USB phone, which is essentially an intercom that works from computer to computer.)
- Multi-user interactivity that accommodates social cues
- The ability to know the locations and activities of coworkers, and to be able to communicate with them if necessary.

Technology that enables a continuous virtual presence can also easily cross the line into surveillance. Until “electronic etiquette” is more fully evolved, codes of virtual conduct should
be integrated into the employee handbook. Ultimately, technology should provide all of the sensory cues to virtual interaction that the human senses bring to physical interaction.

4.1.2 Policies & Procedures

The following list of suggested policies and procedures for an organizational telecommuting program are suggested by George Piskurich, author of *An Organizational Guide to Telecommuting*:

- Set strict standards for eligibility. The organization must determine which jobs, departments, or positions are eligible and which aren’t.
- Develop a set schedule of who comes into the office on what days in order to coordinate meetings or hotelling of offices or desks.
- A list of criteria on how telecommuters will be chosen.

New hires should be required to work onsite for a set period of time to develop relationships with coworkers, and learn corporate culture and procedures. Generally, telecommuting programs are most effective when voluntary. Further, a telecommuting program usually requires a critical mass of employees in order to justify the expense in training and technologies. If the telecommuters are an organizational aberration, the costs will outweigh the benefits.

One common concern among managers is that if the employee is unable to draw the line between work and home life, he will accrue a disproportionate amount of overtime. Telecommuters are subject to the Fair Labor Standards Act's wage and hour requirements and must be paid one and a half times their regular hourly rates for all hours worked in excess of 40 in a week. For hourly employees, a system that allows for easy daily tracking of hours and projects is a critical part of any corporate intranet.

4.1.3 Distant Management
According to Jack Welch, leadership guru and former CEO of General Electric, “what you can't do very well from home is lead. To lead, it's no good blowing into town for important meetings and showing up at retreats. You have to muddle in the muck in between. People have to see how calm you stay in a PR crisis, how decent you are to new employees who don't have the hang of things, how much you sweat during a tough deal, and how hard you work on a deadline without bitching and moaning. Or how you don't do any or all of the above.” This very blunt assessment of the merits of distant management expresses a skepticism shared with many business people. It’s important for the purposes of this discussion to define the difference between leadership and management. Leadership is necessary when an organization is moving into new territory that requires redefining procedures and resetting goals. Management, on the other hand, is the act of coordinating those tasks that are well defined and making them as efficient as possible.

In the variety of research done in the course of this project with regard to managing distant workers, several common themes were repeated, namely:

- Start the telework arrangement on a trial basis
- Develop specific performance benchmarks and goals by which the work will be measured.
- Focus on the product, not the procedures.
- Plan a communications process – when to communicate, how often, and what tools will be used.

On that last point, Will Pape, cofounder of VeriFone Inc., who has worked as a virtual manager for over 16 years from his home in New Mexico, suggests: "Daily progress reports can be a waste of time…You trade information with the frequency that the situation demands,
through whatever form is necessary -- videoconferencing, concise emails, the phone. The overall objective is not for your boss to look over your shoulder but to keep in sync\textsuperscript{60}.

4.2 Conclusions

4.2.1 The Road Ahead

The acceptance of the internet as a potentially rich medium for human interaction is progressing at a very rapid pace, driven primarily by relatively young users in virtual communities engaging in primarily social activities. The sensibilities that this generation will bring to the work environment should lay the groundwork for a sea change in how workers interact and collaborate. In many ways, personal online activity is far ahead of business activity in a very transparent way. The rise of retail sales on the Internet signals nothing less than telecommuting to the mall\textsuperscript{61}. However, regardless of how seamlessly integrated the internet becomes with the sensibilities of “Generation Y” and beyond, human nature will dictate that certain interactions are better, more productive, and more efficient when done in close proximity, while certain tasks are better done in a room alone. Well into the future, telework will be a practical alternative work arrangement for some people all of the time, other people some of the time, and for others, never.

As the American economy transitions from manufacturing to service, the emergence of pure virtual organizations will become more commonplace. In many ways, the virtual organization is well entrenched in our lives. Tech support, ticket reservations, data processing, and a host of other services are performed transparently by contractors scattered all over the planet. The notion that the boundaries of an organization are determined by proximity will give way to the concept of the organization that is bounded by a common output or client. As this evolution unfolds, the concept of the daily commute might become a relic of the past.
5 Sources


APPENDIX I – Case Studies

5.1.1 Case Studies

Case studies are currently in progress with several DC-area organizations. Face-to-face interviews have been conducted with one or more survey respondents from each of the identified organizations. Interviews consist of a series of questions designed to evaluate the effectiveness of the organization’s telecommuting efforts. The specific methods that the case study corporation is using to enable its telecommuters will be examined and evaluated. Finally, the study will attempt to identify what organizational structures have been altered or created in order to accommodate telecommuting at this organization.

Predicate Logic

Located in Arlington, Virginia, Predicate Logic specializes in software and systems engineering services with a focus on communications technology. The company’s business comes mostly from defense agencies. Predicate was selected as a survey participant because of its rigorous security requirements, since much of its work is considered top secret by the Pentagon.

Interviews were performed with Predicate’s director of information assurance, Kevin Esser, and one of its project managers who regularly telecommutes, Gerard Vandenberg. Several Predicate employees, who live as far away as West Virginia, have telecommuting arrangements. Typically, employees are required to commute to the Arlington office once or twice a week. Mr. Esser pointed out that simple email is their primary telecommuting technology. Because of their security issues, their highly sensitive work is still done onsite, and their routine communications are done via email and telephone. Mr. Esser expressed a need for a secure collaborative tool; currently, they use Google’s collaborative tools for their non-sensitive work. Companies like
Predicate have use of the Navy/Marine Corps Intranet (NMCI) for secure information sharing. However, NMCI connections off the corporation’s main footprint are impractical. Until a secure information-sharing platform is developed, defense contractors, and other organizations with security issues, such as banks, will be unable to offer telecommuting arrangements to their employees. According to Mr. Esser, the company’s telecommuting policy has allowed it to save money and attract employees who otherwise might live too far away to consider working at Predicate. He considers telecommuting a must for companies such as his, where the primary product is intellectual property, and the talent pool is scattered over the middle Atlantic. In order to accommodate a telecommuting workforce, Predicate’s Arlington office is made up primarily of project managers of equal rank and an information director, Mr. Esser. Predicate can assign one or several project managers to a given client in the DC area in somewhat of a modular fashion. The company’s San Diego headquarters is much more hierarchical, and because of this, much of the corporate functions, such as marketing and human resources, is performed there.

Nate VanderRoest, Consultant, Fire Protection Engineering

Mr. VanderRoest provides consulting services to the U.S. Capital in the areas of emergency support and incident management. Though he himself telecommutes only two or three days per month, he considers a telecommuting plan a vital part of incident management for any organization, particularly government organizations whose roles and responsibilities are vital in the very incidents that might shut their offices down. Mr. VanderRoest works with the Citrix technology platform that enables desktop sharing and document collaboration. Citrix enables employees to access their desktops, including the ability to run all applications on their hard drives or on the network, or access any files on the organizational intranet. The platform also
enables managers to monitor desktop activity and coordinate a dispersed team of workers through real-time text messaging and chat portals. Since telecommuting is by and large a contingency work arrangement at the U.S. Capital, the organizational structure has not changed appreciably. Mr. VanderRoest remarked that the ability for an organization like the U.S. Capital, which requires most of its employees to be physically on site, to be able to “morph” into a flatter organization while in its contingency work arrangement mode is a condition that has been modeled into the contingency plan, though it is difficult to model in simulated scenarios. Mr. VanderRoest indicated that most government organizations since 9-11 have developed virtual work platforms in response to the need for a dispersed workforce in a time of emergency.

Autodesk, Inc.

Autodesk offers a variety of design software packages for engineers, architects, and animation studios that enable visualization and computer-assisted design and manufacturing. Ed Reid is an Annapolis-based sales representative for the company who spends much of his time traveling to client sites. Mr. Reid commutes to Autodesk’s DC-area office once a week to attend the weekly sales meetings and to have “face time” with coworkers and managers. Although other Autodesk employees telecommute, Mr. Reid lives farther away from the office than most, and telecommutes more than most other employees. He lives in Annapolis because of his wife’s job as a physician in the Naval Academy hospital there; he also prefers the lifestyle. However, he has observed that lifestyle over work preferences and the telecommuting that accompanies it can have a negative effect on one’s career. Less time in the office generally equates to a slower climb up the corporate ladder and perhaps even more susceptibility to lay-off. Autodesk encourages telecommuting by providing the technology necessary at the home, including the broadband connection and the laptop computer. As a software company, they take a progressive
approach to telecommuting, using collaboration software Netmeeting for virtual meetings, and a Virtual Private Network to allow employees access to the corporate intranet from anywhere outside of the company. Mr. Reid’s job in sales, like most sales jobs, is easily measurable in sales volume and customer retention, and the sales job has historically been a relatively easy job to take on the road or work from home. Autodesk made the decision two years ago not to have a desk for every employee, but rather to “hotel” their desks and offices. Mr. Reid commented that this was not a popular decision amongst the employees, most of whom preferred to have their own spaces regardless of the amount of time they were used. Nevertheless, hotelling desks has saved Autodesk a tangible amount of money because of the reduced overhead that comes with a smaller office. Autodesk has a conventional corporate structure within its DC-area office and designates specific positions, namely sales and software development, as telecommuting positions. It has structured its weekly routines so that all telecommuting employees come to the office on different days in order to attend meetings and maintain corporate culture within the fragmented workforce.

Further case studies are provided below that present a variety of organizational approaches to virtual work:

Case Study: American Express

In the early 1990’s American Express was losing market share to Visa, and Richard Tiani, then vice president of best practices, was given the responsibility of improving the productivity of the sales force. His research concluded that the sales team needed to spend more time with clients and prospective clients, and respond to client needs more quickly. He quickly turned the sales department into a virtual organization with the following changes: 1) new laptops were
issued to everyone, 2) low-volume accounts shifted to phone-only, 3) paper was virtually
eliminated, 4) weekly teleconferences replaced onsite meetings, 5) employees’ homes were
equipped with broadband, 6) all staff was trained to telecommute, 7) a buddy system was
organized, and monthly social gatherings were planned. These changes had the following
measurable effects after six months: 1) many sales offices were closed, since they were going
unused, 2) customer satisfaction went up 28% and employee satisfaction went up 25%. Sales
managers spend the majority of their time in the field, increasing productivity and sales from
15% to 40%. As a direct result of making its sales department virtual, in 1994 it gained $40
million in new business and saved $3.7 million on real estate costs.62

Case Study: Merrill Lynch

In 1995, Wall Street giant Merrill Lynch, faced with hundreds of high-cost analysts who were
spending two hours a day commuting between their homes in the suburbs and Merrill’s and New
Jersey offices, instigated a telecommuting program. "You can't just give people computers, send
them home, and call them telecommuters," says Camille Manfredonia, a Merrill Lynch vice
president who directs the firm's alternative work arrangements group. "There are so many issues.
What kind of equipment do you need? How will working from home affect your clients, your
manager, your coworkers? How will it affect your career? How do you manage people
effectively from a distance?" Manfredonia's says the keys to its success are:

• Comprehensive training for telecommuter and manager

• Prospective telecommuters submit a detailed proposal that covers when and how
  they're going to work at home - and even what their new office will look like.
  Furniture must meet strict ergonomic standards.

• A two-week simulation experience, followed by a three-month trial.
• Requires most of its telecommuters to spend at least one day a week in the office to maintain relationships.

• Plan farther ahead in order to have all the necessary files and other materials on your home office desk.
APPENDIX II:
Greenhouse Gas Protocol Corporate Standard Commuter Emissions Accounting Module

INSTRUCTIONS: To calculate commuting emissions, you will need to obtain activity data on the distance employees travel to and from work and the mode of transportation they use. For relatively small companies and organizations, you may be able to obtain this information from each employee. For larger companies, it may be more efficient to take a sample and estimate total activity data from it using the Employee to Sample Ratio to extrapolate the data.

In the table below, data from a hypothetical company of 50 employees has been used. Each mode of transportation has its own CO\(_2\) Emission Factor which is based on research done by the World Resources Institute. Total CO\(_2\) production is calculated by the following formula:

\[
\text{(Total Distance Traveled)} \times (\text{CO}_2 \text{ Emission Factor}) \times 1000 = \text{Total CO}_2 \text{ Emissions in tons}
\]

After emissions from each transportation mode is calculated, overall emissions are totaled for the sample employee group. Then the Employee to Sample Ratio is used to extrapolate the data to calculate the CO\(_2\) emissions of the entire organization.

<table>
<thead>
<tr>
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<tbody>
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<td>Number of employees in company</td>
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<table>
<thead>
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<th>Commute Details</th>
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<tr>
<td>Automobile: Midsize</td>
</tr>
<tr>
<td>Automobile: Large</td>
</tr>
<tr>
<td>Automobile: Small</td>
</tr>
<tr>
<td>Automobile: Large</td>
</tr>
<tr>
<td>Train</td>
</tr>
<tr>
<td>Transit Rail (e.g. subway)</td>
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<tr>
<td>Bus</td>
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### TOTALS

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<tr>
<th>Mode of Trans.</th>
<th>CO₂ Emissions in Metric Tons - Sample Group</th>
<th>Employees to Sample Ratio (E/S)</th>
<th>CO₂ Emissions in Metric Tons - All Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ emissions in metric tons</td>
<td>3.70</td>
<td>4.17</td>
<td>15.43</td>
</tr>
<tr>
<td>Total</td>
<td>3.70</td>
<td>4.17</td>
<td>15.43</td>
</tr>
</tbody>
</table>

### Endnotes

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