



A COMPREHENSIVE SURVEY OF EMERGING TECHNOLOGY FOR NEW YORK METROPOLITAN AREA



Technical Memorandum 1 Addendum: Telecommuting

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Table of Contents

TABLE OF CONTENTS.....	2
1 INTRODUCTION.....	3
2 TECHNOLOGY ENABLERS FOR TELECOMMUTING.....	3
3 TELECOMMUTING SUCCESS STORIES	5
4 REFERENCES.....	7
5 APPENDIX. SCREENSHOTS OF COLLABORATION SOFTWARE	8

1 Introduction

Telecommuting, also referred to as e-commuting, e-work, telework, working at home (WAH), or working from home (WFH), refers to employees reporting to work remotely from their home or a local office. Since employees do not report to work at office a more general term – ‘working away from office’ (WAFO) is also used. Telecommuting is an example of Travel Demand Management strategy that is being successfully implemented¹. Though telecommuting was considered as early as 1980s and was considered a failure in the mid 90s (Technology Review, Vol 98 (5)), rapid advances in communication and computing technology in the last decade have made telecommuting an attractive TDM strategy. However the true potential for telecommuting has not yet been achieved. According to the National Technology Readiness Survey (NTRS), sponsored by the Robert H. Smith School of Business’ Center for Excellence in Service at the University of Maryland and technology research firm Rockbridge Associates Inc, only 11 percent of respondents telecommute despite over 25 percent respondents citing employer support for telecommuting. NTRS estimates that if everyone with the potential to telecommute did so for even 1.6 days per week, an estimated \$3.9 billion could be saved every year assuming average distance of 20 miles per day and mileage of 21 mpg at gas rates if \$2.89 per gallon.

Several factors impact telecommute choice. Walls, Safirova, and Jiang (1) in their paper report that telecommuting propensity increases with worker age and educational attainment. Telecommuting propensity also depends on worker’s job characteristics such as industry and occupation category. Telecommuting also depends on the organizations management style. Telecommuting requires a shift in management style from management by observation to management by objectives. Equally important is the availability of right technologies could affect the propensity to telecommute. In this document, we review technologies that enable telecommuting.

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2 Technology Enablers for Telecommuting

There are several **technological enablers** for telecommuting in the market. These include software for e-mail, instant messaging, fax, audio conference, video conference, data conference, collaborative management, real-time polls and surveys and desktop sharing. Besides the software technologies, Voice Over Internet Protocol (VoIP) has emerged as a preferred telecommunication method particularly for international calls.

- Technology enablers:
- E-mail, IM and fax
 - Audio conference
 - Video conference
 - Data conference
 - Collaborative Management
 - Real-time polls & surveys
 - Desktop Sharing
 - VoIP

While e-mail, instant messaging, fax, and audio conference have become commonly available and frequently used technologies in the work place, they act as principal enablers for telecommuting. However, they lack in visual communication, data sharing and presentations in real-time. Video conference is an effective method for visual communication. Most instant messaging software provides basic video conferencing facilities. More advanced video conferencing tools are provided by Adobe, Cisco, and AT&T.

Often visual communication requires the sharing of data and presentations in real time. An alternative to video conference is a data conference where participants are allowed to write or load graphs and charts on electronic whiteboards to share with others. Several technologies provide the capabilities for seamless interaction known as **Collaborative Management** - their

¹ See www.telework.gov for telework status report in the Federal Government and <http://www.fhwa.dot.gov/environment/cmaqpgs/telework/> for examples of successful telework implementations.

capabilities include audio, video, data, and desktop sharing features in a single package. Examples of collaboration software include *Microsoft Office Groove*, *Adobe Acrobat Connect*, *Webex*, and *OfficeScape* among others. More specialized offerings include special software to hold web seminar (webinars). This is efficiently provided by technologies such as *Infinite Conferencing* and *NCSA Habanero* - a collaborative framework to create Java applications.

Collaborative Management software provides audio, video, data, and desktop sharing features in a single package.

VoIP has recently emerged as the preferred calling method particularly in small and medium-sized enterprises for international calls. Current VoIP providers include *Packet8*, *Vonage*, *Knightel*, *Vonics Digital*, and *BBTelsys LLC*. Another VoIP/instant messaging software that has become popular is *Skype*. *Skype* requires a computer to make telephone calls while the other providers can be used both through a computer and through traditional telephones connected to a phone adapter which is linked to the internet router.

The advances in virtualization software are likely to encourage telecommuting further and have led to the emergence of *Virtual Office*. While *Virtual Office* software is very similar to collaborative management software, they appear to be more general. Specific examples of *Virtual Office* software include *iareaOffice* and *Virtual Office*. Recent technologies in virtual office also allow the users to address security issues over the internet network thereby providing a secure exchange of information.

An important impediment to wide spread adoption of telecommuting among employers is the lack of direct auditing and overseeing capabilities. While most employers' measure performance based on final work output some management styles or job profiles require more constant monitoring. **Project management software** have been designed that can also account for employees working remotely. Examples include *@task* and *Ace Project*. A set of tools to accurately assess the economic feasibility and impact of telecommuting are *TeleworkAudits* and *TeleworkAnalysys* (www.teleworker.com/taudits.html).

Technology Examples:
Collaborative Management -
Microsoft Office Groove,
Adobe Acrobat Connect,
Webex, and OfficeScape
VoIP – *Packet8, Vonage,*
Knightel, Vonics Digital
Virtual Office – *iareaOffice,*
Virtual Office
Project management - *@task,*
Ace Project
Feasibility Assessment -
TeleworkAudits,
TeleworkAnalysys

All the above technologies may be grouped as software technologies. The hardware technology includes communication infrastructure and computer and video hardware. Currently the hardware technology by itself may not be the barrier. The quality and the cost is an issue. Hi-definition video conferencing technologies are very expensive. For example, Cisco TelePresence costs between \$80,000 to \$299,000, Telanetix costs about \$40,000 plus the monthly cost for T-1 internet lines (>\$1000 per month), and at the lower end is Polycom's HDX-4000 at \$8000 (source: <http://www.networkworld.com/news/2007/082107-networker.html>).

A key to deploying high-quality video conferencing and seamless communication of data/files is high-speed internet technology. Current broadband cable internet service speeds range from 2 Mbps (on average) to up to 50 Mbps (maximum) for downloads and 0.5 Mbps

Further advances in optical transmission technology can provide data transfers in the range of 10Gbps – 40 Gbps (or 20 to 80 times faster than current maximum speeds).

(average) to 20 Mbps (maximum) for uploads. Further advances in optical transmission technology such as Dense Wave Division Multiplexing (DWDM) can provide data transfers in the range of 10Gbps – 40 Gbps (or 20 to 80 times faster than current maximum speeds). The next-generation of wireless technology such as ultra-mobile broadband is likely to provide speeds of 100Mbps to 1 Gbps with excellent quality of service and security.

3 Telecommuting Success Stories

Advances in video-conferencing and Internet and the growing transportation congestion problems have made telecommuting more attractive. Dedicated organizations (www.telcoa.org) and companies (www.telecommutect.com) have sprung up to support telecommuting initiatives. **Other than driving alone, telecommuting is the only commute mode that has gained market share since 1980.** In 2005, 4.5 million

In 2005, 4.5 million Americans telecommuted on most work days, roughly 20 million at least once per month, and 45 million once a year.

Americans telecommuted on most work days, roughly 20 million telecommute at least once per month, and 45 million once a year. However, the long-term success of telecommuting from the viewpoint of transportation planners will depend on how effective telecommuting is in substituting travel. Several issues remain with respect to the real impact of telecommuting on travel. Second-order effects such as increased non-work travel either by the telecommuter or other members of the household (since a vehicle becomes available) and choice of household location (stay farther away since commuting is not an every day affair) may undermine any reduction in commute travel recognized through telecommuting. Choo, Mokhtarian, and Salomon (2) develop aggregate time-series models to examine the impact of telecommuting. Their models suggest that "telecommuting reduces vehicle miles traveled (VMT), with 94% confidence. Together with independent external evidence, the results suggest a reduction in annual VMT on the order of 0.8% or less. Even with impacts that small, when informally compared to similar reductions in VMT due to public transit ridership, **telecommuting appears to be far more cost-effective in terms of public sector expenditures.**"

John Edwards, the chairman of Telework Coalition, in an interview claims increased productivity of 7% to 20% (3). Among the reasons for the increase in productivity he cites: no office politics, fewer interruptions, and fewer distractions, and could be available for duty outside traditional office hours. Further, he claims, telecommute program would allow employees to work from home when they, or their family members, get sick. Periodic transit strikes, bad weather, traffic incidents, and increased security due to terrorism threats at transportation hubs might also prompt employers to think about setting up a telecommute program.

Teleworkexchange (www.teleworkexchange.com) portal lists several successful telecommuting initiatives throughout the country in different employment sectors (4). Several of these success stories were built on Virtual Office and Virtual Private Network technologies. For example, the Federal Aviation Administration "provides its workforce with access to a secure, shared virtual office suite that mimics a typical "real world" office setup. Think document management, meeting spaces, project teams, libraries, and tight security - all in cyberspace... called the Knowledge Services Network (KSN)" (4). The core technology behind the KSN is Microsoft Windows SharePoint Services. The Internal Revenue Service on the other hand provided its remote workforce with SharePoint team rooms, secure messaging, Virtual Private Networks (VPN), multi-functional printing devices, and remote communications routing. Other organizations that have successfully implemented telecommuting programs include the Arizona Department of Administration, Defense Information Systems Agency (DISA) - Department of Defense, and the Washington Council of Governments (WASHCOG). In WASHCOG's an extra 18% of workers (in addition to the 14.6% already telecommuting) have jobs that would allow them to telecommute and would be interested in telecommuting.

Telecommuting has also resulted in a new employment sector referred to as **Microjobs**. Microjobs refers to the method of working where individuals work as freelancers but use technology and the internet to do their work remotely. www.pajamanation.co.uk is a website that matches employers to potential microjob seekers.

Table 1. List of Technologies for Telecommuting

Name	Type	Brief Description	Link	
Microsoft Groove	Office	Collaboration software program that helps teams work together dynamically and effectively, even if team members work for different organizations, work remotely, or work offline	http://office.microsoft.com/en-us/groove/	
Adobe Connect	Acrobat	Collaboration software	Enables individuals and small businesses to instantly communicate and collaborate through easy-to-use, easy-to-access online personal meeting rooms.	http://www.adobe.com/products/acrobatconnect/
Webex	Collaboration software / Web conference	Online meetings, webinars, online training and e-learning, remote support. WebEx is the only web meeting applications provider that has earned Web Trust and SAS70 certification.	www.webex.com	
OfficeScape	Virtual Office	Officescape applies advanced web and communication technologies to provide secure and flexible online office services, total conferencing solutions, and on-demand physical offices.	www.officescape.com	
InfiniteConferencing	Web conference	Professional phone and web conferencing, web casting and webinar services.	www.infiniteconferencing.com	
Packet8	VoIP	Packet8 Virtual Office is a hosted iPBX communications solution that delivers high quality digital voice services	http://www.packet8.net/	
Vonage	VoIP	Vonage is a leading provider of broadband telephone services	www.vonage.com	
Vonics Digital	VoIP	Vonics Digital is a next generation digital communications company that allows consumers and businesses to make and receive phone calls anywhere in the world using a high-speed Internet (ISDN/DSL/Cable) connection	www.vonics.com	
iareaoffice	Virtual Office	iareaOffice provides a complete outsourced voice data and application network where users have secure mobile access to all phone calls, voicemails, emails, faxes and desktop files.	www.iareaoffice.com	
Virtual Office	Virtual Office	An integrated suite of applications that are accessed via the Internet and available 24/7. The 15 applications include email, calendar and address book and can also synchronize with your PDA and phone.	www.office.com	
@task	Project Management	On-demand project and portfolio management software to help teams' access business intelligence and work together.	www.attask.com	
Ace Project	Project Management	Project Management Software, Time Tracking, Project Tracking and Timesheet Software for Project Manager	www.aceproject.com	

4 References

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2. Sangho Choo, Patricia L. Mokhtarian, and Ilan Salomon, Does Telecommuting Reduce Vehicle-miles Traveled? An Aggregate Time Series Analysis for the U.S., *Transportation* 32(1), 2005, 37-64.
3. Interview with John Edwards, Chairman Telework Coalition, <http://www.italladdsup.gov/newsletter/winter06/experts.html>
4. <http://www.teleworkexchange.com/resource-center-case-studies.asp>

5 Appendix. Screenshots of Collaboration Software



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