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Final Report on Technology Barriers to Home-Based Telework

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Office of Governmentwide Policy General Services Administration

Final Report
Washington, D.C.
April 5, 2002

Executive Summary

Overview

Congress has mandated that home-based telework be made available to all federal employees by 2004 as an alternate work approach. However, to date, less than 4% of federal employees are engaging in home-based telework programs, lagging the pace of implementation anticipated in the original legislation. Home-based telework does present unique managerial, organizational, and cultural issues to federal organizations, which often result in challenges facing successful implementation. The purpose of this analysis was to specifically address barriers to implementation related to the information technology (IT) needed to provide teleworkers with an effective work environment in the home, and to maintain connectivity with the office. This analysis resulted directly from a request made by Congress that the General Services Administration (GSA) "...identify and develop a plan to resolve technology barrier issues that impede the creation of home workstations for federal employees."

The premise used to guide the overall analysis was that barriers due to information technology are impacting the implementation of home-based telework programs by federal organizations. The approach used in this analysis contained the following elements:

- Assessment of technologies available to support home-based telework, including performance, functionality, user interface and cost issues
- Perspectives of CIO staff and IT management in federal organizations of potential technology barriers to home-based telework facing federal organizations
- Insights from telework coordinators concerning the actual impact of technology barriers on implementation and management of telework programs
- Feedback from teleworkers and teleworker managers on the effect of technology barriers on overall teleworker effectiveness
- Review of "lessons learned" concerning information technology challenges and solutions through case studies of organizations with active telework implementation plans.

Data collection efforts to obtain CIO staff and IT management perspectives, teleworker coordinator insights, and teleworker and manager feedback focused on ten executive departments and agencies:

- Department of Commerce
- Department of Health and Human Services

- Department of Interior
- Department of Justice
- Department of the Treasury
- Department of Veterans Affairs
- Federal Trade Commission
- General Services Administration
- National Aeronautics and Space Administration
- National Imagery and Mapping Agency

In addition, CIO staff and IT management perspectives from the Defense Information Systems Agency (DISA) were obtained to better represent the perspectives of DoD organizations in this area.

The overarching finding from this analysis is that there are technology problems associated with Federal telework implementation, but that, today, no single information technology barrier is preventing or impeding telework implementation. Additionally, the analysis found that IT, as a resource for telework programs, is frequently provided on an "as needed" basis. For example, many federal agencies have not yet addressed how the home IT environment supporting the home-based teleworker should be configured, funded, or supported; as a result decisions concerning selection, acquisition, and support for home IT equipment are made by individual managers. As Federal telework expands, these IT problems, if unresolved, will become significant barriers to successful implementation and operation of telework programs. It is recommended, therefore, that IT management in federal organizations must be more effectively engaged in telework planning, budgeting and implementation to insure successful resolution of IT issues which federal managers and telework coordinators are facing as telework programs move forward. IT support for home-based telework should be addressed at an enterprise level to ensure successful delivery of IT capabilities to employees, and that as telework expands to become an important alternative for most or all federal employees, IT management must play a greater role in planning and implementation support to ensure these employees have the IT capabilities necessary to perform their jobs.

The analysis identified certain IT-related issues that will present challenges as the scale of home-based telework expands, including the following:

- Bandwidth and availability of residential network services that will provide the last mile connectivity for home-based teleworkers
- Performance and reliability of legacy client-server applications in a home-based telework environment, particularly when supported over dial-up connections
- Protection and security of agency information and systems as networks are "opened" to accommodate home-based telework.

The challenges resulting from these (and other) IT areas are not expected to prevent most federal organizations from proceeding with telework implementation. However, if left unresolved many federal organizations will likely find that these challenges will slow or significantly impair implementation activities as telework becomes more prevalent in the federal environment. Such challenges can be resolved through application of agency IT planning, architecture, budgeting, and project management processes that have not yet been fully brought to bear on home-based telework.

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Assessment of Technologies

The survey of technologies supporting home-based telework evaluated key information technology components supporting the home environment. The survey partitioned these IT components into three broad domains:

- Residence domain, including PCs, printers, software for the home environment, and residential network services to provide connectivity
- Network domain, encompassing wide area transport and remote network access technologies
- Enterprise domain, including application software and enterprise-level information security capabilities.

Within each domain a number of potential barriers were identified against which available technology solutions could be assessed. The functionality, performance, and cost characteristics of available products and services in these domains were evaluated. In total, sixteen potential barriers to home-based telework were identified across all three domains. Technology solutions are available to assist agencies in addressing these barriers, but an agency's need to implement these solutions will depend on the severity of the impact of specific barriers on each agency's IT environment and home-based telework programs. Thus, these sixteen potential barriers were used in planning the data collection activities in the following perspectives:

- CIO staff

- Teleworker Coordinators
- Teleworkers and Managers
- Case Studies (of organizations implementing home-based telework).

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Description of Findings by Perspective

CIO Staff and IT Management

CIO staff and IT management within the departments and agencies contacted during this analysis were able to provide insights into the degree of IT support of home-based telework programs, IT planning activities related to telework, and the impact of the potential barriers to telework implementation identified in the technology assessment. In general, home-based telework has not yet been a factor in the longer range IT planning and budgeting decisions made at the department level. For example, enterprise-level assessments of telework impact on end user equipment, agency technology architectures, user environments, network services, and information security have not yet been performed by many of the agencies contacted. CIO staff and IT management are aware of telework implementation efforts within their departments and agencies, but home-based telework to this point within most departments and agencies has been relatively slow, and typically driven at the bureau/sub-agency level or below, limiting its visibility to department-level IT staff.

However, there were some concerns that CIO staff at the department/agency level were able to address, when considering the longer term impact of large scale home-based telework deployment. First, the availability and performance of broadband residential data service (e.g., Digital Subscriber Line service, cable modem service) was viewed as a potential barrier, from the standpoint of coverage limitations, ease of installation, ability to support virtual private network services, and cost. CIO staff view high-speed connectivity solutions to the home as a necessary condition to ensuring a quality in-home work environment in the future, but see unknowns in the current market environment in making such connectivity ubiquitous. Second, the performance of legacy client-server applications over remote connections, particularly in the absence of high-speed network connectivity, may limit availability of certain enterprise systems to home-based teleworkers, or potentially require redesign of these applications to function over remote access (particularly dial-up connections). Redesign of these applications or migration to web-based architectures would likely alleviate any such problems along this line, but the extent of potential problems with legacy applications portfolios is not yet known. Third, security of agency information and systems in the course of telework implementation was viewed as an important but manageable concern moving forward. CIO staff and IT management contacted throughout the analysis generally indicated that the technology and management tools to address IT security issues are available now, but effort needs to be placed into identifying security risks and designing solutions to mitigate these risks.

Telework Coordinators

The overall findings suggest that, from the perspective of telework coordinators, technology does not present a barrier to telework. However, telework coordinators identified technology-related issues that should be addressed in an effort to make telework programs stronger and more viable for a larger proportion of the workforce. First, telework coordinators view the task of obtaining funds to equip teleworkers with personal computers and network services as the most significant technology-related challenge facing federal organizations as they seek to expand telework. Second, while most telework coordinators do not view security as a major issue, there is concern that the volatility of the security issue could lead to future problems and therefore warrants attention. Third, greater communication and coordination is needed between telework coordinators and IT staff with regards to telework implementation efforts. Fourth, availability of appropriate IT equipment for use in the home is a challenge facing telework implementation; currently, some employees use recycled equipment or personal equipment. Finally, the speed of a teleworkers' network connection impacts the overall quality of a teleworker's home IT environment, thus pointing to the need for sufficient network connections.

Teleworkers and Teleworker Managers

Questionnaires were designed to gather information from teleworkers and managers of teleworkers about their experiences with technology barriers to telework. About 2,400 teleworkers and 900 managers of teleworkers, drawn from nine of the ten organizations in the analysis, were invited to participate in the questionnaire (one agency was not included in the questionnaires because its home-telework program is still in the planning stages). The questionnaires were conducted through a website during late November and the first half of December 2001, and generated acceptable response rates of 43 percent for teleworkers and 38 percent for teleworker managers.

Findings from the questionnaire results show that although teleworkers and teleworker managers do not generally view technology issues as a major barrier to telework, some technology issues can present problems. When asked to rank the technology barriers to telework, respondents ranked system performance and teleworkers' access to equipment and services as

being the top two barriers. In addition, funding is a serious barrier for some teleworker managers, and funding issues have a great impact on whether they are able to provide equipment and services for telework. Access to technical support is a serious barrier for some teleworkers and teleworker managers, and teleworkers believe this can greatly impact their performance. However, teleworkers and teleworker managers generally believe that technology barriers have little impact on the frequency or the success of working from home. In addition, respondents report that IT-related security had little impact on management's decision to move forward with home-based telework, nor did IT-related security concerns impact the ability of teleworkers to work from home successfully. Other findings showed that most teleworkers use a standard set of equipment and services, including a personal computer, applications software, printer, and a dial-up Internet connection. More than half of teleworkers use their own printers and personal computers for telework. Also, most teleworkers have access to telephone communications services, including teleconferencing and the ability to communicate by phone while working online. More than half of the respondents reported that teleworkers receive little or no training for telework. When training is provided, teleworkers and their managers have mixed opinions on how much it provides information needed to telework.

Case Studies

The case studies focused on specific organizations that have had successful experiences with home-based telework programs, and included the following organizations:

- Consumer Product Safety Commission (CPSC)
- GSA Public Buildings Service Region 7
- GSA Region 1
- IRS Modernization and Information Technology Services (MITS)
- NASA Langley Research Center
- Patent and Trademark Office (PTO)
- Treasury Inspector General for Tax Administration (TIGTA)
- Wright-Patterson Air Force Base

Most of these organizations had either gained experience in managing home-based telework programs or had successfully completed pilot programs and were actively rolling out home-based telework to larger segments of their workforce. These organizations shared many common elements of their approaches that appeared to contribute substantially to their ability to successfully confront IT-related challenges that arose during implementation. First, senior management within these organizations often endorsed and actively promoted home-based telework as a vital element of the organization's strategy. Frequently, as a result of this leadership, management from multiple disciplines within a given organization were key contributors to creation of the telework program; these disciplines often included IT, human resources, procurement, facilities, and security, as well as core business operations. This improved communications between management enabled telework planners to anticipate potential problems, and to identify and resolve actual problems encountered during trials and pilot programs. IT management was able to provide guidance and recommendations on suitable home equipment, software configurations, and network services that were compatible with agency architectures. Further, equipment and connectivity needs for home-based teleworkers were included in longer range IT budgeting and planning within these organizations. These organizations often emphasized the use of broadband residential data services and training in home IT equipment to improve the overall effectiveness of the home IT environment.

Impact of Home-Based Telework on IT Costs

Additions and enhancements to an agency's IT infrastructure to support home-based telework will lead to higher agency IT costs. These additional costs will include "per employee" costs for additional equipment and network services (e.g., dual desktop computers for the office and home environment, laptops with docking stations, residential broadband services to improve connectivity) and enterprise infrastructure enhancements to support employee access from beyond the organization's boundaries (e.g., VPNs, firewalls, remote access servers and connectivity, network and configuration management tools, redesign of client/server applications).

Many of the enterprise infrastructure enhancements have additional uses beyond telework, for example to support mobile workers, improve virus protection, and provide secure Internet access. It is expected that the "per employee" costs for hardware and network services will be the dominant IT cost drivers in telework implementation. These costs will impact an organization's IT seat cost, which reflects the full costs for providing employees with the hardware, software, network connectivity, and technical support to adequately perform their jobs. The actual impact on seat costs will be primarily driven by hardware and network services costs. The impact of these elements will be driven largely by IT management decisions on the types of equipment and connectivity needed to support for home-based telework, and by agency telework policies governing how many employees can engage in home-based telework, the actual equipment to be provided to support teleworkers, reimbursement for network services, and other issues governing IT delivery to the teleworker. Many of these policies have yet to be defined by many federal organizations, and most of the organizations contacted in the analysis had not yet viewed teleworker IT costs from an overall IT seat cost perspective. Agencies may be able to mitigate the impact on IT seat costs by

considering home-based telework requirements in the identification and acquisition of personal computers for use by teleworkers, and by incorporating telework requirements into agency desktop technology refreshment/replacement cycles.

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Overview of Recommendations

The recommendations from this analysis primarily address management behavior necessary to ensure the proper level of IT support for successful home-based telework implementation. The solutions to the substantive IT challenges to telework implementation faced by federal organizations lie in ensuring adequate involvement and participation by IT management within these organizations. The state of technology will pose some challenges telework implementation (most notably with respect to network services and client-server applications). However, active participation of senior IT management in telework planning and implementation will be necessary if solutions are to be identified and implemented in a manner consistent with an agency's IT architecture and long term strategy.

The recommendations resulting from the findings and conclusions fall in five major areas, described in the following paragraphs:

- Senior Management Leadership
- IT Planning for Telework
- Broadband Residential Services
- Security
- Training

Senior Management Leadership

Interviews with CIO staff, telework coordinators, and case study organizations throughout the analysis illustrated the importance of leadership from senior management in launching successful telework programs. Organizations in which the senior leadership had endorsed telework as important to the future success of the business were better able to engage a broader range of agency stakeholders in planning and implementing home-based telework programs. For example in several organizations contacted in the analysis senior executives have identified telework as a strategic qualitative advantage these organizations could offer with respect to recruiting and retention of staff, as market salaries for staff with specific skill sets rise. This leadership by senior management was often the key factor in organizations being able to mobilize functional support groups such as IT, human resources, facilities, and procurement in supporting telework. As a result, IT staff assisting with telework implementation were able to assist in defining home equipment and network connections compatible with the office environment, provide training to teleworkers, and make necessary adjustments to agency IT infrastructure to ensure successful implementation. Federal departments and agencies should provide guidance to senior management at the component level and below to take on this overall leadership role within their organizations regarding home-based telework implementation. Further, CIOs and IT management should take a proactive role in educating management within their organizations on how information technology can be leveraged to further telework programs and reduce implementation risk.

Several organizations were able to engage management on the benefits of telework to the organization through the use of business case analyses. These organizations were able to identify cost reductions in the post-telework office environment that offset much (and sometimes all) of the additional costs of IT equipment and services for home-based teleworkers. In addition, the most attractive approach to implementation can usually be identified through this process. Thus, departments and agencies should provide guidance to component organizations on the use of business cases as part of telework planning, both to identify longer-term benefits and assess implementation alternatives.

IT Planning for Telework

A key finding from this analysis was that many organizations are at the very early stages of planning home-based telework, and often staff planning and implementing telework programs have not yet fully engaged IT staff in decisions regarding home telework equipment, software requirements, network services, and other aspects of IT support for home-based teleworkers. In addition, IT organizations have frequently not yet identified standard products or configurations for home environments, nor have they fully assessed the impact of home-based telework on their agency IT environments. In some cases, employees are providing their own machines for home-based telework applications, and in other cases managers may provide employees with excess or obsolete equipment for the home environment. The potential impact on the longer term agency IT environment could be large, but many organizations are not yet factoring telework into their long range IT plans.

CIO staff and IT management in federal organizations should define requirements for home-based telework and include them in the organization's longer term IT architecture and capital planning processes. Specifically, federal organizations should define technical requirements for the home environment as part of their enterprise desktop architectures to ensure availability of

end user systems and support services that provide sufficient support for teleworkers. In addition, decisions on legacy application modernization and redesign should reflect the benefits for home-based teleworkers; while such benefits may not be sufficient to justify major redesigns of agency mission applications, the benefits derived from greater accessibility and performance to home teleworkers could make the case for modernization more attractive. Finally, as CIO staff and IT management consider requirements for home-based telework, federal organizations should consider technologies that can facilitate telework and improve the effectiveness of the home telework environment and possibly the office environment as well. For example, document management systems, collaboration tools, and performance measurement systems would allow federal organizations to better manage document access, team communications, and overall effectiveness not only of teleworkers, but of office-based staff as well.

Broadband Residential Services

The quality of the home IT environment will be governed largely by the capacity and performance of a teleworker's connection to the agency network. CIO staff pointed out that the limitation of the "last mile" connection was a key issue to be resolved for large-scale home-based telework to be most successful. While most teleworkers are using dial-up connections today according to the questionnaire results, as the scale of telework expands (involving more or most employees in some organizations, many of whom will telework more days during the week than today's norm), the limitations of dial-up access are expected to become more apparent. Two organizations with successful telework programs contacted in the case study discussions have created standard policies for providing broadband services for their teleworkers.

Federal organizations should facilitate the adoption and use of broadband residential services for home-based telework, both to improve the quality of service for home teleworkers and to expand telework opportunities to additional federal workers. Specifically, CIO staff and IT management should identify broadband options for home-based telework to match expected teleworker requirements (as part of the overall IT architecture process). Further, telework policies should address and clarify how an organization within a department or agency will compensate employees for use of broadband residential data services in support of home-based telework.

Security

Managers in organizations actively implementing telework are concerned about security and protection of agency information and systems. However, the need to provide information security is not seen as a reason to inhibit home-based telework in any of the organizations contacted in the analysis. CIO staff and IT management in organizations that have not deployed home-based telework are aware that expanded access to the outside world may lead to increased vulnerabilities. These staff members believe that sufficient technology solutions and management processes are available to address these concerns; the key challenge these organizations will face is obtaining the resources to identify vulnerabilities, deploy the right tools, and implement the correct practices to ensure security. Management in most organizations indicated that an important element in any information security plan was training and education of employees on security policies, information protection procedures, and potential consequences, and that such training will be key elements of home-based telework. In addition, IT staff in several organizations implementing telework have reported that since the vulnerabilities due to remote access for mobile workers and home-based teleworkers are very similar, the additional effort and resources needed to secure an agency's network against telework vulnerabilities are very small if vulnerabilities arising from other remote access applications have been adequately addressed.

Information security assessments conducted by federal organizations should include potential vulnerabilities emerging from home-based telework. Security issues arising from home-based telework should be addressed in enterprise-wide IT security and protection plans. Federal security policies specifically address all aspects of remote and Internet access for all applications, including (but not limited to) home-based telework.

Finally, telework programs should ensure that all teleworkers are educated regularly on these security topics (as should all employees in organizations utilizing sensitive or classified information).

Training

The analysis found that the more successful telework programs emphasize teleworker training. However, CIO's, teleworker coordinators, and teleworker managers confirmed that teleworkers often receive little or no specific training concerning the home IT environment. This appears to be the case despite the fact that teleworkers tend to be more dependent on their IT environment than office-based staff. In addition, managerial concerns over teleworker accessibility remains a primary issue facing telework implementation programs. Federal organizations continue to explore different approaches to allow teleworkers and managers to remain in contact. It is important to note as well that employee awareness is a fundamental element of an organization's information security program.

The role of education and training should be emphasized and expanded in federal home-based telework programs particularly in relation to IT, security procedures, and maintaining effective communications. Federal organizations should: first, assess the needs of home-based teleworkers and incorporate basic IT training into telework programs based on the needs of teleworkers as necessary; second, consider electronic means to assist teleworkers and managers to stay in contact during the business day (e.g., pagers, cell phones, email); third, provide training to teleworkers on appropriate procedures to maintain regular, reliable communications with their managers; and fourth, provide teleworkers with ongoing training on tools, processes, and procedures concerning information security and vulnerability.

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Introduction

This is the sixth and final deliverable submitted as part of Booz Allen's *Analysis of Technology Barriers to Home-Based Telework*.

Summary of Deliverables Schedule

1. Full Project Plan and Schedule
2. Assessment of Key Teleworking Technologies
3. Senior Management and Telework Program Management Perspectives on Technology Barriers
4. Questionnaire Results and Case Study Organizations' Perspectives on Technology Barriers
5. Draft Final Report
6. Final Report

Purpose of the Study

The overall study identified telework technology barriers and the results were used to propose solutions in order to make telework practical to Federal workers.

- Technology barriers to development, implementation, expansion, and/or successful functioning of federal home-based telework programs were identified and described
- In addition, the mechanisms by which these barriers impact telework were discussed
- The prevalence of barriers across agencies, number of employees impacted were estimated and organizational, occupational, and/or demographic prevalence relationships were determined
- Current market-based technology solutions, projected future technology solutions and time-to-market, and expected results were presented
- Methods by which Federal agencies can take advantage of current and near-term technology to break down barriers to home-based telework were described

Drivers of the Study

Recent legislation requiring Federal agencies to enable all eligible employees to telework was the impetus for this study of technology issues that may have an impact on organizations' ability to comply with the law.

- Congress requested a study of technology barriers to telework and potential solutions to help organizations negotiate these barriers
- The U.S. General Services Administration, one of the leading Federal agencies to promote and utilize telework, contracted with Booz Allen Hamilton to conduct this study on technology barriers to home-based telework
- Beginning with the hypothesis that information technology issues do present barriers to telework, Booz Allen investigated:
 - The existence and prevalence of technology-related barriers to telework
 - How these barriers are viewed from a variety of different organizational perspectives
 - What kinds of solutions to the technology-related barriers are available
 - Which solutions have proven to be successful in Federal telework programs

Summary of the Study's Major Activities

The study collected information from several different groups of telework stakeholders, which was analyzed to draw conclusions and make recommendations for Federal telework programs.

- Interviews with Chief Information Officers and their staff provided insight into the technical issues surrounding the high-level planning, management, and support of information technology that enables telework
- Focus groups with Telework Coordinators from the departments and agencies involved in the study shed light on the component-level issues related to developing, communicating, and enforcing policies on the use of equipment, services, and other technology for telework
- Questionnaires gathered information from Teleworkers and Managers of Teleworkers about their experiences with the information technology that is used for telework, and their perspective on which IT issues present the greatest challenges to telework
- Case studies of organizations with mature telework programs gave an organization-wide perspective on the technology-related factors that created the greatest barriers to their telework programs, and some common solutions that helped the organizations effectively overcome or avoid these barriers

Outline of Deliverable

The remainder of this report presents the study methodology, key findings from each of the telework stakeholder groups, and the conclusions and recommendations that were derived from these findings.

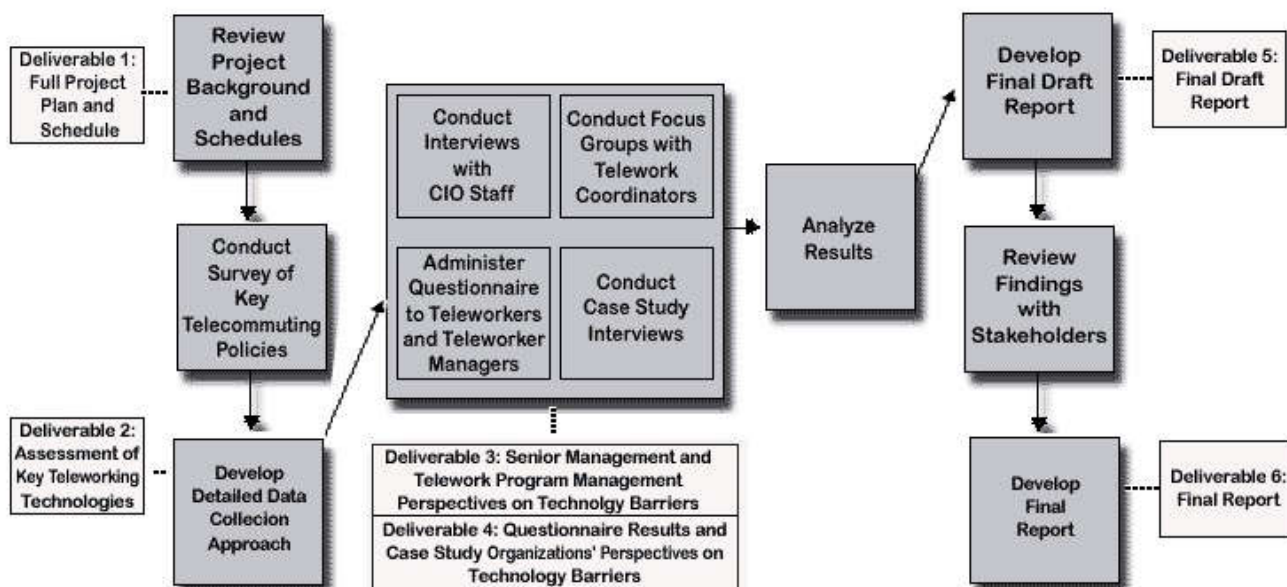
- [Chapter II](#) discusses the study methodology
 - Overview of the study's research plan
 - Selection of participating agencies and departments
 - Summary of the methodology used to gather data from each perspective
- [Chapter III](#) summarizes the major findings from different telework stakeholders' perspectives: CIOs and their staff, Telework Coordinators, Teleworkers, Teleworker Managers, and Case Study Organizations with mature telework programs
- [Chapter IV](#) provides aggregate findings across the different perspectives and identifies the sources of those findings
- [Chapter V](#) presents conclusions and recommendations that will help Federal organizations recognize, evaluate, and navigate the technology issues that may arise as barriers to the success of their telework programs

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Methodology

Approach

Booz Allen used a structured approach to comprehensively examine technology barriers to telework.



Logistics

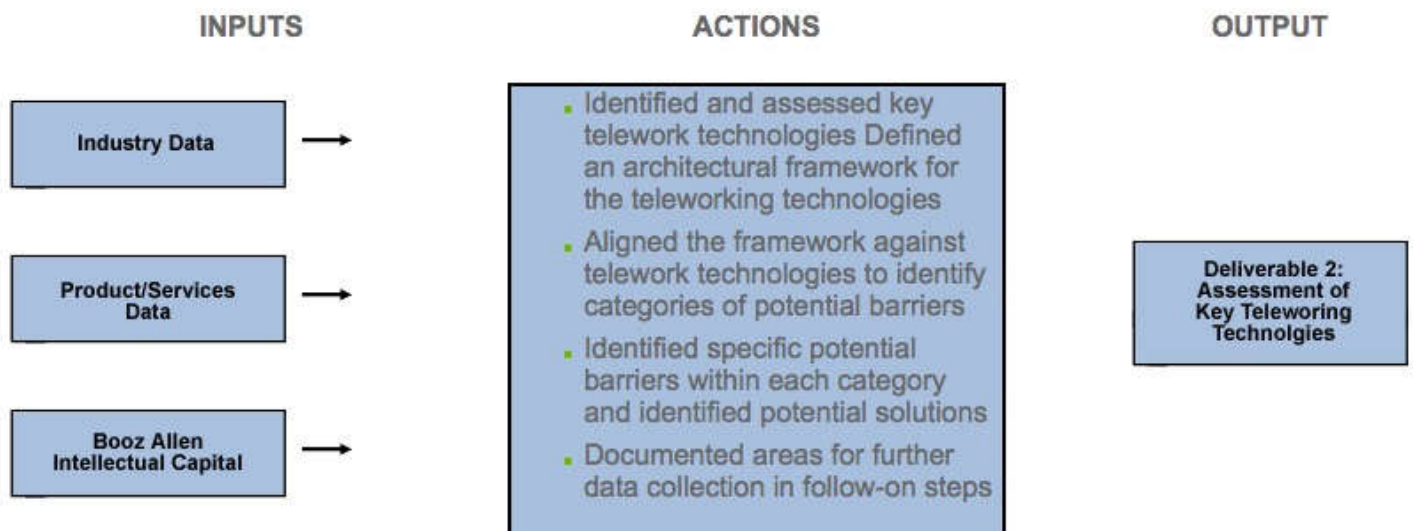
Booz Allen included ten Federal Departments/Agencies in the study.

- Booz Allen strove to select a set of organizations based on the following criteria:
 - Inclusion of a broad range of communities of work across the Federal Government
 - Organizations that have sufficiently broad perspectives concerning the technical barriers associated with telework
 - Organizations that have workforce populations representing a significant percentage of the Federal civilian employment base
- Six departments and four agencies were selected
 - Department of Commerce (DOC)
 - Department of Health and Human Services (HHS)
 - Department of Interior (DOI)
 - Department of Justice (DOJ)
 - Department of the Treasury
 - Department of Veterans Affairs (VA)
 - Federal Trade Commission (FTC)
 - General Services Administration (GSA)
 - National Aeronautics and Space Administration (NASA)
 - National Imagery and Mapping Agency (NIMA)

In addition, we conducted interviews with CIO staff at the Defense Information Systems Agency (DISA) to gain a DOD perspective on IT challenges facing home-based telework.

Assessment

The technology survey was conducted using publicly available industry data, product/services data, and Booz Allen intellectual capital.



CIO Interviews and Coordinator Focus Groups

Booz Allen designed standardized protocols to capture data through interviews and focus groups.

- Interview and focus group protocols were crafted with open-ended questions designed to provoke discussion; interview questions were also designed to flow in a logical progression to keep participants on topic
- Interview and focus group protocols were designed with parallel questions, to the extent appropriate, to allow for comparisons across perspectives
- Each protocol contained open-ended questions in the following categories
 - IT Equipment and Services
 - Procurement and Funding
 - Systems Performance and Compatibility-Computers
 - Systems Performance and Compatibility - Telephone Communications - Technical Support
 - Security

- Accessibility for Teleworkers With Disabilities
- Usability
- Organization and Management
- Additionally, several general questions were asked at the beginning and end of each session
- Focus group participants were also asked to respond to a set of rating and ranking questions
- Seven interviews were conducted with CIOs and their staff between October 23 and November 16, 2001; one interview was conducted after January 1, 2002 due to scheduling constraints
- Ten focus groups were conducted with telework coordinators between October 18 and November 1, 2001
 - Telework coordinators were encouraged to include other staff (e.g., work/life coordinators, human resources staff, technical support staff) with varied insights
 - In two organizations, one-on-one interviews were conducted instead of focus groups due to the limited number of telework coordinators
 - During the planning phase, we determined that one organization (FTC) has not yet enacted telework; therefore, we excluded them from this analysis

Questionnaires

Booz Allen designed questionnaires to gather information about how teleworkers and their managers experience the different categories of technology barriers.

- The previously-identified categories of technology barriers were used to design high-level research questions and more specific sub-questions
- The research sub-questions were used to craft questions that would be appropriate from the teleworker and/or teleworker manager perspective
- The questionnaires contained questions in following categories:
 - Access to IT Equipment and Services
 - Procurement and Funding (Manager version only)
 - Systems Performance and Compatibility
 - Telephone Communications
 - Technical Support
 - Security
 - IT-related Training for Telework
 - Accessibility for Teleworkers with Disabilities
- A total of 2,416 teleworkers and 897 teleworker managers were invited to participate in the questionnaires
 - 1,030 teleworkers submitted responses, generating a respectable response rate of 43 percent; after screening out respondents who did not fit the study's definition of teleworker, there were a total of 678 valid teleworker questionnaires
 - 339 teleworker managers submitted responses, generating a respectable response rate of 38 percent

Case Studies

Booz Allen conducted "Case Study" interviews with representatives from eight Federal organizations with established telework programs.

- Ten federal organizations, small agencies, or subcomponent level organizations known to have established telework programs were asked to participate in "case study" interviews
- Eight of these organizations agreed to participate in the study:
 - Wright Patterson Air Force Base
 - Department of Commerce - Patent and Trademark Office (PTO)
 - General Services Administration - Public Buildings Service Region 7
 - Department of the Treasury - Treasury Inspector General for Tax Administration (TIGTA)
 - Consumer Products Safety Commission
 - General Services Administration, Region 1
 - National Aeronautics and Space Administration - Langley Research Center
 - Internal Revenue Service - Modernization Information Technology Services
- Categories of technology barriers were used to design high-level research questions and more specific sub-questions; the research sub-questions were used to craft questions for the interview protocols that would be appropriate for established telework programs
- The case study interview protocol questions focused on obtaining information about practices and procedures relevant to information technology supporting telework to address and successfully manage technology barriers to telework

- Based on the findings from the case study interviews, Booz Allen presents telework practices for each of the categories of technology barriers

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Key Findings by Perspective

By gathering data through a variety of sources, Booz Allen was able to assess information technology impacts on Federal home-based teleworks from multiple perspectives.

- In this chapter, we present the key findings that emerged through each of our data collection methods
 - Technology Survey
 - CIO Interviews
 - Focus Groups with Telework Coordinators
 - Questionnaires with Teleworkers and Teleworker Managers
 - Case Studies
- Findings are presented by perspective because they provide insight into how those in different roles may perceive technology barriers to telework differently

Technology Survey

The technology survey evaluated a wide range of information technology components supporting the home-based telework environment, and provided the basis for assessment of potential barriers in subsequent analyses.

- The technology survey assessed potential telework barriers that emerged from key technology components across three telework domains
 - Residence
 - Network
 - Enterprise
- Architecture elements in each domain were assessed from the standpoint of functionality, performance, cost, and ease of use
- The assessment of potential barriers for each domain led to a functional category grouping of sixteen barriers, which were used to structure data collection in later analyses
- Technology solutions (e.g., hardware, software, network services, technical support) are available that allow agencies to address most or all barriers in each area
- Severity or impact of these barriers may vary from agency to agency depending on agency mission, business priorities, and state of network/applications infrastructure
- Implementation of these solutions becomes a management issue for agency management defined by agency-specific needs, costs and investment requirements, current standards, and management processes

CIO Interviews

CIO staff provided enterprise-level perspectives on the use of technology for telework.

- CIO staff in many organizations have not yet addressed home-based telework in their agency's long range IT planning and budgeting efforts
 - Security implications of telework are a major concern, but believed by CIO staff to be solvable
 - Many organizations have not yet identified security vulnerabilities due to telework
 - Application of existing technology and practices can likely address foreseeable security risks
- CIO staff believe the following will likely become greater issues as telework expands:
 - Availability of high bandwidth residential ("last mile") data services
 - Performance of legacy client-server applications supporting critical agency operations
 - Availability of resources for enterprise level enhancements

Telework Coordinators Focus Group

Telework coordinators offered perspectives based on their experiences with telework implementation and operations.

- Coordinators view the task of obtaining funds to equip teleworkers with PCs and network services as the most significant challenge facing federal organizations

- While most coordinators do not view security as a major issue, there is concern that the volatility of the security issue could lead to future problems
- There is often a lack of communication and coordination between telework coordinators and IT staff with regard to telework implementation efforts
- Access to appropriate IT equipment in the home is a major challenge facing telework implementation; employees are frequently allowed to use recycled equipment or are permitted to use their own equipment
- The speed of a teleworker's network connection will impact the overall quality of a teleworker's home IT environment

Teleworker and Teleworker Manager Questionnaires

Teleworkers and managers provided several unexpected perspectives through questionnaires.

- Teleworkers and managers indicate that technology barriers have had little impact on decisions to implement telework or success of working from home
- More than half of teleworkers use their own personal computers and other equipment for telework
- Over 75% of teleworkers are using dial up connections to connect to their agency networks; 19% use some form of high-speed connection
- Teleworkers and managers most frequently cited performance and access to equipment and services as the greatest IT challenges to successful telework (though these challenges have not prevented telework)
- Most teleworkers receive little or no IT training related to telework
- Access to technical support is an issue that can seriously impact performance

Case Studies

The eight case studies illustrate the range of management and technology-related practices used in Federal telework programs.

- Successful organizations displayed several consistent practices:
 - Senior management support for telework
 - Multi-disciplinary management involvement in planning
 - Use of pilot programs to identify problems
 - Centralized budgeting and funding of telework implementation
 - Focused training for teleworkers, including IT
- Information security is a major consideration for most case study organizations; security training is a key component of overall information security assurance
- Many organizations with established telework programs use, accommodate, or are considering future use of residential broadband services

Cost Impact of Home-Based Telework

Specific agency telework policies and IT management decisions will govern the timing and magnitude of IT cost increases resulting from home-based telework.

- The in-home hardware configurations approved by an agency or its component organizations will likely have the biggest impact on home-based teleworker costs
 - Use of single computer or dual computers (for home and office)
 - Use of laptops versus desktops
 - Use of employee-owned equipment
 - Peripherals to be provided for teleworkers (e.g., printers)
- Network connectivity options will also impact teleworker IT costs
 - Choice of broadband connectivity services (DSL, cable modem, satellite)
 - Use of dial-up access
 - Reimbursement to employees for residential services
 - Installation technical support for teleworkers
- Investments in infrastructure enhancements will ultimately be driven by the state of an organization's infrastructure and the specific requirements that result from the organization's telework strategy
- Telework policies and pace of telework implementation will also govern the rate at which employees must be equipped with hardware and connectivity, which employees receive this support, and the timing of infrastructure investments

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Summary of Findings

Organization and Management

Organizations with established telework programs view top level commitment, communication, multi-disciplinary teams, conducting pilot programs, training and communication as critical to success.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
More established telework programs reported the following as elements critical for success <ul style="list-style-type: none"> • Top-level commitment • multi-disciplinary team to develop and shepherd the program • A pilot program to determine which aspects work well and to make modifications prior to rollout • Training and education 				X
Telework is implemented differently across and within organizations, and few organizations have established comprehensive, well-developed telework programs	X	X		
Lack of communication among those involved with implementing and managing telework programs (e.g., Information Technology, Human Resources, Security, Finance) negatively impacts telework success	X	X		
Organizations recognize that managers are responsible for ensuring that teleworkers with disabilities receive appropriate work-related IT accommodations on a case-by-case basis, similar to office-based situations	X	X		

Budget and Funding

Technology funding poses a very real challenge to the viability of telework; organizations have tackled this challenge in different ways.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Technology budgets for telework range from non-existent to centralized funding for teleworkers' expenditures <ul style="list-style-type: none"> • Some organizations have no dedicated budgets for telework information technology, which is often driven by a goal to keep the program cost neutral; funding is therefore often drawn from the teleworker's immediate department budget • Other organizations fund all telework costs out of centralized IT funds or pooled resources from different operating units • CIO staff often reported that technology funding is the responsibility of the teleworker's organization and there is limited funding at the agency level to support telework 	X	X		X
Among telework coordinators, funding emerged as the greatest of the technology barriers		X		
Funding is a serious barrier for some teleworker managers because it impacts whether they are able to provide equipment and services for teleworkers		X	X	
Many organizations feel that considerable enterprise-level infrastructure development needs to take place to support telework but these funds have	X			

not yet been allocated

Several case study organizations have analyzed and established a business case for telework. These organizations found that telework program can result in cost savings particularly related to reduced facilities costs

X

Security

Security does not appear to present insurmountable technical barriers to telework implementations.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Management at all levels view information security as a critical element facing organizations planning large-scale telework	X	X		X
However, most CIO staff and IT management, telework coordinators, and teleworker managers believe security issues can be managed	X	X	X	
CIO staff and IT management believe the necessary IT security products and services exist to address telework-related security requirements but implementation will be challenging				
<ul style="list-style-type: none"> • Need careful, consistent solution across the organization • Need resources and expertise to address overall security requirements, including telework 	X		X	
Several organizations working with classified information have indicated that the incremental costs of meeting telework security requirements is very low, once overall network and system security requirements have been adequately addressed	X			X
Agencies emphasize security training as a key component for ensuring information security in home-based telework environments	X			X

Telework Equipment

Lack of access to computer equipment is not a barrier for home-based teleworkers but related issues of performance, compatibility, equity, and IT support are a concern.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Many organizations do not have a comprehensive plan in place to provide home teleworkers with IT desktop equipment that is equivalent to equipment that is provided to office users in terms of performance and capability	X	X		
Teleworkers predominately use a basic suite of equipment (i.e., computer, printer), which is adequate for enabling many of them to successfully work from home			X	
Over 50 percent of teleworkers are using their home (i.e., employee owned) computer equipment for telework, which may not be fully compatible with the office based environment			X	
The use of recycled equipment is frequently a method of providing equipment to teleworkers, and this equipment is often older and will not support the same software that is used in the office		X		
Some organizations raised concerns about possible restrictions (e.g. regulations, vendor license constraints) against purchasing hardware and/or software for the employee's home environment	X			
The use of many different types of systems will create increased	X		X	

problems (e.g., file sharing, IT support) as more people telework and do so more frequently

Several organizations are addressing the IT equipment issue by migrating to laptops and docking stations as the standard office desktop environment to support teleworkers and mobile workers

Specific technical decisions placed on IT for home-based telework are made at the component level and potentially may differ among individual components within the same department

Stakeholders rate the lack of access to equipment as a minor barrier to successful telework, but give it a high rank compared to other barriers

X	X		X
X	X		X
	X	X	

Network Connectivity

Although it is the top technology related concern, access to network services is not currently a barrier to successful telework.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Over 75% of teleworkers are using dial up connections to connect to their agency networks; 19% use some form of high-speed connection	X		X	
Network connection is rated as the most serious performance issue, and the need for broadband connections will increase as telework becomes more prevalent and frequent	X			X
CIO staff and IT managers view the last mile as the key bottleneck and limitation on the performance experienced by home teleworkers	X			X
Even without the need to access agency applications, dial-up access has inherent limitations that will limit its effectiveness in the near future	X			
Compared to teleworkers who use a dial-up connection, more teleworkers who use a high-speed connection can perform all of their work activities from home and have fewer problems with the speed or reliability of their network connection			X	
Several organizations are aggressively promoting high bandwidth access services to address the need for broadband connections	X			X
However, different high-speed network connection services are associated with different challenges related to data security, billing, and policies enabling organizations to pay or subsidize the service. In addition, developing a common connectivity approach can be difficult due to the diverse computing requirements of teleworkers and the availability of service				X
There is little consistency across case study organizations with respect to paying for network connections, although many teleworkers would like their agency to pay for a broadband connection				X
Stakeholders rate the lack of access to network connection as a minor barrier to successful telework, but give it a high rank compared to other barriers		X	X	

Training

Although many organizations do not provide telework-related IT training, established telework programs find training can be a key to success.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Many organizations provide little or no telework-related IT training	X	X	X	X

- 67% of managers report that teleworkers receive little or no IT training related to telework
- 48% of teleworkers say that they have not received any training related to telework

A few organizations have established training on operational issues that teleworkers are expected to take before they begin telework. Other organizations use more informal methods of training such as one-on-one instruction or instruction sheets on using remote access or configuring the computer

x

Formalized security training is the most consistent component of telework arrangements and is generally regarded as an important part of the telework program

x

CIO staff and IT management believe all IT security issues arising from home-based telework can be resolved through application of technology, implementation of security processes and procedures for sensitive information, and employee training

x

Compared to other IT issues, training was ranked as the least serious barrier to telework. However, teleworkers suggested training on equipment set-up, connectivity, use at remote locations, and troubleshooting would be helpful

x

x

Technical Support

Although not rated as a top barrier to telework overall, teleworkers' problems with technical support can present barriers to telework because it can seriously affect their performance.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Typically, home-based teleworkers utilize the same technical support resources as office-based employees	x			
Teleworkers have different IT support needs than office-based workers and the IT organization does not yet have a full understanding of these differences	x	x		
Typically, the support provided to home-based teleworkers is limited relative to the levels of support provided to office-based staff	x			
Most organizations reported that maintenance is offered for government-provided equipment used in the home but typically the equipment must be brought into the office for servicing (although a few organizations provide at home service)	x	x	x	x
Maintenance is rarely offered for teleworker-provided equipment; however, some organizations will provide applications support for teleworker-provided equipment and software used for government business such as email	x	x	x	
Although not rated as a top barrier to telework overall, teleworkers' problems with technical support can present barriers to telework because it can seriously affect their performance			x	
Desktop management products exist to allow IT staff and help desk to monitor employees' computer over the network, but these have not been widely deployed due to funding issues and other constraints	x			

Telecommunications

Although telecommunications does not present a significant barrier to telework, second phone lines and payment of those lines remain as needs for teleworkers.

Findings (Bullet in the columns on the right indicates the source(s) of the findings)	CIO Staff	Telework Coordinators	Questionnaires	Case Studies
Few organizations believe that telephone communications present a significant barrier to telework		X		
Most teleworkers have access to telephone communications services, including teleconferencing and the ability to communicate by phone while working online			X	
Almost three quarters of teleworkers report that they are able to have a telephone conversation while they are connected to the Internet or their agency's network:				
<ul style="list-style-type: none"> • 42% have more than one phone line • 17% use a cellular phone • 13% do not use their phone line to connect to Internet 			X	
Some organizations pay for additional phone lines, provide cell phones, phone cards, reimburse for long-distance, and/or encourage instant messaging		X		
Although not considered a barrier to telework, some teleworkers remarked that they would like agencies to provide a second phone line or cell phone and reimburse for long-distance charges			X	

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Conclusions and Recommendations

Overview

Recommendations are primarily directed toward management behavior concerning technology issues impacting telework implementation.

- Senior management of federal organizations should take a leadership role in promoting the adoption of home-based telework to ensure sufficient support by IT and other functional organizations
- Information technology requirements for home-based telework should be factored into long range enterprise architecture and capital planning efforts
- Federal organizations should consider technologies that can better enable telework implementation
- Broadband residential services should be used to expand telework opportunities and improve overall quality of service
- Information security assessments should include potential vulnerabilities emerging from home-based telework
- Effective IT training should be incorporated into federal home-based telework program

Senior Management Involvement

Senior management of Federal organizations should take a leadership role in promoting the adoption of home-based telework to ensure sufficient support by it and other functional organizations.

Conclusions

Involvement of top management within specific line organizations has been critical to successful telework implementation

Senior CIO and IT management involvement has been critical to addressing IT needs of telework programs on an ongoing basis

Realization that the economic benefits of telework can offset or even fully recover any additional IT costs can motivate important stakeholders to contribute to telework implementation efforts

Recommendations

Departments and agencies should provide guidance to senior agency executives to take a leadership role in promoting home-based telework within their organizations

CIOs and IT management should educate other management on how to best leverage information technology to further telework programs and mitigate risk

Departments and agencies should provide guidance to subordinate organizations to conduct business case analyses to identify full costs and benefits, including IT components, facilities, recruiting, retention, contingency support, and security and risk assessments

Departments and agencies should provide guidance to subordinate organizations to assist in creating well-structured telework programs, including:

Well-structured pilot programs have led to successful telework programs

- Use of pilot programs
- Training
- Equipment, services, and support provided to the teleworker
- Use of employee-owned equipment and services

IT Planning for Telework

Information technology requirements for home-based telework should be factored into long range enterprise architecture and capital planning efforts.

Conclusions

Many organizations are not addressing IT infrastructure needed for home-based telework in their IT spending plans

Home-based telework programs which have been more successful provide funds for teleworker IT equipment and services at the enterprise level

Home-based teleworkers are often using employee-owned or recycled government equipment, which may not be compatible with the current office desktop environment

The degree of technical support provided to home-based teleworkers varies widely within an agency

IT management involved in successful telework implementations align standards for the home IT environment with the organization's desktop standards

Reliance on employee-owned equipment for home-based telework can impact the effectiveness of teleworkers, particularly when using legacy client-server applications

IT management should assess the impact of home-based telework technical requirements on a broad range of enterprise architecture components.

- Performance and usability should be considered when evaluating IT configurations for home-based teleworkers
 - Types of hardware (computers, printers, use of laptops versus desktops)
 - Office automation and workgroup software
- Technical support for home-based teleworkers may impact how network and desktop configuration management systems should be configured to provide better visibility into employee machines outside the organization's physical network
- Requirements for connectivity between the home and office environment should address performance, security, and compatibility with the organization/agency network
- Security requirements should also be considered in the evaluation of intrusion detection, virus protection, and other security measures
- Performance and usability of legacy applications in the home environment should also be factored into decisions concerning modernization and redesign of existing applications

Federal organizations should consider technologies that can better enable telework implementation.

- Document management systems

Recommendations

Federal organizations should incorporate requirements for home-based telework into their IT capital planning and budgeting processes

System development and modernization decisions should include support for telework as potential benefits

Agencies should define technical requirements for home-based teleworkers as part of their enterprise desktop architecture to ensure availability of end user systems and support services compatible with the office environment

Departments and agencies should clarify policies governing the use of employee-owned or provided equipment and services for government business

Federal organizations allowing use of employee-owned equipment should define standards and configuration requirements that must be met by the home system in order to support home-based telework

- Collaboration tools
- Performance measurement systems
- Portal delivery tools
- Authentication tools
- Secure network technologies
- Web-based application design

Broadband Services

Broadband residential services should be used to expand telework opportunities and improve overall quality of service.

Conclusions

The capacity and performance of the teleworker's connection to the network will be the most important driver of IT service quality for home-based teleworkers

Relatively few teleworkers today are equipped with residential broadband services

Many legacy client server applications supporting Government operations will not work reliably over dial-up connections

Successful telework programs have established rules governing the funding of residential broadband services to support telework implementation

Several organizations have been unwilling or unable to pay for certain broadband services

The ability of broadband service providers to support secure network access services and technologies has not been fully demonstrated in the federal environment

Configuration of residential broadband services for home-based telework will present challenges to agencies and teleworkers as implementation expands

Recommendations

Federal IT organizations should identify broadband options for home-based telework to match expected operational requirements of teleworkers (application access requirements, percentage of time spent teleworking)

Telework policies should address and clarify government funding of residential broadband services for home-based telework

The CIO Council should explore ways to work with the broadband services industry to identify and resolve technical and service issues on an ongoing basis

Government organizations should evaluate all broadband residential service options for potential telework applications

- To improve availability of broadband service alternatives for teleworkers
- To ensure these services meet appropriate agency technical and security requirements

Information Security

Information security assessments should include potential vulnerabilities emerging from home-based telework.

Conclusions

Organizations with classified and sensitive information have been able to adequately address security concerns in deployment of successful telework programs

Telework security issues in many federal organizations can be adequately managed as part of a comprehensive information security program

Technology solutions for security vulnerabilities arising from remote network access are available for many federal agencies, but must be applied by organizations to support their specific infrastructure requirements

Adequate security education of staff is an equally critical element as a secure infrastructure

Recommendations

Federal security policies should specifically address all aspects of remote and Internet access for all applications, including (but not limited to) telework

Federal organizations should ensure that security issues arising from telework are addressed in enterprise-wide IT security assessments and protection plans

Telework programs should ensure that all teleworkers are educated regularly on information protection procedures and

Training

Effective IT Training should be incorporated into Federal home-based telework programs.

Federal organizations should assess needs of home teleworkers and incorporate specific IT training targeted to telework programs as necessary

Conclusions

Teleworkers often receive little or no specific training concerning the home IT environment

Teleworkers may be more dependent on their home IT environment (desktop computer, network connection) to maintain communications with the rest of the organization than office-based staff

Teleworker training is emphasized in successful telework implementations

Federal organizations have explored different approaches to allow teleworkers and managers to remain in contact

Manager concern over teleworker accessibility is an issue facing telework programs

Employee awareness is a major element of an organization's information security program

Recommendations

Federal organizations should assess needs of home teleworkers and incorporate specific IT training targeted to telework programs as necessary

Federal organizations should provide guidelines and training to teleworkers on appropriate procedures to maintain regular, reliable communications with their managers

Federal organizations should consider electronic means to assist teleworkers and managers to stay in contact during the business day (e.g., pagers, cell phones, email)

Federal organizations should provide teleworkers with ongoing training on tools, processes, and procedures concerning information security and vulnerability

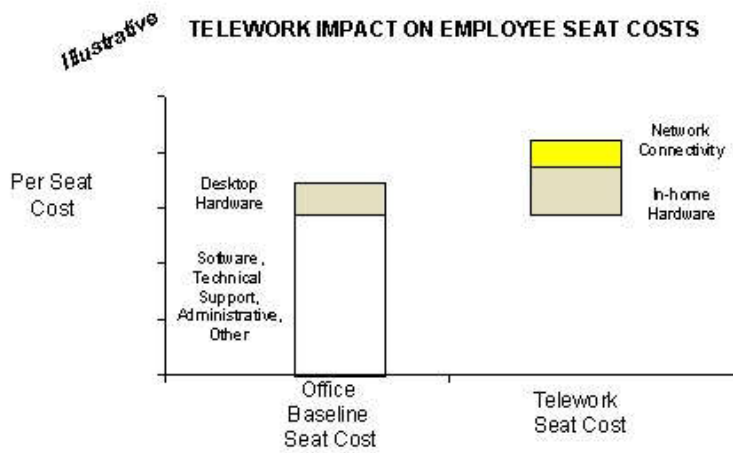
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Appendix - Cost Impact Of Home-Based Telework

Information technology for individual employees will be the primary driver of additional IT costs for supporting home-based telework.

- Home-based teleworkers may require a second PC for the home environment or a more expensive computer (e.g., laptop with docking stations at home and the office)
- Teleworkers will also connect to the office environment through the agency network through the public telecommunications network and the Internet (depending on the technical approach taken)
- As telework expands to the entire base of eligible federal employees, the costs for these "per employee" components will increase employee IT seat costs
- In addition, federal organizations will need to enhance portions of their IT infrastructure to support home-based telework; these enhancements could include remote access enhancements, network/desktop configuration management tools, application redesign, Internet security, and others
- Most infrastructure enhancements to better support telework will likely be dual- or multiple-use investments (i.e., enhanced support for mobile/traveling workers) in which the costs can be shared across multiple benefits

Hardware and network connectivity costs will add to an organization's information technology seat costs for home-based teleworkers.



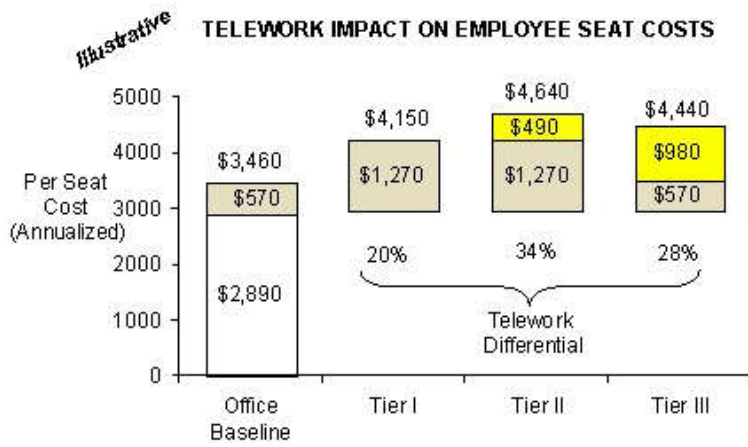
Specific agency telework policies and IT management decisions will govern the timing and magnitude of IT cost increases resulting from home-based telework.

- The in-home hardware configurations approved by an agency or its component organizations will likely have the biggest impact on home-based teleworker costs
 - Use of single computer or dual computers (for home and office)
 - Use of employee-owned equipment
 - Peripherals to be provided for teleworkers (e.g., printers)
- Network connectivity options will also impact teleworker IT costs
 - Choice of broadband connectivity services (DSL, cable modem, satellite)
 - Use of dial-up access
 - Reimbursement to employees for residential services
 - Installation technical support for teleworkers
- Investments in infrastructure enhancements will ultimately be driven by the state of an organization's infrastructure and the specific requirements that result from the organization's telework strategy
- Telework policies and pace of telework implementation will also govern the rate at which employees must be equipped with hardware and connectivity, which employees receive this support, and the timing of infrastructure investments

For example, one organization's telework support policy governs the hardware and the network connectivity provided to individual teleworkers based on days spent at home.

Level	Eligible Days/Week For Telework	Configuration/Agency Support	Per Employee Cost Impact
I	1-2 Days	Agency-provided laptop with dial-up access	<ul style="list-style-type: none"> • Hardware costs for laptop and docking stations
II	3-4 Days	Agency-provided laptop, 50% rebate for DSL	<ul style="list-style-type: none"> • Hardware costs for laptop and docking stations • 50% of DSL installation, equipment, and monthly service costs
III	5 Days	Agency-provided desktop, 100% rebate for DSL	<ul style="list-style-type: none"> • Hardware costs for laptop and docking stations • 100% of DSL installation, equipment, and monthly service

Such policies would incrementally increase in employee IT seat costs relative to seat costs for office-based staff.



- Assumptions:
- Agency office baseline averaged from seat costs from several organizations
 - Desktop computer cost is \$1600
 - Laptop cost with docking stations is \$3500
 - DSL installation cost is \$600, service cost is \$60/month

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