

Final
Report 1999-24



An Evaluation of the Cambridge Telework Center

Technical Report Documentation Page

1. Report No. MN/RC - 1999-24	2.	3. Recipients Accession No.	
4. Title and Subtitle AN EVALUATION OF THE CAMBRIDGE TELEWORK CENTER		5. Report Date January 1998	
		6.	
7. Author(s) Paul R. Sackett, Ph.D.	8. Performing Organization Report No.		
9. Performing Organization Name and Address University of Minnesota Industrial Relations Center 321 19th Avenue, So. Minneapolis, Minnesota 55455-0438	10. Project/Task/Work Unit No.		
	11. Contract (C) or Grant (G) No.		
12. Sponsoring Organization Name and Address Minnesota Department of Transportation 395 John Ireland Boulevard Mail Stop 330 St. Paul, Minnesota 55155	13. Type of Report and Period Covered Final Report June 1996 - June 1997		
	14. Sponsoring Agency Code		
15. Supplementary Notes Appendices available upon request.			
16. Abstract (Limit: 200 words) This report summarizes an evaluation of the first year of the Cambridge Telework Center, where Minnesota Department of Transportation employee volunteers work one or two days a week instead of commuting to Twin Cities sites. Researchers surveyed participants and their supervisors at the beginning of their involvement, six months later, and a final survey a year later. The surveys asked questions about commuting time and distance, expectations about and experiences with telework, job satisfaction and other work attitudes, job performance, day-to-day operations at Cambridge, and other issues. The Telework Center reduces commuting time and distance by a per day average of 32 miles and 74 minutes. In the first survey, participants and supervisors expected to see improvements in a wide variety of areas, including quality and quantity of work, job satisfaction, and reduced stress. One year later, the two groups reported that most of these expectations were met, and they rated their telework experience as positive. However, according to direct measurements, teleworker job satisfaction and commitment to the organization remained unchanged from the program's start to one year later. The same proved true with job performance.			
17. Document Analysis/Descriptors telework human resources alternate transportation	18. Availability Statement No restrictions. Document available from: National Technical Information Services, Springfield, Virginia 22161		
19. Security Class (this report) Unclassified	20. Security Class (this page) Unclassified	21. No. of Pages 35	22. Price

AN EVALUATION OF THE CAMBRIDGE TELEWORK CENTER: Commuting Time and Distance, Work Attitudes, Job Performance, and Financial Impact

Final Report

Prepared by:

Paul R. Sackett, Ph.D.
Industrial Relations Center
University of Minnesota

With the assistance of:

Daniel Magan and Daniel Ostgaard
Industrial Relations Center
University of Minnesota

January 1998

Published by:

Minnesota Department of Transportation
Office of Research Services
Mail Stop 330
395 John Ireland Boulevard
St. Paul, MN 55155

This report presents the results of research conducted by the authors and does not necessarily reflect the views of the Minnesota Department of Transportation. This report does not constitute a standard, specification or regulation.

TABLE OF CONTENTS

Executive Summary	2
Introduction	4
Methodology	5
Results	11
Conclusion	31

Executive Summary

- This report summarizes an evaluation of the first year of the Cambridge Telework Center. Participants worked at the center typically 1-2 days per week, retaining their regular work site. 18 individuals were participating in the project when the evaluation study began in June, 1996; by the final data collection in June, 1997, the number had risen to 28.
- The evaluation made use of survey methodology. Two groups were surveyed: participants in the telework program, and their immediate supervisors. Each group was surveyed on three occasions: an initial survey at the beginning of their involvement with the telework program, an intermediate survey roughly six months later, and a final survey after roughly 12 months involvement with the program. The surveys dealt with a variety of topics: 1) commuting time and distance, 2) expectations about and experiences with telework, 3) job satisfaction and other work attitudes, 4) job performance, 5) day-to-day operations at Cambridge, 6) teleworker financial expenditures and community involvement in Cambridge, and 7) open-ended comments.
- The Telework Center reduces commuting time and distance, with average savings of 32 commuting miles and 74 minutes saved for each day the Center is used in lieu of a participant's regular office.
- A small portion (8%) of the time savings are devoted to work-related activities; the rest is devoted to personal activities.
- The initial expectations for the telework center were positive for both teleworkers and their supervisors. Improvement in a wide variety of areas was expected, ranging from quality and quantity of work, job satisfaction, reduced stress, and quality of home life. One year later teleworkers and their supervisors report that these expectations were met, with limited exceptions (i.e., teleworkers found that job stress remained the same, rather than decreasing). Thus teleworkers and their supervisors are positive about the telework experience.
- However, other data offers a somewhat different picture. Teleworker job satisfaction and commitment to the organization were measured at the beginning of the telework program and again one year later, and average levels of job satisfaction and commitment were found to be unchanged. Supervisors evaluated teleworker job performance at the beginning of the telework program and again one year later, and performance was found to be unchanged. Thus direct measurement of satisfaction and performance suggest that these features do not change measurably; however retrospective measures in which teleworkers and supervisors are asked to estimate whether satisfaction and performance have changed yield self-reports of positive change. Our sense is that the direct measures are more trustworthy than the retrospective measures, which in all likelihood reflect the overall positive opinion of telework held by participants and their supervisors. While teleworkers may be able to point to occasions where telework had an affect on, say, how well they were able to complete a particular task, any changes due to telework are not substantial enough to affect overall performance evaluations.

- It is worth emphasizing that a conclusion of "no change" in job performance as a result of telework may be a positive finding in and of itself. One concern of skeptics is that absent close supervision teleworkers will lack the discipline to consistently exert high effort and that performance will decline. That performance levels do not decrease is a useful finding in and of itself. It is important to note, however, that individuals were not randomly selected to participate in the telework program. It is likely that supervisors would not have agreed to permit an employee to participate in the program if the supervisor was not confident in the employee's level of work effort. It is possible that different findings would result if employees were not prescreened prior to entering a telework program.
- It is also worth noting that it is not uncommon for evaluation research to rely solely on retrospective measures (i.e., asking participants whether they feel that their satisfaction, productivity, and other features have changed as a result of telework). Had we also relied solely on retrospective measures, we would have concluded that work attitudes and job performance increased as a result of participation in the telework program. However, by also including direct measures of work attitudes and performance at multiple points in time, we are led to a different conclusion. Thus study methodology may effect findings about telework programs.
- Teleworker expenditures and civic involvement in Cambridge were examined. Teleworkers spent an average about \$44 per week in Cambridge, with about half spent on groceries, and with restaurant and gasoline expenditures making up the bulk of the remainder. Teleworkers have generally not shifted activities such as banking, health care, college classes, and volunteer work from their home communities to Cambridge. Thus impact on Cambridge has been limited.

I. Introduction

In Spring of 1996, a research team at the University of Minnesota, headed by Dr. Paul Sackett of the Industrial Relations Center, undertook an evaluation of the first year of operations at the Minnesota Department of Transportation (MnDOT) Cambridge Telework Center. The Telework Center is a facility in Cambridge, MN, about one hour north of the Twin Cities, where select MnDOT employees who volunteer to participate in the program and receive supervisory approval can reserve office space for some portion of their work week, commonly one or two days. These employees maintain their current office at central MnDOT locations. The initial number of employees participating in the telework program was small: 18 employees were participating when data collection began in June, 1996; as of June, 1997, 28 employees had begun participating.

Participating employees held the following job titles: highway technician, marketing manager, assistant project management engineer, automation support specialist, personnel officer, motor carrier specialist, enforcement specialist, income maintenance program advisor, account clerk/tech/supervisor, programmer/analyst, office specialist, telecommunications analyst, engineering specialist, ITS-hydraulics application coordinator, hazardous materials specialist, rate and tariff supervisor, and employee development specialist.

The evaluation made use of survey methodology. Two groups were surveyed: participants in the telework program, and their immediate supervisors. Each group was surveyed on three occasions: an initial survey at the beginning of their involvement with the telework program, an intermediate survey roughly six months later, and a final survey after roughly 12 months involvement with the program. The surveys dealt with a variety of topics: 1) commuting time and distance, 2) expectations about and experiences with telework, 3) job satisfaction and

other work attitudes, 4) job performance, 5) day-to-day operations at Cambridge, 6) teleworker financial expenditures and community involvement in Cambridge, and 7) open-ended comments.

II. Methodology

A. Survey Development Process

The surveys were developed through an interactive, collaborative process between the University research team and a team of MnDOT employees involved in the planning and operations of the telework center. Initial draft surveys were generated by the University team and both face-to-face meetings and mail distribution were used to obtain feedback.

Between survey administrations, we kept in contact with administrators at the Telework Center and monitored previous results, which led to the addition of certain items in the second and third surveys. These new items addressed issues raised by respondents and administrators, the most notable of which were concerns about the low levels of computer support for teleworkers between the first and the second administration.

B. Study Design and Survey Distribution

The study used a time series design; no control group was used. One fundamental reason for the lack of a control group was that decisions as to who would participate in the telework program had been made prior to contacting the university research team to undertake the study. Thus it was not possible to, for example, randomly assign individuals to telework vs. no telework conditions. Recognizing this design limitation, the decision was made to track participants and their supervisors over time.

It is important to note that the Time 1 "baseline" measures were obtained as individuals began their participation in the telework program. This has the potential to affect study results. For example, consider the comparison of overall job satisfaction at Time 1 and Time 3. We would like to interpret the difference between the two measures as an indication of whether participation in the telework program affected satisfaction. However, the Time 1 measure would

ideally have been obtained prior to individuals knowing that they were going to participate in the telework program. It is possible that the Time 1 measure already reflects an increase in satisfaction, as simply the prospect of telework may have raised satisfaction levels. We attempted to deal with this problem by asking individuals to describe their average level of satisfaction over the past year in the baseline measure.

Surveys were distributed by mail from and returned to the University of Minnesota, with assurances to the participants that only the university research team would have access to their individual responses.

The formal plan for the evaluation called for a baseline survey (hereafter referred to as "Time 1"), a six month follow-up ("Time 2"), and a final 12 month follow-up ("Time 3"). Operationally, the first wave of surveys was administered in June, 1996, the second in November, 1996, and the third in June, 1997. However, it is important to note that the evaluation was not static: we did not simply follow the initial participants in the telework program through their first year. As additional participants joined the telework program, we administered the Time 1 surveys to the participants and their supervisors, with Time 2 surveys administered at the appropriate time, if possible. An employee who entered the telework program only one month before the final data collection for this project would thus contribute only Time 1 data. In short, the phrases "Time 1", "Time 2", and "Time 3" do not refer strictly to calendar dates, but rather are individualized to reflect the starting date of each teleworker's participation in the program.

C. Response Rates

Via a code number, the research team was able to monitor who did and did not respond to the surveys. We relayed the names of those not responding in a timely fashion to the on-sight coordinator in Cambridge, who encouraged the teleworkers and their supervisors to complete the surveys. A few teleworkers and supervisors chose not to respond, which was their right given the voluntary nature of the survey. Response rates for the surveys were quite high: 89% of

teleworkers and 93% of supervisors completed Time 1 surveys. The number of Time 3 surveys sent out was smaller (only the 18 teleworkers participating from the outset of the program were sent Time 3 surveys; the 10 individuals who joined the telework program over the course of the year only completed Time 1 and, in most cases, Time 2 surveys). However, response rates remained high, with 94% of teleworkers and 83% of supervisors who were sent Time 3 surveys completing them. We do note, though, that some individuals returned incomplete surveys, and thus the number of valid responses varies from item to item.

As with any survey, nonresponse is a potential problem. It is possible that non-respondents differ in their expectations, experiences, attitudes, and performance from those who do respond. However, the primary concern in this study was the determination of whether expectations, experiences, attitudes, and performance changed over the course of individual's participation in the telework program, and considerable insight can be gained from examining change over time among those who do respond. One limited method for examining non-response is to conduct separate analyses for individuals responding to all three surveys, and compare the results with those individuals providing incomplete data; we report such analyses in this report.

D. Survey Content

Supervisors and teleworkers received similar forms of the survey. Each was intended to assess the perceived benefits and drawbacks of the Cambridge Telework Center. But supervisors and teleworkers have different frames of reference and areas of expertise that we tried to tap in to. In this section, we separately outline the aims of supervisor and teleworker surveys, respectively.
(All actual survey items are reproduced in the results section of this report).

Teleworker Survey

Commuting time and distance

This section included questions on mode of transportation, time and distance to and from home and MnDOT office and to and from Cambridge, and the number of anticipated days of telecommuting. This section was included only on the Time 1 survey.

Telework experiences/expectations

The first wave was intended to establish a baseline measurement of expectations of how employees anticipated their jobs might be affected by teleworking. This point deserves restatement - this section, on the first wave, assessed employees' *future expectations* about teleworking, not necessarily feelings about their job at the present time. Subsequent surveys asked teleworkers to consider the same topics since they had begun teleworking. Issues addressed in this section included quality of their work, productivity, their relationship with supervisors, and what they expect to do with the commuting time they will presumably save.

Job satisfaction

The job satisfaction section measured the same areas in all three waves of the evaluation. Again, the first wave established the baseline and waves two and three measured any potential changes. Issues addressed in this section included overall satisfaction with their job, as well as satisfaction with technology, support (both computer-related and secretarial), their relationships with co-workers, and their perceptions of others' satisfaction with teleworking.

General work attitudes

Although similar to the job satisfaction section in aim, the general work attitudes section was intended as a more macro-level assessment of employee attitudes. Rather than asking specific questions about day-to-day issues, it addressed topics such as organizational loyalty (both in the abstract as well as tangible applications, such as intent to stay with MnDOT),

perceptions of their own time management skills, and perceptions of intra-organizational communication.

General economic information

The general economic information section was intended to assess the economic and social impact that a facility like the Telework Center can have on a community. For, on top of the benefit to the organization, part of the Cambridge Center's success might be measured by its contribution to the community in which it is located. Issues addressed in this section included the amount of money spent in various Cambridge businesses (e.g., banks, convenience stores, gasoline stations), and the level of community involvement (e.g., church groups, civic organizations) of employees both in their respective communities as well as in Cambridge.

Day-to-day at Cambridge

The day-to-day at Cambridge section was perhaps the most straightforward assessment of the Cambridge Telework Center. In this section, respondents were simply asked to assess their satisfaction with several common facets of working at Cambridge. Among them were parking facilities, the building's physical environment, computer services (both hardware and support), safety of personal belongings as well as computer files, and secretarial support.

Open-ended essay

The essay section, the last on the survey, asked was a primarily open-ended question. Although it prompted respondents to describe specific experiences (either good or bad) with teleworking, suggestions for improvement, or general feelings, there was no defined protocol.

Supervisor Survey

Telework experiences/ expectations

This first section of the survey was concerned with overall expectations (in the first survey) and experiences (in the second and third surveys) with regards to teleworking. Issues addressed included quality of the their (teleworking) subordinates' work, the quality of their work, and the

quality of the relationships that the employee had with the supervisor as well as non-teleworking employees of MnDOT.

General reactions

The general reactions section was intended to assess in a more concrete fashion, the advantages and disadvantages of teleworking. Rather than the experiences and expectations section, in which the statements were phrased rather neutrally, this section included both positive and negative self statements about specific situations. Respondents were asked to agree and disagree to varying degrees. Issues addressed included the level of supervisory control, the worker-supervisor relationship, and telework's general potential to benefit MnDOT.

Performance appraisal

The performance appraisal section of the survey, unlike the others, makes no reference to teleworking at all. It is intended to assess the perceived quality of a particular teleworker's work. The first wave survey provided a baseline measurement and subsequent waves provided the opportunity to measure any potential changes in job performance. Issues addressed included quality and quantity of output, level of teamwork, and dependability.

Open-ended essay

The essay section, the last on the survey, asked was a primarily open-ended question. Although it prompted respondents to describe specific experiences (either good or bad) with teleworking, suggestions for improvement, or general feelings, there was no defined protocol.

E. Analyses

The results presented in the section below rely on descriptive statistics: averages and frequency distributions. We do not rely heavily on inferential statistics. One key reason is that the sample sizes are quite small: roughly 25 at the maximum for Time 1 survey, and roughly 15 for Time 3 surveys. Participation in the program did not approach the numbers anticipated at the time this study was undertaken. One consequence is that differences across time periods would

need to be quite large to reach statistical significance. For example, most survey items are measured on a 5-point scale; with the available sample sizes, a mean difference of roughly half a scale point between two time periods is needed for a non-independent sample two-tailed t-test to reach significance at the .05 level. Virtually none of study variables yield significant differences. (Only a single item showed a statistically significant different between Time 1 and Time 3: item #28 on the teleworker survey dealing with opportunities for career advancement; see results section).

III. Results

A. Teleworker Survey - Commuting Time and Distance

The Time 1 survey contained information about commuting patterns that gives insight into time and mileage savings resulting from the use of the telework center. A summary of responses follows:

How do participants in the telework program report that they get to work?

79% of the time they drive alone

21% of the time they carpool

0 % of the time they take bus or other form of transportation

What type of vehicles do employees of MnDOT use when commuting to work?

(as teleworkers may drive different vehicles on different days, we report results in terms of "% of days", rather than "% of teleworkers")

29% of days - compact pickup truck

11% of days - subcompact car

22% of days - compact car

19% of days - intermediate size car

8% of days - full size car

3% of days - full size pickup

4% of days - minivan

4% of days - full size van

How far do employees of MnDOT commute to work?

Home to MnDOT 38.55 miles

Home to Cambridge 22.46 miles

Difference *16.09 miles*

How long does it take employees of MnDOT to get to work?

Home to MnDOT 58.36 minutes

Home to Cambridge 22.80 minutes

Difference *35.56 minutes*

How long does it take employees of MnDOT to get home from work?

Home from MnDOT 61.10 minutes

Home from Cambridge 22.62 minutes

Difference *38.48 minutes*

What will MnDOT employees do with the time they save due to using the Cambridge

Telework Center?

8% of the time saved is reported spent on job-related activities

92% of the time saved is reported spent on personal activities

How many days per week do MnDOT employees anticipate teleworking?

1.9

In sum, teleworkers save an average of 32 round trip miles and 74 minutes every day that they use the telework center. A small portion of the time savings is devoted to work activities; the bulk of the time savings is devoted to personal activities.

B. Teleworker Survey - Experiences/Expectations

As noted earlier, these items were framed in terms of expectations about telework at Time 1 and experiences with telework at Time 2 and Time 3. The actual survey instructions for Time 1 are reproduced below:

Section I : Telework Expectations

This section of the survey contains questions related your expectations regarding teleworking. Please think carefully about how you feel about each of these issues. Questions will be measured on the following five point scale:

Large Decrease	Some Decrease	No Change	Some Increase	Large Increase
1-----	2-----	3-----	4-----	5-----

Please indicate your response by placing the number corresponding to your choice in the blank provided next to each question.

The instructions for Time 2 and Time 3 were as follows:

Section I : Telework Experiences

This section of the survey contains questions related to how your job has changed since telework began. Please think carefully about how you feel about each of these issues. Questions will be measured on the following five point scale:

Large Decrease	Some Decrease	No Change	Some Increase	Large Increase
1-----	2-----	3-----	4-----	5-----

Please indicate your response by placing the number corresponding to your choice in the blank provided next to each question.

Each survey question is reproduced below, accompanied by the mean response at Time 1, Time 2, and Time 3. More detail, including standard deviations, medians, and a complete frequency distribution of results, is found in the Appendix. Refer to the scale above to interpret these findings: a value higher than 3 indicates that on average, individuals expected (Time 1) or experienced (Time 2 and Time 3) an increase in the aspect of the job under consideration as a result of the telework program.

Time 1 Time 2 Time 3

- | | | | | |
|-----|-----|-----|-----|--|
| 1. | 3.8 | 3.8 | 3.6 | My ability to get work finished on time. |
| 2. | 3.3 | 3.4 | 3.4 | The quality of my relationship with my supervisor. |
| 3. | 3.6 | 3.8 | 3.5 | The time I spend working on tasks and objectives. |
| 4. | 3.6 | 3.3 | 3.5 | The quality of my work. |
| 5. | 3.8 | 3.8 | 3.9 | My productivity. |
| 6. | 3.7 | 3.7 | 3.7 | The quantity of work I produce. |
| 7. | --- | 3.5 | 3.4 | The number of hours I spend working per day. |
| 8. | 4.5 | 3.9 | 4.2 | My overall job satisfaction. |
| 9. | 3.8 | 3.7 | 3.8 | My time management skills. |
| 10. | 3.2 | 3.3 | 3.4 | My ability to meet customer needs. |
| 11. | --- | 2.2 | 2.9 | The amount of time per day lost to interruptions. |
| 12. | 4.2 | 3.6 | 3.8 | The quality of my home life. |
| 13. | 2.3 | 3.0 | 3.0 | My level of job stress. |
| 14. | 2.9 | 3.2 | 2.9 | The quality of support services (e.g., secretarial, general office support). |
| 15. | 3.2 | 3.3 | 3.4 | The amount of discretionary income I have. |
| 16. | 3.1 | 3.0 | 3.0 | The quality of my relationships with co-workers. |
| 17. | 3.3 | 3.3 | 3.3 | My involvement in community activities. |
| 18. | 3.2 | 3.2 | 3.2 | The quality of my relationships with my customers. |

19. 3.0 2.8 2.8 My opportunities for career development and advancement.

A variety of observations about responses to these 19 items dealing with expectations and experiences can be made. First, it is clear that the initial expectations of the individuals participating in the telework program were high. Of the 17 items asked at Time 1, 13 produced mean responses greater than 3, indicating an expected increase in the job feature in question as a result of teleworking. For most items, means were between 3 and 4: between "neutral" and "some increase". Two items had means between 4 and 5: between "some increase" and "large increase"; thus these are the areas in which the largest amount of change was expected. These were item #8 (overall job satisfaction) and #12 (quality of home life).

Item #13, dealing with job stress, is one where participants reported an expected decrease (Time 1 mean = 2.3); for this item a decrease is a positive feature. For only two items were initial expectations negative. Teleworkers had initial expectations of a small decrease in quality of support services (item #14) and in opportunities for development and advancement (item #19).

In sum, teleworkers reported initial expectations of positive change for the vast majority of issues addressed. We turn now to whether these expectations were met. We focus on the Time 1- Time 3 comparison, as Time 2 reflected an interim response. The Time 1-Time 3 comparison indicates the degree to which initial expectations had been met one year later.

The most striking finding is the very high degree of consistency between Time 1 and Time 3 results. For only two of the 17 items measured at both Time 1 and Time 3 is there a mean difference as large three-tenths of a point. Item #8 (overall job satisfaction) shows a change from 4.5 to 4.2, indicating that while satisfaction did increase, it did increase to quite the degree initially expected. The largest difference found is on Item #13 (level of job stress). The initial expectation mean was 2.5, indicating an expected decrease in stress, while the Time 3 mean was 3.0, indicating no change in job stress.

Note that two items were not asked at Time 1, but were added to the survey for the Time 2 and Time 3 administration. In response to Item #7, teleworkers reported an increase in the number of hours spent working; in response to Item # 11, teleworkers reported only a very small decrease in time lost due to interruptions at Time 3.

Thus teleworkers report that initial positive expectations were met almost without exception. In no case do reported experiences contradict initial expectations (i.e., a feature expected to increase turned out, in fact, to decrease).

C. Teleworker Survey - Job Satisfaction

At Time 1, teleworkers were asked to report on their average level of job satisfaction over the last year; at Time 2 and Time 3, they were asked to focus on their average level of satisfaction since the telework program began. Time 1 instructions are reproduced below:

Section II : Job Satisfaction				
This section of the survey measures your level of job satisfaction. Job satisfaction changes from time to time; we are asking you to think about your average or general level of job satisfaction over the past year. These questions ask about your job as a whole, not just at the telework center. Satisfaction will be measured using the following five point scale:				
Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
1	2	3	4	5

Time 2 and Time 3 instructions are reproduced below:

Section II : Job Satisfaction				
<p>This section of the survey measures your level of job satisfaction. Job satisfaction changes from time to time; we are asking you to think about your average or general level of job satisfaction since the telework program began. These questions ask about your job as a whole, not just at the telework center. Satisfaction will be measured using the following five point scale:</p>				
Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
1	2	3	4	5

Each survey question is reproduced below, accompanied by the mean response at Time 1, Time 2, and Time 3. More detail, including standard deviations, medians, and a complete frequency distribution of results, is found in the Appendix. Refer to the scale above to interpret these findings: values higher than 3 indicate that on average, respondents are above the neutral point in their satisfaction with the job facet in question, while values lower than 3 indicate that respondents are below the neutral point.

Time 1 Time 2 Time 3

- | 20. | 3.8 | 4.0 | 3.7 | Overall, how satisfied are you with your job? |
|-----|-----|-----|-----|--|
| 21. | 3.5 | 3.0 | 3.7 | How satisfied are you with your office technology (e.g., computer hardware and software, other necessary office equipment)? |
| 22. | --- | 2.9 | 2.9 | How satisfied are you with the level of recognition you get for the work you do? |
| 23. | 3.5 | 3.5 | 3.4 | How satisfied are you with your support services? That is, general secretarial support (e.g., copy services, taking messages). |
| 24. | 4.0 | 3.6 | 3.9 | How satisfied are you with your relationship with your supervisor? |
| 25. | 3.5 | 2.6 | 3.6 | How satisfied are you with your technical support (e.g., repairs needed to computers or other office equipment)? |
| 26. | 3.9 | 3.5 | 3.7 | How satisfied are you with your relationships with your co-workers? |
| 27. | 3.3 | 3.3 | 2.9 | How satisfied are you with your pay? |

28. 2.8 2.8 2.2 How satisfied are you with your opportunities for career advancement?
29. 3.2 3.5 2.9 How satisfied are you with your ability to get the information you need to complete your job tasks?
30. 3.4 3.4 3.3 How satisfied are you with your ability to stay informed about departmental and organizational events and activities.

The above data show a number of interesting findings. Perhaps most striking is the generally high degree of consistency between Time 1 and Time 3 results. The overall pattern that emerges is that there is very little change in job satisfaction over the course of the first year of the telework program. Change is noted on two dimensions: Item #27 (satisfaction with pay) shift from slightly above neutral to slightly below neutral; item #28 (satisfaction with career advancement) showed the highest level of initial dissatisfaction (Time 1 mean = 2.8); by Time 3 this dropped to 2.2); this is the only difference that is statistically significant,. It is not clear that these changes are attributable to the telework program; the Time 1- Time 3 comparison also reflects any change due to organizational policies and practices during the one year period.

There is an interesting dilemma in comparing the results in the section of the survey with results from the earlier section on expectations and experiences. In the earlier section, teleworkers had been asked whether their overall job satisfaction had increased over the course of the first year in the telework program (Item #8). The mean response indicated that they reported an increase in satisfaction. Yet when satisfaction measured directly at Time 1 is compared with satisfaction measured directly at Time 3 (Item #20), results are virtually identical: 3.8 at Time 1 vs. 3.7 at Time 2. Thus two different approaches to measurement produce different results: when asked if they are more satisfied than when the program began, teleworkers answer "yes", but when reported levels of satisfaction at Time 1 are compared with reported levels of satisfaction at Time 3, no change is seen. Perhaps the reported increase is too small to be reflected in the direct comparison of Time 1 - Time 3 satisfaction measures. Perhaps teleworkers do not accurately recall their initial levels of satisfaction when reporting that satisfaction has

increased. And perhaps teleworkers report an increase in satisfaction due to telework because they have strong positive feelings overall for the telework program. In any event, we suggest that the conservative approach is to place trust in the direct comparison of Time 1 and Time 3 measures, and conclude that overall job satisfaction has not changed measurably over the course of the first year of the telework program.

D. Teleworker Survey - General Work Attitudes

Like the previous section dealing with job satisfaction, Time 1 instructions focused on the average level of attitude over the last year, while the Time 2 and 3 instructions focused on the average level since the telework program began. We reproduce here only the Time 2 and 3 instructions:

Section III : General Work Attitudes				
<p>In this section, we will be asking you a series of general questions that you may either agree or disagree with. We realize that your attitudes to these issues may change over time, so we again ask that your response not necessarily indicate what you are feeling today, but rather what your average or general level of feeling has been since the telework program began. Please refer to the following five point scale when answering these questions:</p>				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1-----	2-----	3-----	4-----	5-----

Each survey question is reproduced below, accompanied by the mean response at Time 1, Time 2, and Time 3. More detail, including standard deviations, medians, and a complete frequency distribution of results, is found in the Appendix. Refer to the scale above to interpret these findings: values higher than 3 indicate that on average, respondents are above the neutral point in their agreement with the item, while values lower than 3 indicate that respondents are below the neutral point, indicating disagreement.

Time 1 Time 2 Time 3

- | | | | |
|---------|-----|-----|--|
| 31. --- | 3.1 | 3.9 | Most of the time, it is clear to me what my work priorities are. |
| 32. --- | 3.7 | 3.1 | Where I work, employees are encouraged to participate in decisions which affect their work. |
| 33. --- | 3.8 | 3.9 | I have enough opportunities to talk with my immediate supervisor. |
| 34. 3.5 | 3.7 | 3.5 | I feel very loyal to this organization. |
| 35. 3.1 | 3.3 | 3.4 | I could just as well be working in a different organization as long as the type of work were similar. |
| 36. 2.4 | 2.8 | 2.6 | It would take very little change in my present circumstances to cause me to leave this organization. |
| 37. 3.0 | 3.5 | 3.1 | For me, this is the best of all possible organizations for which to work. |
| 38. 3.8 | 3.8 | 3.7 | I intend to stay with this organization for a long time. |
| 39. 3.9 | 3.7 | 3.9 | I have a good relationship with my supervisor. |
| 40. 4.0 | 3.6 | 3.9 | I believe that my supervisor has ample opportunity to observe my work and effectively evaluate my performance. |
| 41. 3.8 | 3.7 | 3.4 | I feel comfortable with my current level of autonomy. |
| 42. 3.0 | 3.1 | 2.9 | I believe I receive timely feedback about my job performance. |
| 43. 4.1 | 4.2 | 4.1 | I believe I manage my time efficiently. |
| 44. 2.7 | 2.8 | 2.4 | I believe I have ample opportunity for career advancement. |
| 45. 3.4 | 3.0 | 3.2 | I receive valuable input from my peers/co-workers. |
| 46. --- | 2.6 | 2.4 | Working at Cambridge has led me to feel isolated from some co-workers at MnDOT. |

The dominant theme in examining the Time 1 -Time 3 data for the general attitude items is the high degree of consistency over time. Of the 16 items in this section, means are virtually unchanged over time for 12. Item #31 (clarity of work priorities) shows an increase over time, which is consistent with the notion that there is likely to be a period of adjustment when moving to a new work arrangement, such as telework. Item #32 (employees encouraged to participated

in decisions) shows a decline, as does the related item #41 (level of autonomy). It is not clear that these changes reflect issues directly related to telework, or whether they reflect broader organizational issues. Item #44 (opportunity for career advancement) parallels findings from earlier items #19 and #29, which also dealt with career advancement. Career advancement is an area in which participants report concern and dissatisfaction consistently, from Time 1 to Time 3. Thus career advancement appears to be an organizational issue that is broader than a concern about telework.

This section contained a set of items dealing with issues of commitment to the organization (e.g., loyalty, intent to stay with the organization; items #34-38); the high degree of consistency of responses to these items is notable. Telework does not appear to produce a marked change in commitment to the organization. Similarly, a set of items dealing with relationships with the direct supervisor (items #31, 39, and 40) also show a high degree of consistency. This is useful information, as one concern about telework is that absence from direct contact with the supervisor may adversely affect relations with the supervisor. These data do not support such a position.

E. Teleworker Survey - Economic Impact

Teleworkers were asked to report financial expenditures in Cambridge. The specific instructions were "over the past two weeks, please estimate the total value of purchases made in Cambridge in each of the following categories:" Mean responses were as follows:

	<i>Time 1</i>	<i>Time 2</i>	<i>Time 3</i>
Groceries	15.30	14.38	37.30
Restaurants	12.15	13.38	12.64
Gas/Supplies	15.35	16.19	21.73
Hardware	6.25	5.00	2.05

Clothing	3.50	7.69	4.55
Entertainment	2.85	0.00	6.67
Other	1.50	2.69	3.18

It is very important to note that four participants living in or very near Cambridge were excluded from the above analyses. Our intent was to assess the impact of the Telework Center on financial activity in Cambridge, and thus we wished to tap new expenditures in Cambridge.

The data show that by the end of the first year teleworkers reported spending about \$44 per week in Cambridge, primarily in grocery stores, restaurants, and gas stations. There is an increase in spending over the course of the year, due to an increase in grocery store expenditures.

In addition, a set of items dealing with community involvement in Cambridge were included. Again, the four teleworkers living in or very near Cambridge were excluded from these analyses. Results show that there is only a limited amount of community involvement on the part of the teleworkers:

Taken classes at a college in Cambridge : 1

Been active in volunteer work in Cambridge: 2

Been active in school affairs in Cambridge: 3

Been active in church affairs in Cambridge: 0

Held an elected or appointed position in Cambridge: 0

Attended a public meeting: 1

Thus the results show modest financial involvement and very limited civic involvement on the part of teleworkers.

F. Teleworker Survey - Day-to-day operations at Cambridge

Items dealing with day to day operations were included on the Time 2 and Time 3 surveys. The instructions to respondents are reproduced below:

Section V : Day-to-Day Operations at Cambridge

This section of the survey contains questions related to how you feel about the daily environment at the Cambridge facility. Please think carefully about how you feel about each of these issues. Also, please make use of the space reserved for comments underneath each question by explaining any particular problems or concerns you have about issues related to operations at Cambridge.

Responses are summarized below. For each item, written comments offered by teleworkers are reproduced as well, along with an identification of whether the comment came from someone rating the item as 'no problems', 'some problems', or 'many problems'. The comments are drawn from the Time 3 surveys to reflect current concerns.

47. How do you feel about the parking facilities at Cambridge?

Time 2 Time 3

16	14	No problems
0	1	Some problems
0	0	Many problems

- Free parking (no problem)
- FREE! (no problem)
- Parking was always adequate (no problem)
- One way street; hard to back out ; library parking on Main St. is very busy but it's free (some problems)

48. How do you feel about the physical environment inside the Cambridge facility (e.g., lighting, temperature, air quality, noise level, etc.)?

Time 2 Time 3

7	9	No problems
9	6	Some problems
0	0	Many problems

- Air exchange could be improved (fresh air) (some problems)
- Quickly resolved (no problems)
- Quiet; not ergonomically friendly (some problems)
- Temperature not consistent; vaults are not appropriate for cubicle spaces (some problems)
- Too quiet at times (no problem)

- Temperature problems (some problems)
- Heating either on or off; I have moved out of the vault, so the air is better.; noise- you can hear everything (some problems)
- Temperature too hot; sometimes too cold (some problems)

49. How do you feel about your computer services at Cambridge (e.g., hardware, software, support services)?

Time 2 Time 3

2	11	No problems
10	3	Some problems
4	1	Many problems

- I wish I had that computer at my Roseville office (no problem)
- Never able to adequately connect with our home office (some problems)
- It is not compatible with the main office (many problems)
- Problems at first, but it's getting better (some problems)
- Any change in my software seems to create problems because of large MnDOT network (some problems)

49a) At the time of the second evaluation, we asked the preceding question about computer services at Cambridge. Many people reported problems. Please tell us if and how you think the situation has changed.

- I have not experienced these problems (there was no problem)
- The problem came when the MIS person was terminated. There was no one there for a very long time until this position had to be filled. Many people were wondering if this position would ever be resolved. It finally was, but there were a few people that could not put up with this, especially supervisors, couldn't understand what was really going on for a long time. (was a problem, and improved)

50. How do you feel about the availability and quality of supplies (other than computers) that you need to complete your daily tasks at Cambridge?

Time 2 Time 3

13	13	No problems
1	2	Some problems
1	0	Many problems

- I brought a calculator and typewriter to Cambridge to use (no problem)
- We furnished our own supplies (no problem)
- No courier, mail service pickup and delivery (some problems)

51. MnDOT does a good job or ensuring the physical security of its employees at the Cambridge facility.

Time 2 Time 3

14	10	No problems
1	4	Some problems
0	0	Many problems

- I have had no problems, although anybody can walk through the building (no problem)
- There is no security ; access during the day is unlimited (some problems)
- No security available that I know of
- Building is “open” to one and all during the day (some problems)
- People off the street enter occasionally (no problem)
- Problems early on have been addressed (no problem)
- Many people just walk in still thinking it’s the courthouse (some problems)
- As long as someone’s at the front desk I feel secure (no problem)

52. MnDOT does a good job of ensuring the personal belongings of its employees at the Cambridge facility.

Time 2 Time 3

14	13	No problems
1	2	Some problems
0	0	Many problems

- But I wish I had a secure place to put my belongings when I’m not around (no problem)
- Never had a problem, but there is no security (some problems)

53. MnDOT does a good job of ensuring the security of its employees’ files and documents at the Cambridge facility.

Time 2 Time 3

13	11	No problems
1	3	Some problems
0	0	Many problems

- Until we had our offices switched, I never had a problem finding the materials and books we brought to the facility. I have no idea where our books are now (some problems)
- My stuff was moved from our workspace to another without asking me (some problems)
- Now that we have file cabinets to lock (no problem)
- I have no idea if files & documents are secure

G. Supervisor Survey - Expectations/Experiences

As in the case of the parallel section of the teleworker survey, discussed earlier, these items were framed in terms of expectations about telework at Time 1 and experiences with telework at Time 2 and Time 3. The actual survey instructions for Times 2 and 3 are reproduced below; the Time 1 instructions replace “experiences while supervising a teleworker since telework began” with “expectations about telework”.

Section I: Telework Experiences				
This section of the survey contains questions related to your experiences while supervising a teleworker since telework began. Please think carefully about how you feel about each of these issues. Responses will be measured on the following five point scale:				
Large Decrease	Some Decrease	No Change	Some Increase	Large Increase
1-----	2-----	3-----	4-----	5-----
Please indicate your response by placing the number corresponding to your choice in the blank provided next to each question.				

Each survey question is reproduced below, accompanied by the mean response at Time 1, Time 2, and Time 3. More detail, including standard deviations, medians, and a complete frequency distribution of results, is found in the Appendix. Refer to the scale above to interpret these findings: a value higher than 3 indicates that on average, individuals expected (Time 1) or experienced (Time 2 and Time 3) an increase in the aspect of the job under consideration as a result of the telework program.

Time 1 Time 2 Time 3

1. 3.4 3.2 3.6 The teleworker's level of productivity.
2. 4.1 3.9 4.1 The teleworker's level of satisfaction.
3. 2.5 2.6 2.4 The likelihood that the teleworker will leave to take another job.
4. 2.9 2.9 2.7 The number of days that the teleworker is absent.
5. 3.3 3.1 3.2 Impact on the quality of work that is done by the teleworker.

- | | | | | |
|-----|-----|-----|-----|--|
| 6. | 3.5 | 3.3 | 3.6 | Impact on the quantity of work that is done by the teleworker. |
| 7. | 3.5 | 3.1 | 3.3 | The teleworker's ability to meet work deadlines. |
| 8. | 3.2 | 3.1 | 3.5 | The quality of my relationship with the teleworker. |
| 9. | 2.3 | 2.4 | 2.4 | The teleworker's level of job stress. |
| 10. | 3.0 | 3.1 | 3.2 | The time the teleworker spends on tasks and objectives. |
| 11. | -- | 3.1 | 3.4 | The number of hours the teleworker spends working per day. |
| 12. | -- | 2.6 | 2.1 | The amount of time per day that the teleworker loses due to interruptions. |
| 13. | 3.5 | 3.1 | 3.4 | The teleworker's time management skills. |
| 14. | 3.3 | 3.1 | 3.3 | The teleworker's ability to meet customer needs. |
| 15. | 3.0 | 2.9 | 2.8 | The quality of the teleworker's relationships with coworkers. |
| 16. | 3.0 | 3.1 | 3.0 | The quality of the teleworker's relationships with customers. |
| 17. | 3.2 | 3.1 | 3.2 | The teleworker's opportunities for development and advancement. |
| 18. | -- | 2.8 | 2.6 | My ability to amply observe my employees and effectively evaluate their performance. |
| 19. | -- | 3.1 | 3.2 | The level of trust between myself and my employees. |

The pattern of responses above indicates that supervisors had favorable expectations as the telework program began. Supervisors expected either no change or some improvement on all job facets measured, with the greatest amount of change expected for item # 2 (job satisfaction). These expectations were met virtually without exception: there is a high degree of similarity between expectation at Time 1 and reported experiences at Time 3.

The only negative finding involves item #18 (my ability to observe my employee and effectively evaluate their performance). This item was included only at Time 2 and Time 3; at both time periods supervisors reported, not unexpectedly, that this had decreased due to telework. It is useful, though, to contrast this with item #40 from the teleworker survey, in which

teleworkers reported that they felt that their supervisor did have ample opportunity to observe and evaluate their performance.

In sum, supervisors had positive initial expectations regarding telework, and reported one year later that those expectations had been realized.

H. Supervisor Survey - General Reactions

This section asked supervisors to agree or disagree with a variety of statements about the impact of telework. The items were worded in the future tense at Time 1 (e.g., "I believe telework will lead to a loss of supervisory control") and in the past tense at Times 2 and 3 (e.g., "I believe telework has led to a loss of supervisory control"). Instructions were as follows:

Section II - General Reactions				
In this section, we are interested in your general reactions to telework. We ask that you respond to the statements using the following five point scale:				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
Please think about each of these statements carefully and respond in the space provided next to each question.				

Each survey question is reproduced below, accompanied by the mean response at Time 1, Time 2, and Time 3. More detail, including standard deviations, medians, and a complete frequency distribution of results, is found in the Appendix. Refer to the scale above to interpret these findings: values higher than 3 indicate that on average, respondents are above the neutral point in their agreement with the item, while values lower than 3 indicate that respondents are below the neutral point, indicating disagreement.

Time 1 Time 2 Time 3

- | | |
|-----------------|--|
| 20. -- 3.5 4.1 | I have enough opportunities to talk with the teleworker I supervise. |
| 21. 3.6 2.5 3.4 | I believe telework has had no affect on my ability to amply observe my employee's work and effectively evaluate their performance. |
| 22. 2.8 2.3 2.9 | I believe that there are disadvantages within my unit due to telework. |
| 23. 2.1 2.8 2.0 | I believe that telework has led to a loss of supervisory control over my employees. |
| 24 2.9 3.1 2.9 | I believe that telework has affected the level of trust between myself and my employees. |
| 25. 3.0 2.8 3.2 | I believe that telework has led to a change in the relationship between me and my telework employees. |
| 26 4.0 4.0 4.2 | Telework has the potential to benefit MnDOT. |

Again, there is a very high degree of consistency over time. Supervisor reactions were initially favorable, and they remained equally favorable one year later. The single item generating the strongest positive response was item #26 (Telework has the potential to benefit MnDOT).

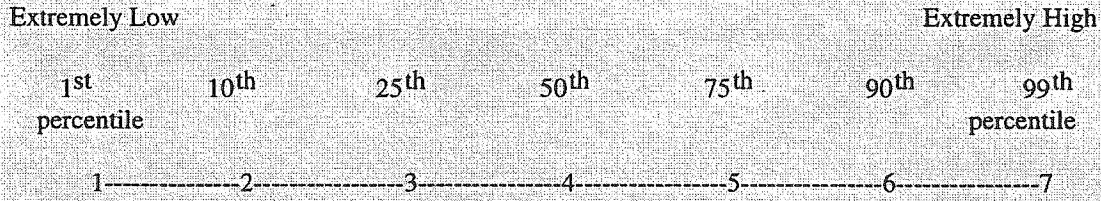
I. Supervisory Survey - Performance Appraisal

Supervisors were asked at evaluate the performance of their subordinates on a variety of job dimensions at each time period. The instructions to the supervisor are reproduced below:

Section III: Performance Appraisal

In order to evaluate the effectiveness of the Cambridge Telework Center, we need to compare employee performance prior to telework with their performance after telework begins. We ask that you answer the following performance-based questions as if you were evaluating your teleworking employee for a performance review.

The following is a percentile scale and should be interpreted as follows: if you believe the employee in question performs better than 10 percent of individuals with similar duties and responsibilities, you should mark a 2. If, however, you believe that she/he performs better than 75 percent, you should mark a 5.



Each survey question is reproduced below, accompanied by the mean response at Time 1, Time 2, and Time 3. More detail, including standard deviations, medians, and a complete frequency distribution of results, is found in the Appendix. Refer to the scale above to interpret the responses.

Time 1 Time 2 Time 3

- | | | | | |
|-----|-----|-----|-----|--|
| 27. | 5.2 | 5.1 | 5.3 | Please rate this employee's overall level of performance. |
| 28. | 5.2 | 5.1 | 5.3 | Please rate the quality of this employee's output. |
| 29. | 5.3 | 5.2 | 5.4 | Please rate the quantity of this employee's output. |
| 30. | 5.2 | 5.1 | 5.4 | Please rate this employee's overall level of effort. |
| 31. | 5.2 | 5.3 | 5.4 | Please rate this employee's overall level of timeliness in completing projects or assignments. |
| 32. | 5.2 | 4.7 | 5.3 | Please rate this employee's level of team work. |
| 33. | 5.0 | 4.4 | 5.3 | Please rate this employee's level of technical proficiency. |
| 34. | 5.4 | 5.2 | 5.2 | Please rate the degree to which this employee goes out of their way to assist other employees. |
| 35. | 5.6 | 5.4 | 5.8 | Please rate this employee's level of dependability. |

Once again, there is a very high degree of consistency in the responses. Evaluations of performance are essentially unchanged from Time 1 to Time 3. Teleworkers are rated as high performers initially, and continue to receive similarly high ratings one year later.

There is an interesting set of conflicting findings here. When performance ratings at Time 1 and Time 3 are compared, no consistent difference is seen. Yet in item #1 of the expectations and experiences section, presented earlier, supervisors reported that the teleworkers' level of productivity had increased as a result of telework. (Recall that a similar finding was found with regard to job satisfaction in the teleworker survey: when satisfaction was measured directly at Time 1 and Time 3, no differences were found. But when asked if satisfaction had increased as a result of teleworking, teleworkers answered in the affirmative). Again, it may be that the degree of increase is too small to be reflected in the performance appraisal ratings. And it may be that the supervisor's overall positive feelings about telework led to their agreement with the item dealing with whether productivity had increased. We place more trust in a comparison of the same measure administered at two points in time than in a retrospective measure of whether change has occurred, and thus conclude that performance does not appear to have changed measurably due to telework.

J. Open-ended Comments from Teleworkers and Supervisors

A compilation of these comments is included as Appendix C to this report. The comments very clearly show the strong support for the telework program from both the teleworkers and their supervisors. The teleworker comments emphasize the time and distance savings, the reduced stress, and the relative lack of distractions at the Telework Center. The most strongly voiced concern is not about the program itself, but about support for telework within MnDOT. Supervisors are also supportive of the concept, and of the expansion of telework efforts.

IV. Conclusion

- The Telework Center reduces commuting time and distance, with average savings of 32 commuting miles and 74 minutes saved for each day the Center is used in lieu of a participant's regular office
- A small portion (8%) of the time savings are devoted to work-related activities; the rest is devoted to personal activities
- The initial expectations for the telework center were positive for both teleworkers and their supervisors. Improvement in a wide variety of areas was expected, ranging from quality and quantity of work, job satisfaction, reduced stress, and quality of home life. One year later teleworkers and their supervisors report that these expectations were met, with limited exceptions (i.e., teleworkers found that job stress remained the same, rather than decreasing). Thus teleworkers and their supervisors are positive about the telework experience.
- However, other data offers a somewhat different picture. Teleworker job satisfaction and commitment to the organization were measured at the beginning of the telework program and again one year later, and average levels of job satisfaction and commitment were found to be unchanged. Supervisors evaluated teleworker job performance at the beginning of the telework program and again one year later, and performance was found to be unchanged. Thus direct measurement of satisfaction and performance suggest that these features do not change measurably; however retrospective measures in which teleworkers and supervisors are asked to estimate whether satisfaction and performance have changed yield self-reports of positive change. Our sense is that the direct measures are more trustworthy than the retrospective measures, which in all likelihood reflect the overall positive opinion of telework held by participants and their supervisors. While teleworkers may be able to point to occasions where telework had an affect on, say, how well they were able to complete a particular task, any changes due to telework are not substantial enough to affect overall performance evaluations.

- It is worth emphasizing that a conclusion of "no change" in job performance as a result of telework may be a positive finding in and of itself. One concern of skeptics is that absent close supervision teleworkers will lack the discipline to consistently exert high effort and that performance will decline. That performance levels do not decrease is a useful finding in and of itself. It is important to note, however, that individuals were not randomly selected to participate in the telework program. It is likely that supervisors would not have agreed to permit an employee to participate in the program if the supervisor was not confident in the employee's level of work effort. It is possible that different findings would result if employees were not prescreened prior to entering a telework program.
- It is also worth noting that it is not uncommon for evaluation research to rely solely on retrospective measures (i.e., asking participants whether they feel that their satisfaction, productivity, and other features have changed as a result of telework). Had we also relied solely on retrospective measures, we would have concluded that work attitudes and job performance increased as a result of participation in the telework program. However, by also including direct measures of work attitudes and performance at multiple points in time, we are led to a different conclusion. Thus study methodology may effect findings about telework programs.
- Teleworker expenditures and civic involvement in Cambridge were examined. Teleworkers spent an average about \$44 per week in Cambridge, with about half spent on groceries, and with restaurant and gasoline expenditures making up the bulk of the remainder. Teleworkers have generally not shifted activities such as banking, health care, college classes, and volunteer work from their home communities to Cambridge. Thus impact on Cambridge has been limited.