

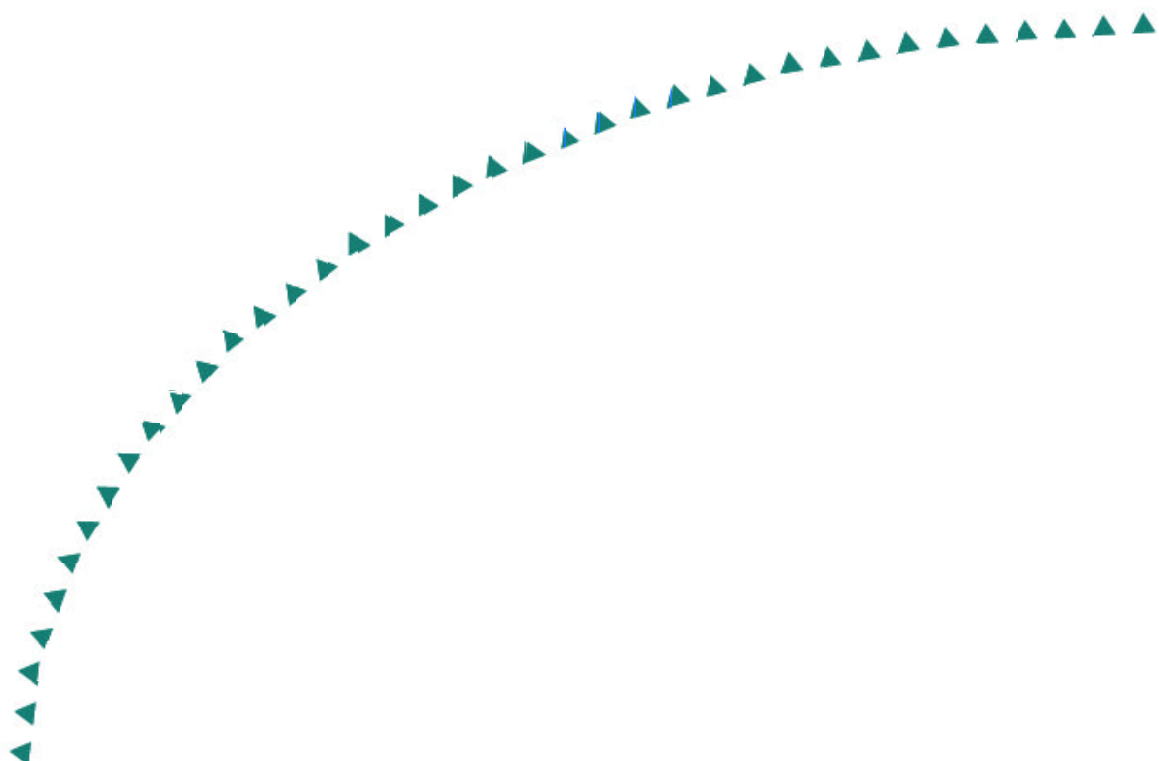
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Final Report

Using ITS to Better Serve Diverse Populations



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Executive Summary

Under the sponsorship of the Minnesota Department of Transportation (Mn/DOT), with funding initiated by Congressman Martin Sabo, The State and Local Policy Program (SLPP) at the University of Minnesota's Humphrey Institute of Public Affairs, in cooperation with the University of Minnesota's Center for Transportation Studies (CTS), has begun a new stream of research related to development and implementation of Intelligent Transportation Systems (ITS): namely examining the potential demand for ITS with a focus on those services that do not require owning a single occupancy vehicle (SOV) to serve as the primary mode of transportation.

The principal objective of this study is to better understand how the needs of travelers are changing and how ITS can be used to provide better transportation services to meet these changing needs. Few people would argue that alternatives to the single occupant vehicle are speedy and convenient, or that they allow for spontaneous travel. Nevertheless, there are some travelers who cannot afford a car for every trip, and there are certain types of trips for which other modes may present greater benefits that are not being realized. The basic premise of this research is that travel behavior has become much more diverse and that corresponding groups of diverse travelers are emerging. ITS solutions for these diverse groups should be considered as ITS can be tailored to meet the assorted travel needs of these groups. The research problem is to identify the nature of the gap between the emerging needs and existing services, and to propose ways to use technology to bridge the gap, both in terms of providing better transportation options and in reducing the cost of these options.

This report begins with an examination of the potential demand for these technologies in Minnesota's populace—both in the Twin Cities and statewide—with a focus on those people who are attracted to services that do not require owning a single occupant vehicle (SOV) to serve as the primary mode of transportation. This work is a compilation of demographic data collected by others, including national studies such as the U.S. Census and sources more specific to Minnesota, such as the Travel Behavior Inventory, a travel behavior study conducted in 20 counties in and around the Twin Cities metropolitan area that was sponsored by the Metropolitan Council. This section concludes that the “non-traditional” populations that could most benefit from innovations in ITS technologies are senior citizens, immigrant and non English-speaking populations, and the disabled.

The next section presents the findings from efforts to collect primary data from each of these populations: a survey of retirees and those who are likely to retire soon in growth areas of the state; a series of focus groups conducted with members of growing immigrant groups (Latino, Somali, and Hmong); and interviews with disability case workers. The findings from this research present a number of opportunities for ITS use in Minnesota: younger participants in all groups demonstrated comfort with computers and applications that rely upon computer use, and all groups also expressed interest in transportation options that will decrease travel time and increase safety.

The third section examines the potential of some applications of ITS technology that may meet the needs of these groups: community-based transit (CBT), carsharing, telework and telemedicine, and advanced traveler information services (ATIS). This research was largely based upon interviews with experts in each field, but also included a survey of CBT providers

throughout Minnesota and a pilot survey of ATIS users. Results from this effort showed that each application has the potential for serving the needs of the populations examined in Task 2, as well as other “non-traditional” populations, such as those unable to afford their own cars. However, none of these applications are ready to serve these populations as they currently exist: alterations of their basic operations will be necessary. Consequently, this section includes recommendations for additional research before significant implementation into the transportation “mainstream” is attempted.

The final section is a listing of the outreach activities conducted during the course of this research project (see also [Appendix X](#)). The presentations are available by contacting the Principal Investigator at the State and Local Policy Program.

Summary of Findings and Conclusions

The ultimate objective of this research was identification of ITS applications that show potential for meeting the mobility needs of various “non-traditional” populations. The results of this work are encapsulated in the chart below.

	Retirees			Disabled	Rural Immigrants			Urban Immigrants		
	Not yet	New	Older		Hmong	Somali	Spanish	Hmong	Somali	Spanish
Community-Based Transit	X	?	?	X	X	X	X	X	?	X
Carsharing					X		X	X		
Telecommunications	X				X				X	
ATIS	X	X			X					

*ATIS: Advanced Traveler Information Services

Note: The disabled group results are inconclusive due to diversity within this population.

Population Findings

Retirees—The group of retirees surveyed included 2,000 people who were born before 1948 and who live in the “Golden Crescent” of Minnesota, which encompasses growing counties extending from Olmstead County in the Southeast, through the Twin Cities, and northwest to Otter Tail and Clay counties. It should be noted that this includes urban, suburban, and rural counties.

In analyzing the results from this group, it became clear that the groups could be classified three ways: “not yet retired,” who were born between 1943 and 1947; “new retirees,” who were born between 1938 and 1942; and “older retirees,” who were born before 1938. In terms of planning for ITS, these groups were most different in their comfort with computers. The “not yet retired” group was shown to be much more comfortable with computers and interested in using computers and telecommunications as a way to replace physical trips. On the other hand, the older groups were more concerned with physical comfort and safety.

Disabled—Research into this population largely consisted of interviews with case workers. Results showed that this population also has significant sub-groups with different transportation needs. These differences included type of disability (mental or physical), race, and income. Unfortunately, our chosen method of interviews did not allow for more in-depth investigation of each of these subgroups. Gaps between the poor and non-poor disabled, distinctive needs of those with mental disabilities, and different levels of comfort and security perceived by the

physically disabled should be studied in more detail with research directly involving the disabled persons themselves.

Foreign-born and non-white—The travel needs of these groups were assessed through focus groups. The initial demographic efforts in this study identified Latino, Somali, and Hmong populations as the most significant populations within this group and that there are significant concentrations of people from the populations both in the Twin Cities and in Greater Minnesota. Consequently, two groups were conducted for each population: one in rural Minnesota and one in the Twin Cities metropolitan area.

Findings from these groups revealed that they are diverse not only in cultural background, but also in their travel preferences. While the Latino groups expressed a preference toward transit and other more “social” types of travel, the Hmong appeared to prefer modes where they could travel privately or only with those that they know. All groups felt that auto travel would provide them with the most mobility, but pointed out that they had reservations about, and faced significant barriers to, using this mode as their preferred alternative.

ITS Findings

Community-Based Transit—For the purposes of this study, Community-Based Transit (or CBT) was envisioned as an expansion of current paratransit services: flexible-route, small-vehicle services that respond to specific requests instead of having regular schedules. To determine the amenability of current providers to accept ITS innovations that may allow for cost-effective expansion of this service, the research team conducted a survey and follow-up interviews with managers of these services. Findings from this work demonstrated that while ITS technologies exist to enhance this mode, only larger providers are interested and able to implement them. In addition, significant organizational challenges exist, including staff training and inter-agency collaboration.

Carsharing—While this concept is simply defined as the sharing of one or more vehicles by many people in close proximity to one another, carsharing operations of any size use a great degree of technology to function. In fact, Internet and wireless technology has led to the rapid proliferation of carsharing in the last five years both in the U.S. and Europe. Because of this rapid expansion, carsharing was included in this study. Research was conducted through interviews with managers of existing car-sharing organizations around the United States. The most significant findings for the purposes of this study were that current car-sharing organizations appear to have a fairly limited market. In pursuit of financial self-sufficiency, organizations all have ended up focusing on middle class populations that live in fairly densely populated areas that are well served by transit. However, carsharing also shows the potential to be beneficial to other populations, either with or without subsidies.

Telecommunications—For this study, telecommuting, telemedicine, and to a small extent e-commerce were reviewed. These areas were selected as they were seen as most amenable to the populations researched. The Task 1 report indicated that the baby-boom population may not retire completely, preferring instead to continue working on a limited basis, despite demographic trends showing they were moving away from population and employment centers. The research largely consisted of interviews with experts in these emerging fields and looked specifically at

the potential for work to continue from a distance, as well as an examination of whether telecommunications may aid in providing health care for an aging, but increasingly dispersed, population. Finally, the research also investigated the potential for telecommunications to provide a solution for overcoming mobility barriers for the physically disabled.

Findings from this research showed that the potential does exist, but, as has been the case for several years, organizational obstacles exist, along with limitations of data transmission speeds. However, transmission speed, that is, access to broadband, has become more widespread in very recent years.

ATIS—As the demographic and travel needs of Minnesotans become increasingly diverse, data and analysis need to help predict future travel behavior, identify suitable ITS technologies to meet these emerging travel needs, and plan transportation systems based on these emerging demographic patterns. As a result, this study also focused on analyzing the availability and quality of, and providing recommendations for, the delivery of online ATIS trip information for use by service providers and end users.

To accomplish this effort, online surveys were tested upon potential end users for a hypothetical transit trip. Findings from this effort indicate that a better understanding of ATIS priority and design considerations is needed. Such a task would involve interviewing national leaders in ATIS, telemetric, and e-government to determine the current status, trends, and directions for providing high-quality diverse trip information via the Internet or through other advanced sources. A second need is to implement the survey with a larger sample of online users. Based on preliminary “quality of service” data obtained during this survey, this task would involve a larger sample size (between 200 and 300) and possibly include user focus groups. A related activity will be to compare online software approaches to providing diverse trip information along a number of “best practices” suggested by the e-government and ITS literature.

Conclusions

As shown in the summary chart, findings indicate that CBT holds the greatest potential to serve the needs of these emerging populations. Current paratransit already serves elderly and disabled populations, and the immigrant focus groups expressed interest in transit services that provide similar benefits. However, the CBT research showed that realizing this potential would require significant investment in technology, training, and even possibly reorganization of how the service is offered. Yet, while the current system of many relatively small providers serving a relatively circumscribed population is not an efficient model for significant service expansion, it should be remembered that one of the key elements of CBT is “community.” A few impersonal, large providers are not likely to provide the flexibility and comfort users will desire.

Consequently, communication, collaboration, and standardization across providers will be necessary. Managers interviewed for this study indicated that they appreciated the information exchange that occurs at the annual Minnesota transit conference and felt that this type of opportunity for information exchange should be greatly expanded. This research also noted that Mn/DOT had attempted to lead in the deployment of ITS in CBT dispatching, but this program as since expired. A return of emphasis in this area also would be beneficial.

Recommendation: Mn/DOT should lead and support efforts to increase the infusion and benefits of technology in CBT operations. Opportunities for information exchange and training should be provided along with technology. Incentives for small providers to expand their service, including pro-active standardization of regulations and equipment, should be promulgated.

Carsharing also presents significant opportunities for the immigrant population. In addition, it could bring the benefits of private automobile ownership to those who typically cannot afford a car of their own, or where ownership is otherwise inefficient, such as university campuses. However, service to these populations is “uncharted territory” for car-sharing organizations, and, in some cases, the service will require continued operating subsidies. Nonetheless, the potential benefits should be examined, and, where possible, quantified.

Recommendation: Mn/DOT should support efforts to make carsharing a reality where it will bring greatest benefits, but also where the proper partners exist. The Technical Advisory Panel for this project has identified two types of partners for whom the time may be right: real estate developers and innovative insurance companies. More specific suggestions for these are included in [Appendix W](#). The State of Minnesota should support efforts to bring carsharing to non-traditional car-sharing markets, such as close-knit ethnic groups and university populations.

Telecommunications and ATIS each also have areas where significant benefits can be achieved. These areas, however, require further research before they can be effectively deployed. As discussed in this study, those who are about to retire, and the baby-boom population, which is likely to begin retiring in the next decade, are likely to benefit from advances in these areas.

Recommendations : Mn/DOT should support continued research into evaluation and definition of high-quality ATIS services and should continue to monitor efforts by telecommunications providers to expand e-services, especially in greater Minnesota.

ATIS also provides opportunities to enhance the other applications. Currently, ATIS exists in the form of “511” services, which provide information about travel delay and other items useful to automobile travelers over the telephone. Further development of ATIS could allow it to also include information about alternative modes, such as CBT. This service also could link to reservation systems of CBT providers or even car-sharing organizations. Certainly, the participation of CBT providers and car-sharing organizations would be needed. However, other potential partners could include employers, who could provide a base for organizing CBT operations, and/or large employers that have automobile fleets, including state and local governments, as potential partners for car-sharing organizations to share vehicles during off-peak times. Further research into the interest of these organizations in working together, the ability to add information from these providers in a centralized fashion, and the ease of customizing ATIS services for user needs will be needed to make this kind of “one-stop” service a reality.

SECTION I—TASK 1

Chapter 1

Using ITS to Better Serve Populations

Introduction

The Minnesota Department of Transportation (Mn/DOT) has taken a leading role in developing intelligent transportation systems (ITS) technologies aimed at improving the state's transportation system, in both rural and urban areas. In recent years, Mn/DOT has focused on delivering multi-modal transportation services that will meet the needs of an increasingly diverse population. The State and Local Policy Program (SLPP) at the University of Minnesota's Humphrey Institute of Public Affairs, in cooperation with the University of Minnesota's Center for Transportation Studies (CTS), has conducted a number of studies regarding aspects of ITS which contribute to sustainable transportation. These studies have included research into using technology to develop measures of sustainable transportation, investigation of potential uses for GPS and other wireless technologies to enhance and promote sustainable transportation policies, and detailed research into how telecommunications might change travel behavior and serve as a "transportation demand measure." The research proposed here begins to examine the potential demand for these technologies in Minnesota's populace, both in the Twin Cities and statewide, with a focus on those attracted to services that do not require owning a single occupancy vehicle (SOV) to serve as the primary mode of transportation.

The principal objective of this study is to better understand how the needs of travelers are changing and how ITS can be used to provide better transportation services to meet these changing needs. Few people would argue that alternatives to the single occupant vehicle are speedy and convenient, or that they allow for spontaneous travel. Nevertheless, there are some travelers who cannot afford a car for every trip, and there are certain kinds of trips for which other modes may present greater benefits that are not being realized. The basic premise of this research is that travel behavior has become much more diverse and that corresponding groups of diverse travelers are emerging. ITS solutions for these diverse groups should be considered as ITS can be tailored to meet the assorted travel needs of these groups. The research problem is to identify the nature of the gap between the emerging needs and existing services, and to propose ways to use technology to bridge the gap, both in terms of providing better transportation options and in reducing the cost of these options.

This first task report examines trends in Minnesota's population, economy, and travel behaviors. Seven groups emerged as populations that merit further investigation in Task 2. The three primary groups of interest include senior citizens and baby boomers, foreign-born and non-white populations, and people with disabilities. Secondary groups include e-workers, households that do not own an automobile, walkers and bikers, and tourists. The report first reviews population, economic, and travel trends for the mainstream population. Then the seven diverse groups of interest are discussed in terms of population, economic, and travel characteristics, and the reasons for examining them are explained. The report concludes with recommendations for Task 2.

Population Trends

During the 1990s, Minnesota was the fastest growing state in the Midwest and Northeast [1]. From 1990 to 2000, the population increased by 12.4 percent from 4,375,099 to 4,919,479 inhabitants, a rate that was a little behind that of the entire nation which was 13.1 percent [2]. The Twin Cities metropolitan statistical area's (MSA) growth was more pronounced growing by 20 percent over the decade from less than 2.5 million to almost 3 million residents. Seventy percent of Minnesota's population growth occurred in second and third-ring suburbs [3]. Scott and Sherburne counties were the fastest growing counties in the state at rates of 54.7 percent and 53.6 percent respectively (see [Appendix A, Map 1](#)) [1].

In Greater Minnesota, the central lakes area is growing and people are also moving from the countryside to regional trade centers. There are two principal drivers of these population shifts. First, the state's aging population wants to relocate to the central lakes area or to regional trade centers that offer a variety of services and entertainment. Second, young adults are moving to small and large cities in order to garner better wages, seek higher education, purchase affordable housing, and take advantage of social amenities [3].

The University of Minnesota's Center for Transportation Studies recently released a study of Greater Minnesota's "crescent of growth" and slow growth areas [4]. The "crescent of growth" refers to an arc extending, "from the southeastern corner of the state, then northwestward through Rochester, Waseca, Mankato, and New Ulm, including the 24 county Twin Cities area, west to Willmar, then northward through the central lakes district to Park Rapids and Bemidji, and west to Fargo-Moorhead," (p. 21) [4]. Rochester and St. Cloud each added more than 10,000 residents during the 1990s [1]. In the north, the areas surrounding Bemidji, Brainerd, and Park Rapids grew faster than those city centers [4]. Aitkin (23 percent), Cass (25 percent), Cook (34 percent), Hubbard (23 percent), and Pine (25 percent) counties were the fastest growing non-metro counties in the state during the 1990s [1]. Growth was more evenly distributed among city centers and outlying areas in the southern half of Minnesota [4].

Slow-growth areas include farmlands in southwestern and western Minnesota and northern counties that cover the areas around Grand Forks-East Grand Forks, International Falls, the Iron Range, and the Arrowhead Region. Population in the Duluth-Superior/Hibbing area grew at modest rates and plunged in the International Falls area; the city of Grand Forks gained people while the surrounding area lost inhabitants. Amidst the population loss in the southern slow-growth areas, the cities of Albert Lea, Marshall, and Worthington grew in population [4]. The growth of these cities can be attributed largely to an influx of migrant workers [5].

Over the past two decades, regional centers have increasingly included some of the same functional attributes and visible features of the Twin Cities Metropolitan Area (TCMA). These regional centers diversified their economies, became less dependent on agriculture, constructed business developments at low densities, and produced more housing. The edges of metropolitan areas and rural areas are becoming characterized by growing clusters of jobs, shopping, and service opportunities [6]. These developments indicate that regional centers also may take on the Twin Cities' low-density development patterns (e.g., overlapping commuting fields and building homes on large plots of land that consume significant amounts of natural and man-made resources, including land and public infrastructure of various types) [4].

Economic Trends

Industry and Occupation Trends

Minnesota's diverse economy will require safe, efficient, and dependable transportation services in order to stay competitive [7]. On a national scale, Minnesota is particularly strong in the company and enterprise management industry (see Table 1.1). In terms of occupations, Minnesotans are heavily employed in the following five occupational sectors (see Table 1.2):

- Community and social services occupations;
- Business and financial operations occupations;
- Computer and mathematical occupations;
- Healthcare support occupations; and
- Personal care and service occupations.

The service sector, Minnesota's largest sector, accounted for more than 20 percent of Minnesota's gross state product in 1999, for a total of \$36 billion [8]. Computer and data processing was the fastest growing service in the services industry. During the 1990s, communications equipment and miscellaneous transportation equipment manufacturing were the fastest growing manufacturing activities. Minnesota's tenacity in the high technology industry is amplified by high employment in industrial machinery manufacturing, including computer-related industries, and rapid growth in the instruments and medical products and electronic equipment industries. The top three industrial sectors in terms of gross state product include: FIRE services (finance, insurance, and real estate), manufacturing, and trade. The local and suburban transportation industry grew by 91 percent from 1990 to 1999.

Five features influencing America's rural economy that can be seen in Minnesota include:

- The declining role of agricultural and other land based industries;
- An expanding manufacturing base;
- The growth of an amenities-based service sector;
- The growth of a retirement-based service sector; and
- The growth of other service sector industries such as Indian gaming [6].

Furthermore, high tech and "new tech" firms are increasingly more likely to locate in rural areas due to advances in communications and other technology. For example, northeastern Minnesota boasts a healthy information technology industry, southeastern Minnesota excels at computer manufacturing and software development, southwestern Minnesota manufactures computer and electrical components, Alexandria's niche is automation technologies, and Mankato is known for wireless technologies [9-12].

Industry Employment, Minnesota, 2001

NAICS	Industry Code Description	Employees Per Week		Location Quotient
		MN	USA	
11	Forestry, Fishing, Hunting & Agriculture Support	2,351	183,476	0.61
21	Mining	6,676	485,565	0.65
22	Utilities	12,927	654,484	0.94
23	Construction	117,506	6,491,994	0.86
31	Manufacturing	373,586	15,950,424	1.11
42	Wholesale Trade	140,178	6,142,089	1.09
44	Retail Trade	315,883	14,890,289	1.01
48	Transportation & Warehousing	79,090	3,750,663	1.00
51	Information	66,321	3,754,698	0.84
52	Finance & Insurance	139,830	6,248,400	1.06
53	Real Estate & Rental & Leasing	36,067	2,013,673	0.85
54	Professional, Scientific & Technical Services	123,646	7,156,579	0.82
55	Management of Companies & Enterprises	100,727	2,879,223	1.66
56	Admin., Support, Waste Mgt., Remediation Services	145,826	9,061,987	0.77
61	Educational Services	51,210	2,612,430	0.93
62	Health Care & Social Assistance	331,939	14,534,726	1.09
71	Arts, Entertainment & Recreation	40,764	1,780,362	1.09
72	Accommodation & Food Services	194,845	9,972,301	0.93
81	Other Services (Except Public Administration)	122,247	5,370,479	1.08
95	Auxiliaries (Exc. Corporate, Subsidiary & Regional Mgt.)	15,237	1,022,114	0.71
99	Unclassified Establishments	1,303	105,228	0.59
Total		2,418,159	115,061,184	

Source: U.S. Census Bureau, 2000 County Business Patterns, 2003

Table 1.1 Industry Employment, Minnesota, 2001

Occupational Employment, by Degree of Specialization, Minnesota 2001

SOC	Occupational Group	MN	USA	1. Location Quotient
11	Management	128,620	7,212,360	0.87
13	Business & Financial Operations	118,410	4,676,680	1.24
15	Computer & Mathematical	68,990	2,825,870	1.20
17	Architecture & Engineering	52,010	2,489,070	1.02
19	Life, Physical, & Social Science	23,300	1,067,730	1.07
21	Community & Social Services	40,210	1,523,890	1.29
23	Legal	16,830	909,370	0.91
25	Education, Training, & Library	148,730	7,658,480	0.95
27	Arts, Design, Entertainment, Sports, & Media	32,840	1,508,790	1.07
29	Healthcare Practitioners & Technical	133,200	6,118,970	1.07
31	Healthcare Support	71,810	3,122,870	1.13
33	Protective Services	46,480	2,957,990	0.77
35	Food Preparation & Serving Related	198,350	9,917,660	0.98
37	Building & Grounds Cleaning & Maintenance	84,150	4,275,340	0.96
39	Personal Care & Service	63,890	2,802,050	1.12
41	Sales & Related	291,130	13,418,240	1.06
43	Office & Administrative Support	444,000	22,798,590	0.95
45	Farming, Fishing, & Forestry	4,990	453,050	0.54
47	Construction & Extraction	116,000	6,239,430	0.91
49	Installation, Maintenance, & Repair	103,270	5,323,070	0.95
51	Production	249,990	11,270,210	1.09
53	Transportation & Material Moving	176,120	9,410,660	0.92
Industry Total		2,613,320	127,980,370	

Source: 2001 Bureau of Labor Statistics, Occupational Employment Statistics, 2003

Table 1.2 Occupational Employment by Degree of Specialization, Minnesota, 2001

Labor Force Trends

Minnesota's labor force grew 16 percent from 1990 to 2000 and is expected to grow another 16 percent from 2000 to 2010 [13, 14]. By 2030, the number of people in the labor force will have grown from 2.6 million in 2000 to almost 3.4 million. This projected labor force growth is influenced by a growing population and increased rates of labor force participation. Labor force participation in the 45- to 64-year-old cohort will grow the most between the years 2000 and 2010 while labor force participation in the 25- to 44-year-old cohort will slightly diminish. There will be dramatic growth in labor force participation for persons aged 65 and older in the next 30 years (see Figure 1). In the TCMA, Sherburne, Scott, Chisago, and Carver counties experienced tremendous growth in their labor force as did the out-state counties of Cass and Crow Wing in the central lakes area, and Cook and Pine counties in the northeast [14].

The Minnesota State Demographic Center constructed four scenarios for Minnesota's labor force between 2000 and 2030. The preferred scenario assumes moderate in-migration and increasing labor force participation rates for an overall 26 percent increase in the labor force [13]. In this situation, the percentage of people age 45 to 64 in the labor force would grow by 39 percent from 2000 to 2010 (see Figure 1.1). Between 2000 and 2030 there would be only a 38 percent change. For those aged 65 and older the growth would be by 35 percent in 2010 and 218 percent by 2030. The other three scenarios showed that in all cases much of Minnesota's labor force will be over the age of 45 during the next 30 years.

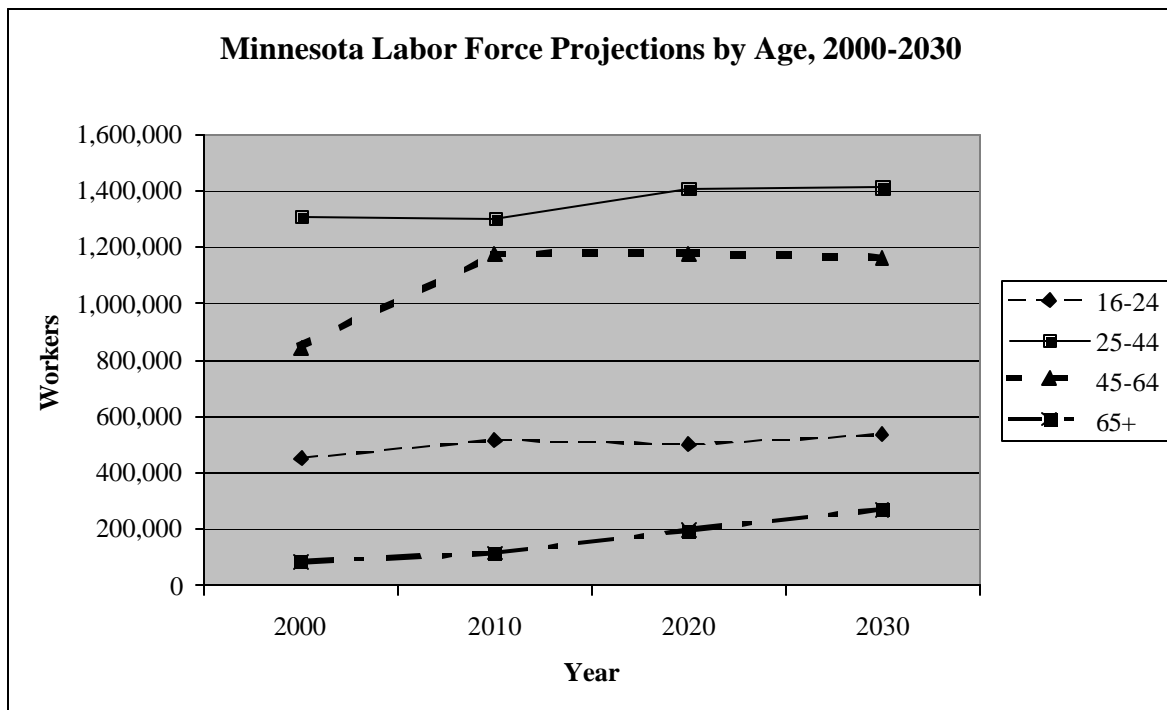


Figure 1.1 Minnesota Labor Force Projections by Age, 2000-2030

Source: State Demographic Center at Minnesota Planning, 1998

The eleven-county TCMA added more than a quarter of a million jobs during the 1990s and more than 190,000 of them (74 percent) were outside Hennepin and Ramsey counties [15]. Even though many of these jobs are located in the west metro, people are increasingly residing in the east metro. More than 350,000 people commuted to Hennepin and Ramsey counties from the suburbs and beyond during the 1990s. More than 68,000 people live in one suburban county and work in another. The mismatch is severe in Washington county where the difference between commuters coming in and going out was 9,000 [16]. Census 2000 data on county-to-county worker flows continued to show the trend for Minnesotans to work farther away from where they live (see [Appendix A, Map 2](#)). In each census since 1970, the proportion of people who work in their county of residence has fallen significantly. In 2000, 66 percent of Minnesota workers were employed in the same county where they lived, down from 71 percent in 1990 and 81 percent in 1970 [17].

Travel Trends

Overall, traffic increased on all Minnesota highway systems in the 1980s and 1990s [4]. Vehicle miles traveled (VMT) increased on all roads particularly on the interstates and other principal arterials. A research team at the University of Minnesota outlined the reasons for the increase in VMT over these past 20 years:

The combination of larger populations, number of households increasing faster than a population, increasing distances between home and work, multiple job holding by workers, higher discretionary incomes with wider consumer choices and more recreational shopping, more leisure, more complex household life styles, more cars and trucks, greater participation by women in the paid workforce, better highways, and other factors all contributed to the enhanced traffic loads on the trunk highways in our study areas (p. 167) [4].

The TCMA's population growth has had an impressive effect on the number of motorized person miles traveled and vehicle miles traveled. Between 1990 and 2000, person miles rose from 55.4 million miles per weekday to 75.4 million, an increase of 36 percent [18]. Vehicle miles increased just under 35 percent from 41.5 million to 55.9 million miles per weekday. Similarly, motorized person trips grew by 22 percent from 8,860,634 to 10,836,233 person trips per weekday. Furthermore, concentrations of population in the Twin Cities MSA and Minnesota's other metropolitan areas will increase congestion and vehicle miles of travel on roadways in and around these centers [7].

According to the 2000 TBI, both person trips and vehicle trips grew faster than the number of housing units or the population from 1990 to 2000 in the 20-county study area. From 1990 to 2000, the total number of person trips by motorized modes increased by 22 percent, the total number of vehicle trips increased by 20 percent, the total number of housing units increased by 14 percent, and the population grew by 15 percent. Nevertheless, both person trips and vehicle trips grew at a slower rate between 1990 and 2000 than in the preceding decade. The person trip rate increased from 3.9 trips per day in 1990 to 4.2 trips per day in 2000. Both person miles and vehicle miles grew faster than the number of trips, indicating that the average trip length is increasing [18].

As in 1990, transit maintained its 2.5 percent share of all trips in the region in 2000 [18]. Daily drive-alone trips by residents increased by 2.5 percent going from 49 percent in 1990 to 50.8 percent in 2000. In addition, person trips in carpools grew by 25 percent from 1990 to 2000. School bus, motorcycle, taxi, and other mode trips declined from 4.1 percent in 1990 to 1.6 percent in 2000. Furthermore, the average number of occupants in work commute trips fell from 1.1 persons per vehicle in 1990 to one person per vehicle in 2000. For all trips, the average vehicle occupancy fell from 1.4 in 1990 to 1.3 in 2000. Between 1990 and 2000 travel time for all trips increased and morning and afternoon peak periods lengthened. Commute times increased by three minutes to 24 minutes in 2000. The percentage of trips to work increased from 12.6 percent in 1990 to 14.4 percent in 2000, but home-based work trips decreased from 14.3 percent in 1990 to 13.3 percent in 2000.

According to the 2001 NHTS, work trips were only 15 percent of all person trips. From 1990 to 2001, the numbers of shopping, other social/recreational, and family and personal errand trips increased more than the number of work trips. Specifically, compared to a decade ago and within the span of one year, the average American adult has added 28 more working trips, 68 more shopping trips, 87 more social and recreational trips, 86 more family and personal business trips, and 18 more visiting trips [19].

Travel and commuting patterns are changing in Minnesota. Many rural residents commute to urban areas for work and some commute to different counties [6]. In 2000, 77.6 percent of Minnesotans 16 and older drove to work alone, 10.4 percent carpooled, and the rest used other means [2]. For residents of the Twin Cities MSA, the rate of driving alone was 78.3 percent and carpooling was 10 percent. The mean travel time to work was 21.9 minutes for all Minnesotans and 23.7 minutes for people in the Twin Cities MSA (see [Appendix A, Map 3](#)). The influx of both young and old people in rural areas means that these travelers have different needs, abilities, and resources. These diverse young and old groups (e.g., in-migrant retirees, older people aging-in-place, ethnic minorities, poor families, and the increasing labor force participation of women) create varied and growing mobility needs, yet the number of family, friend, and community resources that could meet those needs may be declining. Communities that have increasing numbers of older people and poor or disadvantaged minorities may not be able to adequately meet their transportation needs.

Senior Citizens and Baby Boomers

Location and Migration

Thirty percent of Minnesota's population is between 35 and 54 years old (see Table 1.3). This cohort represents the baby boom generation. The median age rose from 32.4 years in 1990 to 35.4 years in 2000. The baby boom population in nine counties grew more than 30 percent from 1990 to 2000, with substantial increases in this cohort occurring in the western TCMA and in the central lakes region during the 1990s (see [Appendix A, Map 4](#)). Although only 30 percent of the state's population lives in Greater Minnesota, 41 percent of those ages 65 and older live there. There were significant population increases of those ages 65 and older throughout the state during the 1990s with the most dramatic growth occurring within the TCMA. The population of those ages 65 and older increased by 129 percent in Dakota county from 1990 to 2000, 96 percent in Scott county, 146 percent in Washington county, 144 percent in Anoka county, and 108 percent

in Sherburne county (see [Appendix A, Map 5](#)) [20]. The number of people ages 65 and older will have grown from 579,200 in 1995 to 1,041,000 in 2025, an increase of 80 percent [21]. The proportion of the state's population over 65 will rise from 12 percent in 2000 to 20 percent in 2025.

Age of Minnesotans, 1990-2000					
Age	1990		2000		% Change
	Number	%	Number	%	1990-2000
0-19	1,293,546	29.6	1,434,845	29.2	10.9
20-34	1,095,789	25.0	995,621	20.2	-9.1
35-54*	1,094,544	25.0	1,489,878	30.3	36.1
55-64	344,286	7.9	404,869	8.2	17.6
65-84	478,099	10.9	508,665	10.3	6.4
85+	68,835	1.6	85,601	1.7	24.4
Totals	4,375,099	100.0	4,919,479	100.0	12.4

*Baby Boomers

Source: U.S. Census Bureau, 2003

Table 1.3 Age of Minnesotans, 1990-2000

The size and location of communities are of particular importance to senior citizens because those factors dictate the availability of human resources, facilities, and services for them [22]. Elderly residents of communities that are densely populated with senior citizens are more likely to feel a sense of belonging in the community. The elderly feel a stronger sense of belonging in communities with a low immigrant population and low separated/divorced population. However, elderly volunteer rates are higher in communities with higher immigration levels.

Senior citizens are more likely to feel a sense of belonging and to volunteer in rural areas versus urban areas [22]. They are more trustful of others in rural settings than in urban ones, and they are more likely to belong to organizations and to volunteer in contrast to their urban counterparts. As the size of an urban area grows, the elderly are less likely to feel as though they belong and they are less likely to volunteer. Elderly residents of communities rich in human capital (i.e., most residents have a post-secondary education) are more likely to feel that they belong and they are more likely to volunteer. Elderly people have a stronger sense of belonging to their communities of residence than younger people. The elderly in affluent communities are more likely to be employed.

Doctor Andrew Schiller, a geographer and demographics specialist, states that people who decide to move because they are retiring, purchasing a second home, or relocating to a different community, look for a place that matches their personal criteria [23]. In the case of newly retired people, they want to move to neighborhoods that are close to their former home, family, and friends. A recent survey by the National Association of Home Builders showed that the majority of non retirees and seniors are retiring close to where they currently live. In fact, in Minnesota, a recent survey showed that only 9.7 percent of Minnesotans ages 55 and older live in another state for part of the year [24]. Schiller thinks that the most important criteria that retirees use for choosing a new community are that it is safe and quiet, there is an educated and vibrant blend of seniors and other age groups, it has beautiful scenery, and its has diverse housing options all within 75 miles of the city center [23].

Schiller's hypothesis appears to be confirmed by a report conducted by the Minnesota Department of Human Services. The report analyzed the future impacts of the aging baby boomer population in Minnesota and anticipates that the migration patterns of baby boomers will continue toward low-density developments in Minnesota's rural lake and recreation areas, particularly in the north and central parts of the state (see [Appendix A, Map 5](#)) [25].

According to the American Association of Retirement Communities, retirees are increasingly purchasing second homes [26]. Most of these homes are within one day's distance from the owner's primary home, and 90 percent of the second homes are in rural areas. Doctor Mark Fagan, sociologist at Jacksonville University in Alabama, predicts that new retirees who rely on private pension plans will have less income for their future [27]. Therefore, they will seek out communities that offer low living costs largely in rural areas.

Activities and Internet Use

As people age, more time is devoted to leisure activities versus work activities. Education and health are the most pertinent influences on later life activities. Those characteristics determine the degree to which an elderly person will integrate into the community or disengage from it, whether s/he will work and/or volunteer. Other factors influencing elderly participation in the work force include a smaller number of incoming workers in future cohorts, the global economy, and changes in industrial and occupational structures [22].

While today's senior citizens are not wired, tomorrow's probably will be. Though senior citizens made up 13 percent of the United States' population in 2000, they comprised only four percent of the Internet population [28]. The typical senior Internet user is male, highly educated, married, and has a relatively high retirement income. The six most popular senior Internet activities are:

- Sending/receiving e-mail messages;
- Acquiring hobby information;
- Reading the news;
- Searching for health and medical information;
- Browsing for fun; and
- Checking weather updates.

There is a stark contrast between the 50 to 64 cohort and the 65 and over cohort in that the younger cohort is more wired and has Internet behaviors similar to those of younger cohorts, whereas the older cohort is less likely to use or to be interested in using the Internet. Internet users between the ages of 50 and 64 are highly likely to continue using the Internet after retirement. Furthermore, within the 50 to 64 cohort, those persons ages 50 to 54 years have higher rates of Internet usage than those ages 55 to 64. Those who were age 50 to 54 in 2000 are the oldest members of the baby boom cohort.

Work Habits and Retirement

Employed persons in the 45- to 64-year-old cohort rose from 24.8 percent in 1990 to 31.4 percent in 2000 while the percentage of workers ages 25 to 44 fell from 55.2 percent to 48.6 percent [14]. An obvious engine of growth in the number of older workers is the baby boom generation. Retirement is becoming an increasingly flexible phenomenon and no longer means never working again [29]. Some people choose to retire well before the age of 65 while others retire years later. Oftentimes after retirement, retirees pursue work elsewhere.

Analysis of the 1990 and 1995 General Social Surveys (GSS) revealed that in Canada, 16 percent of men and 11 percent of women retire from work because of the mandatory “retire at 65” policy [30]. Twenty-five percent of men and 22 percent of women retire for health reasons. The rates are similar for people who retire because of choice, and 10 percent of men and four percent of women have other reasons for retiring early. According to sociologists Fernando and Ravanera, these results generally apply to the United States and other developed societies. This GSS report noted a United States study that showed that older male cohorts retired at later ages and that there was a clear distinction between employment and retirement, whereas younger male cohorts retired at an earlier age but did not directly transition into full retirement. The 1994 GSS showed that there was a marked decrease in labor force participation from men ages 55 to 59, but this decline was not met with a corresponding surge in retirement rates [30]. It is common for people to retire and then assume a “bridge job” that is usually a part-time commitment. These “retirees” are highly educated, skilled workers and professionals or managers. Another study found that in 1997, early retirement in the United States virtually stopped because of policy initiatives that encouraged older Americans to stay in the work force longer [30].

People born just before the baby boom cohort are less likely than their predecessors to pursue early retirement [22]. Baby boomers hovering around retirement age may choose to return to university or engage in novel work situations and schedules. It is common for retirement-age baby boomers to engage in part-time employment, especially men. Women ages 55 to 64 increasingly take on full-time work and are just as likely as men to be employed part time. It is expected that baby boomers will deviate from the current elderly cohort’s norms in the same way that they have consistently deviated from the norm, for example by marrying later, having fewer children, and having children later than their predecessors.

According to the 2000 TBI, the elderly work at home at a higher rate than the general population, nine percent versus four percent. Also, the rate for the elderly having two jobs is higher than the general public, 11 percent and eight percent respectively. This finding could be explained partly by the fact that 77 percent of the elderly work part time whereas only 26 percent of the general population do so. In terms of telecommuting, the rate is lower among the elderly than the general

public, 16 percent versus 22 percent. However, for those who reported to telecommute, the frequency of telecommuting is much higher among the elderly. For example, 64 percent of the elderly telecommuters do so four to five times each week, while the rate is 30 percent for all other telecommuters.

In the 2000 TBI, the non-retired baby boomer respondents had an employment rate of 90 percent. Furthermore, baby boomers are slightly more likely to have full-time jobs than the general public. In the 13 collar counties, 76 percent of the baby boomers are full-time workers while 73 percent of the general public works full time. In the seven core counties, 78 percent of baby boomers work full time while only 72 percent of the general population works full time.

Companies face increasing competitiveness when recruiting young people and may have to rethink how they treat middle-age and older workers [22]. If the elderly are needed in the workforce, employers and the government must take steps to make employment more attractive to them. People in their 60s and 70s may consider staying with their current employer, for example, if they were allowed to work part time but still receive benefits [29].

Economic Traits

More cities and states are looking to retirees as engines of economic growth as these areas stand to benefit from retirees' income and related tax revenues as well as the revenue generated from retirees' recreational and leisure activities. Elderly persons are more likely to be engaged in community life rather than isolated from it. They are active and continue to work part or full time, enjoy flex work schedules and places, join clubs such as the Chamber of Commerce, eat out, take in cultural events, and more. On average, retirees have more disposable income than working people and are able to spend money in the community [31]. The Christian Science Monitor reports that:

The American Association of Retired Communities estimates that one relocating retiree can have as great an economic impact on a community as three to four factory workers. The logic behind it is simple: Retirees are, in general, wealthier than working people, and therefore spend more money in the community. A study by Thomas, Warren, and Associates, for instance, suggests that residents 50 and older brought \$2.7 billion to Florida in 2000 and cost the state only \$1.3 billion in services.

Therefore, communities need not see large elderly populations as a drain on the economy in terms of costs associated with special services; rather, senior citizens can turn out to be a great economic asset.

Travel Trends

Mobility is important to senior citizens, and the inability to drive in Minnesota, a state where the majority of trips are made with SOVs, impinges upon the accessibility of services such as medical care and shopping, ultimately hampering the quality of life for the state's elderly population [32]. Access to transportation decreases with increasing age and with decreasing health status. Females and seniors who live alone are at a further disadvantage when it comes to accessing transportation. Almost half of seniors with inadequate transportation live in multi-

family housing. The trend to view senior citizen transportation as a human services endeavor is gaining popularity. Within this human services context, the duties of the health care worker, core service provider, and transportation provider strongly overlap. Increasing numbers of people ages 65 and older in Minnesota will demand alternatives to the SOV; changes in highway design, roadway signage, and the infrastructure for walking; and other aspects of transportation [7].

Driving is the most common means of transportation for persons over age 50; ridesharing is a distant second [33]. Less than five percent of those ages 50 and over report that walking, public transportation, taxis, and community or senior vans serve as their usual mode of transportation. The most common problems associated with driving for licensed seniors are inconsiderate drivers, traffic congestion, night driving, poor roads, driving cost, crime, and fast traffic. Seniors expressed a hesitancy to rideshare because it makes them feel too dependent on others or that they are imposing on others. Overall, seniors did not associate large problems with public transportation. However, the small problems were transferring from bus to bus and the accessibility of the stop or station. The most common problems cited for walking are distance and physical strain. The majority of persons ages 50 and over are satisfied with their mobility.

According to the 2001 NHTS, persons aged 65 and older on average make three trips per day and travel 18.7 miles each day whereas persons between the ages of 16 and 64 make four trips per day traveling between 28 and 33 miles per day [34]. Similarly, the 2000 TBI indicates that those 65 and older made fewer trips than the general population. Specifically, at the individual level, 22 percent of the elderly versus 16 percent of the general public make no daily trips. The discrepancy is even larger at household trip level with 13 percent of the elderly versus four percent of the general population reported to make no daily household trips. Baby boomers make more individual daily trips than the other population groups in general. In particular, the percent of baby boomers making no trips is much lower (7.5%) than the general population (15.6%), while the rates are higher for those who make one or more trips among the boomers than the general public. Nevertheless, the household trips for the baby boomers are in the similar pattern and rates with the general public. In the seven core counties, baby boomers drive alone to work at a higher rate than the general public; while in the 13 ring counties, the mode shares for driving alone are about the same among baby boomers and the other population group in general.

Persons aged 65 years and older accounted for nine percent (1,330 out of 14,671) of the total population surveyed in the 2000 TBI (see Table 1.4). Among the elderly, a total of 206 (15 percent) reported that they were employed. Those persons largely commute to work by driving alone (70.4 percent), but at a lower rate than the general population (78.2 percent). It is more common for senior citizens in the seven core counties than in the thirteen ring counties to drive alone to work. The elderly commute to work via transit at a slightly lower rate than the general population, two percent and three percent respectively. Furthermore, none of the elderly workers in the 13 ring counties reported to commute by transit.

Senior Citizens, Employment & Mode to Work, 2000

	7 Core Counties		13 Ring Counties		Total	
	#	%	#	%	#	%
Total persons 65+	973	100.0	357	100.0	1,330	100.0
Persons employed	155	15.9	51	14.3	206	15.5
Mode to work	155	100.0	51	100.0	206	100.0
Driving alone	111	71.6	34	66.7	145	70.4
2 Person carpool	5	3.2	2	3.9	7	3.4
3 Person carpool	3	1.9	0	0.0	3	1.5
Vanpool	1	0.7	0	0.0	1	0.5
Transit & walk	1	0.7	0	0.0	1	0.5
Transit & auto	4	2.6	0	0.0	4	1.9
Walk	3	1.9	4	7.8	7	3.4
Bike	(x)	(x)	(x)	(x)	(x)	(x)
Work at home	15	9.7	4	7.8	19	9.2
Other	(x)	(x)	(x)	(x)	(x)	(x)
Refused	12	7.7	7	13.7	19	9.2

Source: 2000 Travel Behavior Inventory, 2003

Table 1.4 Senior Citizens, Employment & Mode to Work, 2000

Foreign-Born and Non-White Populations

Location and Migration

From 1990 to 2000, the foreign-born population in Minnesota more than doubled from 113,039 to 260,463, with the greatest increases occurring in non-urban areas of the state (see [Appendix A, Map 6](#)). In comparison to the entire United States, Minnesota experienced an increase of 130 percent in its foreign-born population compared with 57 percent nationwide [2]. Another interesting characteristic of Minnesota's foreign-born population with respect to the rest of the nation is that a higher proportion of Minnesota's immigrants are refugees. Significant immigration from Mexico and Africa has contributed to the swell of foreign-born Minnesotans [29]. According to state demographer Tom Gillaspay, Minnesota gains 15,000 to 25,000 residents each year from in-migration and immigration. In 1998, eight percent of United States immigrants were refugees compared with 24.3 percent of immigrants in Minnesota [35]. In 2000, eight percent of Minnesotans did not speak English at home compared with six percent in 1990 (see [Appendix A, Map 7](#)) [2]. In the Twin Cities MSA, the foreign-born population increased by 140 percent from 87,380 in 1990 to 210,344 in 2000. Nine percent of Twin Cities residents do not speak English in the home.

The three dominant racial and ethnic groups contributing to this accelerated growth in Minnesota's foreign-born population are African Americans, Asians or Pacific Islanders, and people of Hispanic origin [21]. These three groups are growing significantly and will continue to do so in the years to come. This growth is a result of immigration and in-migration and natural increases in birth. Forecasting future growth for these relatively small groups is difficult not only because of their size, but also because of their migratory characteristics—a highly unpredictable factor. Nevertheless, Minnesota Planning projected that by the year 2025, Minnesota's African American population will grow by 113 percent, the number of Asian and Pacific Islander residents will grow by 104 percent, and the Hispanic-origin population will more than triple, growing by 248 percent (see Figure 1.2). Despite the fact that 2000 and 1990 U.S. Census data are not strictly comparable (2000 Census respondents were able to mark multiple races), the dramatic growth of non-white populations in Minnesota in the 1990s is clearly evident. [Appendix A, Map 8](#) displays the striking increases in the non-white population throughout the state with the most dramatic growth occurring in the non-urban areas of the south and southwest.

Employment

Non-white people in Minnesota have higher rates of labor force participation than the national rate. For example, 70 percent of Minnesota's Latinos were members of the labor force in 1999, compared with 61 percent nationally [14]. Sixty-eight percent of Minnesota's African Americans are in the labor force as are 65.6 percent of Asians and Pacific Islanders. Minnesota businesses must meet the needs of non-white and Hispanic people and move into niche markets [29]. This population offers a considerable number of consumers and workers. Businesses also must be knowledgeable and sensitive to different languages, religions, and cultural practices. Companies must adapt to Minnesota's changing population, lest they risk missing opportunities. The same could be said for transportation; without adapting transportation to fit the needs of the immigrant population, Minnesota could be passing up opportunities.

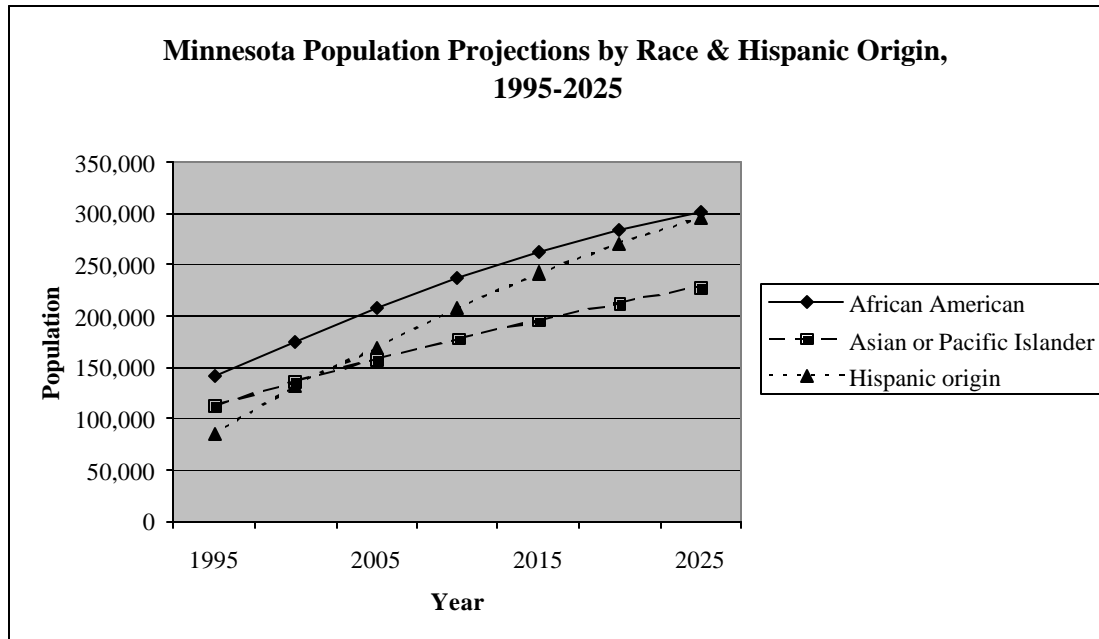


Figure 1.2 Minnesota Population Projections by Race and Hispanic Origin, 1995-2025

Source: Minnesota Planning, State Demographic Center, 1998

Travel Trends

The 2000 U.S. Census revealed four interesting trends in non-white travel behaviors in Minnesota. First, the non-white population has a higher rate of using public transportation than the white population. African Americans use public transportation at the highest rate, 18 percent, among all of the race groups. Second, the non-white population also has a higher rate of carpooling than the white population. The Hispanic/Latino group carpools at the highest rate among all race groups with a rate of more than 26 percent. Third, African Americans commute by taxi at a rate of nine percent compared with two percent of the white population. Finally, the non-white population has a higher rate of walking than the white population.

Persons with Disabilities

Employment

Fifteen percent of Minnesotans ages five and older have a disability (see Table 1.5). According to the National Organization on Disability (NOD), 32 percent of all working-age (ages 18 to 64) Americans with disabilities are employed full or part time, compared with 81 percent of people without disabilities. Today, 56 percent of people with disabilities are able work, whereas in 1986, only 46 percent of people with disabilities reported that they were able to work. For the 18- to 29-year-old cohort, 57 percent of those with disabilities who are able to work are working compared with 72 percent of their non-disabled counterparts. Sixty-seven percent of those

persons with disabilities who are unemployed would prefer employment [36]. In Minnesota, 65 percent of those with disabilities are employed, compared with 84.3 percent of those without disabilities who are employed.

**Disability Status of Minnesota's Civilian
Noninstitutionalized Population, 2000**

	#	%
5-20 years	1,168,374	100.0
With a disability	82,719	7.1
21-64 years	2,803,699	100.0
With a disability	392,313	14.0
% Employed	(x)	65.0
No disability	2,411,386	86.0
% employed	(x)	84.3
65+ years	554,138	100.0
With a disability	204,204	36.9
Total population	4,526,211	100.0
With a disability	679,236	15.0

Source: U.S. Census Bureau, 2003

Table 1.5 Disability Status of Minnesota's Civilian Noninstitutionalized Population, 2000

Technology and Internet Use

In 2001, close to 38 percent of American adults with disabilities used the Internet at home compared with 56 percent of non-disabled adults [37]. This is a marked improvement from the rates in 1998 where the percentages were seven percent and 26 percent respectively. Between 1998 and 2001, there was a 400 percent increase in the rate of home Internet use among persons with disabilities compared with the 200 percent increase in the rate of home Internet use among the non-disabled. If the rate of home Internet use among persons with disabilities continues to accelerate at the same rate, the gap between persons with disabilities and non-disabled persons with respect to home Internet use will close.

The Internet has an ability to significantly increase social opportunities for people with disabilities [38]. Yet, close to 60 percent of people with disabilities have never used a personal computer compared with 25 percent of people without disabilities. Forty-two percent of people with disabilities assert that, "the Internet has significantly increased their ability to reach out to people who have similar interests and/or experiences," in contrast to 30 percent of people

without disabilities. Considering the speed at which technological innovations occur, it is probable that technology will soon close all gaps that people with disabilities face.

People with disabilities spend an average of 30 hours online per week [39]. People with severe disabilities and people with slight or moderate disabilities spend an average of 34 hours and 26 hours respectively online per week. People without disabilities spend an average of 15 hours online per week.

Similarly, 56 percent of people with disabilities spend more than eight hours per week writing, sending, or receiving e-mail messages, compared with 36 percent of people without disabilities. In fact, people with disabilities spend an average of 17 hours per week using e-mail systems compared with 10 hours for people without disabilities [39].

Almost half of those with disabilities believe that the Internet has significantly improved their quality of life while only 27 percent of people without disabilities feel the same way.

Among persons with disabilities who use the Internet at home, 43 percent have seeing or hearing difficulties, 39 percent have learning or cognitive difficulties, and 35 percent have mobility and movement difficulties [37].

Telecommuting

Telecommuting assures increasing employment opportunities to persons with disabilities [40]. The Americans with Disabilities Act of 1990 (ADA) has caused companies to allow alternative employment practices. In 1998, eight million of the unemployed were people with disabilities. The unemployment of those workers costs the economy over \$200 billion each year in subsidies, financial aid, and lost tax revenue. If all of these people became telecommuters, that \$200 billion figure could be reduced to \$152 or even \$104 billion. Unfortunately, the conversion of unemployed persons with disabilities into productive telecommuters is not happening at the rate one would expect. Employers are not hiring persons with disabilities to become telecommuters apparently because of network security concerns and the desire to have office-based workers. It has been suggested that telecommuting limits opportunities for workers with disabilities in that employers want face-to-face interactions with their employees especially at high levels, putting home-based workers at a disadvantage. Furthermore, home-based workers cannot easily meet face-to-face with supervisors, clients, and co-workers.

Travel Trends

Reducing transportation barriers would result in increased community participation and greater life satisfaction among people with disabilities [41]. Forty percent of people with severe disabilities are not involved in their communities in contrast with 20 percent of people without disabilities that are not involved in their communities [36]. Lack of transportation is one of several contributors to disabled persons' lack of involvement in their communities. According to NOD, people with disabilities are much more likely to consider inadequate transportation to be a significant problem in their lives versus people who do not have disabilities (30 percent versus 10 percent respectively). Forty-seven percent of people without mobility limitations reported to

be very satisfied with their lives according to the National Health Interview Survey (NHIS), but only 24 percent of people with mobility limitations were very satisfied with their lives.

Thirty percent of people with disabilities are confronted with inadequate transportation compared with 10 percent of non-disabled people [38]. Access to transportation affects one's opportunities to work, socialize, get an education, obtain health care, and participate in the life of the community. Inadequate transportation is a greater problem for people with severe disabilities. Nevertheless, income also plays a significant role in being a victim of inadequate transportation [42].

The 2000 TBI contained 61 persons who reported having a disability and were employed. Forty-nine percent of working disabled persons drive alone to work compared with 78 percent of the general population in the TBI. Close to five percent of people with disabilities in the sample commute by three-person carpool and three percent by vanpool. In comparison, for the general population in the TBI, 0.8 percent use a three-person carpool to commute to work and only 0.2 percent use a vanpool. The disability rate is much higher among the elderly than the general population according to the 2000 TBI, indicating a need for specialized transportation for the elderly with disabilities. In particular, the gap is larger in the 13 collar counties (10.4 percent versus 2.5 percent) than in the seven core counties (5.9 percent versus 1.6 percent).

E-workers

It is important to study teleworkers, also known as telecommuters, in order to discern how they influence society in terms of their travel behaviors, their residence and business locations, and the ties between quality of life and occupations [43]. In August 2001, the information technology and telecommunications research firm IDC conducted a survey of 2,500 U.S. telework households in order to create a teleworker profile [44]. The survey revealed several interesting demographic trends:

- Forty-one percent of teleworkers have children under 18 in the household;
- Sixty-five percent of teleworkers are male;
- Sixty percent of teleworkers have some college education and 31 percent have graduate degrees;
- Fifty percent of teleworker households earn \$50,000 or more annually and 17.9 percent of households earn more than \$100,000;
- Teleworkers in the IDC sample work from home at least three days per month; and
- Most teleworkers view telework as an interim situation, and they often return to full-time work at the office.

A recent SLPP study on information and communications technology and travel provided an illustration of what the typical teleworker looks like in the Twin Cities Metro Area [45]. Altogether, 37 out of 153 respondents telecommute and 36 of those worked from home.

There were 1,850 telecommuters in the 2000 TBI sample, or 12.6 percent of the total population surveyed. Among the telecommuters, 53 percent were male and 47 percent were female. Telecommuters tend to be concentrated at the higher income levels than the general public. For example, 21 percent of the telecommuters versus 18 percent of the general population reported to

make \$75k to \$100k per year. The rates are 17 percent versus 10 percent for those who make \$100k to \$150k, and eight percent versus five percent for those who make more than \$150k.

In terms of commute mode, telecommuters drive alone at a much lower rate than the general population, especially in the 13 collar counties where 62 percent of telecommuters drive alone to work while as much as 80 percent of the general public drive alone to work. Telecommuters also work at home at a higher rate, 16 percent, than the general public at four percent. When it comes to the number of individual daily trips, telecommuters tend to make more daily trips than the general public. Seven percent of the telecommuters make no daily trips, while the rate is 16 percent among the general public.

Households That Do Not Own an Automobile

A small percentage of Minnesota households do not have vehicles available for the use of household members. The highest concentrations of households in which no vehicle is present are found within Hennepin and Ramsey counties; lower concentrations are found within suburban counties of the Twin Cities (see [Appendix A, Map 9](#)). Three percent of Minnesota owner-occupied households do not own a vehicle, while almost half of these households own two vehicles [2]. Twenty percent of renter-occupied households do not own vehicles, while almost half of these households own one vehicle. The percentages are similar for the Twin Cities MSA. An analysis of 2000 TBI revealed that in the 20-county area, only 262 people out of a total of 17,467 (1.5 percent) people surveyed did not own a vehicle. Exploratory analysis on those 262 people was conducted, although it is not possible from this data set to make generalizations for the entire population of persons who do not own vehicles.

According to the 2001 NHTS, only eight percent of urban households do not own a vehicle [34]. Of those urban households who do not own a vehicle, 34 percent of their trips are made by automobile (29 percent by HOV), 19 percent by transit, and 44 percent by non-motorized means (41 percent walk). Out of all income categories, the category with the largest share of urban households that do not own a vehicle are those households earning less than \$20,000. In addition, for those urban households whose annual income is less than \$20,000, 75.9 percent of their trips are by automobile (45.9 percent HOV), 4.6 percent by transit, and 17 percent by non-auto methods (16.2 percent walk).

In the 2000 TBI, 134 persons of the 262 non-vehicle owning sample reported that they commute to work. Interestingly enough, 24 of these commuters get to work by driving alone. Twenty-nine people use transit and auto for their work commute. The rate of transit and auto mode share among non-vehicle-owning persons is 32 percent higher than all other mode shares. Twenty-six percent of non-vehicle-owning persons and 15.6 percent of households that do not own vehicles reported making no trips on the day they completed the travel diary. In terms of demographics, fewer men than women reported not owning a vehicle—100 men compared with 162 women. The two age groups most likely to not own a car were those ages 65 and older and those between 25 and 35 years (69 people and 41 people respectively). Fifty-seven percent of non-vehicle-owning persons are in one-person households.

Walkers and Bikers

According to the 2000 U.S. Census, Minnesotans living outside the 13-county metro area walk to work at a slightly higher rate than those inside the metro area (3.3 percent and 2.4 percent respectively). A similar pattern was noted from the 2000 TBI data in that the percentage of people who walk to work is higher in the 13 ring counties (2.8 percent) than in the seven core counties (1.8 percent). In general, in the 13 ring counties, of those who walk to work, more are men than women (66.7 percent and 33.3 percent respectively) and conversely in the seven core counties, more women than men walk to work (53.2 percent versus 46.8 percent respectively). People who walk to work in the 13 ring counties tend to be older (ages 45 to 54 years) than those who walk to work in the core (ages 24 to 34 years). Walkers who reported to work at home are concentrated in either the lowest or the highest income groups—less than \$25,000 or more than \$100,000. Walkers telecommute at slightly higher rate in the seven-county core area. Thirty-eight percent of those who walk to work in the core counties telecommute compared with 31 percent in the ring counties. Thirteen percent of the walkers in the core do not own a vehicle, but all of the walkers in the ring own a vehicle.

Although only a small sample of bikers could be drawn from drawn from the 2000 TBI, an analysis of it casts some light on the travel behaviors of bikers in the 20-county area. Only 0.6 percent of the 2000 TBI respondents reported to commute by bike. Most of the bikers (88.6 percent) reported to live in the seven core counties. Bikers are concentrated in the 18 to 24 and 35 to 44 age groups. Six percent of bikers in the 20-county metro area are between the ages of 18 and 24 and 18 percent are between the ages of 35 and 44. Within the seven core counties area, 24 percent of the bikers are ages 18 to 24 and 33 percent of the bikers are ages 35 to 44. In the core, 60 percent of the bikers are male. Thirteen percent of bikers do not own a car. Forty-seven percent of bikers work part time compared with 26 percent of the general population.

Tourists

Minnesota has 124 state parks and forests, one national park, two national forests, and countless lakes, rivers, and other scenic areas [8]. Minnesota's 58 state forests consist of four million acres and nearly 2,000 miles of forest roads. During the 1990s, Minnesota tourism was responsible for an estimated 25 million domestic and 760,000 international one-person trips in 2000. In 1999, Minnesota ranked twenty-third in international travel expenditures among all states and the District of Columbia and twenty-fourth in domestic travel expenditures. Travel spending by domestic and international visitors produced 129,700 jobs in Minnesota in 2000. Less than two percent of Minnesota tourists come from abroad, and Minnesota holds only a one percent share in the number of overseas tourists traveling to the United States [46]. International visitors come for business reasons or to visit friends and relatives.

Between 1998 and 2001, Minnesota's accommodation and food services industry added 13,741 employees and 16 establishments [47]. It is important to note that due to the U.S. Census Bureau's transition from tracking industries by Standard Industrial Classification (SIC) codes to North American Industry Classification System (NAICS) codes, it was not feasible to compare all of the 1994-1997 SIC data to the 1998-2001 NAICS data in order to ascertain a trend over a greater period of time.

Within the accommodation and food services industry, there was tremendous growth in recreational vehicle parks and campgrounds. The number of establishments grew by 24 percent from 1994 to 2000 while the number of employees grew by 244 persons. The number of seasonal, recreational, and occasional-use homes as a percentage of total housing units is quite remarkable in Aitkin, Cass, Cook, and Hubbard counties (see [Appendix A, Map10](#)). Furthermore, as mentioned earlier in the report, the central lakes area has grown considerably since 1990 (see [Appendix A, Map 1](#)).

In terms of tourism, Minnesota is a regional destination, and people use automobiles to travel [46]. According to the 1995 American Travel Survey, Minnesotans travel more than the national average; 85 percent of all Minnesota households travel compared with 80 percent nationally [48]. These households took one or more trips that were 100 miles or more away. Minnesotan travelers took 26.6 million person-trips, an average of 5.6 trips and 3,989 miles per traveler. Persons visiting Minnesota took 24.8 million person-trips, an average of 5.5 trips and 3,429 miles per traveler. Minnesotans who travel out of the state are most likely to visit Wisconsin, North Dakota, and Iowa, and people from these states travel in great numbers to Minnesota. Minnesotans and visitors to the state traveled mostly for leisure purposes and to see family and friends.

Conclusion

Minnesota's population is aging and becoming more racially and ethnically diverse. These two groups, senior citizens and the non-white population, are growing at significant rates and will increase the demands on Minnesota's transportation system. Persons with disabilities continue to face challenges accessing suitable transportation. This group in particular relies on advances in communications and transportation technologies to significantly improve their quality of life. The ability to telecommute and to have a flexible work schedule and work place continue to become increasingly popular options for today's worker. It is assumed that people who demand flexibility in their work time and place also will demand flexibility in their transportation options. Households that do not own automobiles are a rarity in Minnesota as are people who primarily walk or bike to work. Mainstream tourists are dependent on the automobile. Travel in Minnesota relies heavily on the SOV. The SOV best serves the general population; however, the aging labor force, the growing foreign-born and non-white populations, the increasing number of e-workers and flex-workers, and the migration patterns that move people into less dense areas will require ITS-enhanced alternatives to the SOV to better and more efficiently serve these emerging and diverse groups.

This study is significant because it asked a very important and unique question, that is, "What populations in Minnesota would be better served by alternatives to the SOV and advances in ITS?" The research identified seven populations that would benefit from ITS solutions. While there is ample information on the demographic, economic, and travel characteristics of the senior citizen and baby boomer populations, that does not hold true for the other six. This study attempted to gather data on these lesser-known populations and is the impetus for continuing to do so for the subsequent research tasks.

Researchers must create and distribute surveys and organize focus groups to further investigate the transportation needs of these seven diverse groups in both rural and metropolitan settings. Special attention must be given to:

- How these needs may affect Minnesota's economy;
- How the needs of the different groups differ from each other;
- Their opinions about the value of better transportation information and other ITS services;
- How these needs vary from the driving population;
- The ways in which needs are not being met by the current system; and
- The potential impact of continuing to not meet their needs.

Afterwards, written summaries and a task report of data from the surveys, focus groups, interviews, and existing reports will explain how and/or why SOV ownership is not in the best interest of these selected groups. The summaries and report will highlight ways in which these groups, and the state as a whole, are therefore disadvantaged.

SECTION II—TASK 2

Chapter 2 Baby Boomers and Retirees

About the Survey

The transportation needs of baby boomers (non, new, and older retirees) were examined through a survey of people born before 1948. The random sample of 2,000 people was drawn from the counties in the “Golden Crescent” of Minnesota, which encompasses a diversity of urban, rural, and sub-urban area types. The sample was drawn from a national database by Claritas, Inc., and the survey was conducted from February, 2004 through April, 2004.

This particular survey was designed to answer questions regarding the needs, desires, and preferences of Minnesota baby boomers (non, new, and older retirees) in different age cohorts. Questions were asked regarding:

1. Activities for which respondents travel;
2. The relative importance of each activity type to the traveler;
3. The preferred modes of transportation;
4. The desired qualitative aspects of transportation alternatives;
5. The level of comfort with computers; and
6. The degree of dependence on driving, and auto ownership.

By understanding these aspects of this population segment, it can be better understood how ITS-oriented alternatives examined elsewhere in this research can be best matched to non, new, and older retirees. Understanding the priorities and qualitative trip preferences of this population will also provide guidance in designing and implementing transportation alternatives in a way that is most appropriate for this population.

Respondents

Of the 2,000 surveys distributed, 267 were returned, representing a response rate of 13 percent. These responses represent a balance of “non retirees” (persons born between 1943 and 1947), those approaching the retirement cycle, referred to as “new retirees” (persons born between 1938 and 1942) and “older retirees,” those of an age expected to be retired (persons born before 1938). The “non retirees” comprised 27 percent of the respondents. Twenty percent of respondents were “new retirees,” and the remaining 51 percent were born before 1938 and were classified as “older retirees.”

These three age cohorts are referenced and compared throughout the remainder of this analysis because:

1. They represent different stages of the retirement cycle and different levels of expected workforce participation.

2. They represent the graduation of the generation from the traditionalist generation (long-time retirees) to non and new retirees.

The majority of the respondents (more than 93 percent) lived either alone or with a spouse. Less than 6 percent lived with children or extended family and less than 4 percent lived in retirement communities. More than 95 percent of the respondents owned a car, and all of those who owned a car also drove.

Trip Purposes

Most transportation literature classifies trips as “subsistence, maintenance, and discretionary.” However, for this study, maintenance trips were not expected to be influenced. Instead, respondents were asked to classify their activities in the last week into the categories of “work” and “medical” trips, which can be considered “subsistence” activities, and also “social,” “visit friends,” and “recreational” activities, which can be considered “discretionary” activities. The respondents also were asked to rate the importance of each of these activities on a scale of 1 to 4, with 1 being least important and 4 being most important. Table 2.1 demonstrates the average number of trips per week for each of the three age groups previously indicated.

Average Number of Trips (Weekly)					
	Work Trips	Friend Visits	Medical Visits	Recreational Activities	Social Activities
Non Retirees	4.95	2.53	0.89	1.96	1.81
New Retirees	3.42	2.15	.8	1.94	2.04
Old Retirees	2.1	1.93	0.88	1.6	1.75

Table 2.1 Average Number of Trips (Weekly)

Table 2.2 demonstrates the average importance (on a scale of 1 to 4) of activities for the different age groups.

Average Importance of Activities (1 to 4)					
	Work	Friend Visits	Medical	Recreation	Social
Non Retirees	3.18	2.04	2.35	2.06	2.04
New Retirees	2.83	2.09	2.28	2.42	2.28
Old Retirees	2.02	2.01	1.78	2.26	2.03

Table 2.2 Average Importance of Activities (1 to 4)

Work

Overall, the most common trip purpose reported in the survey was the work trip. On average respondents made 3.45 work trips per week. The distribution of work trips demonstrates a graduated cycle of retirement, with the number of work trips declining as respondents grow older, but with respondents continuing to travel for some work trips well over the standard retirement age of 65.

The “non retirees” (persons ages 57 to 61) reported on average a standard five-day work week averaging 4.95 trips per week. The “new retirees” (persons ages 62 to 66) averaged 3.42 trips per week, representing a reduction in the number of trips associated with retirement at the age of 65. Older retirees over the age of 66 continued to report work trips, averaging 2.1 work trips per week. This suggests that whether continuing to work part time in their careers or taking jobs for supplemental income or personal satisfaction, persons over the age of 65 do continue to make some weekly trips for work.

In addition to being the most common trip purpose reported in the survey, the overall importance of the work trip also was rated as more important than other trip purposes throughout the sample, with an average score of 2.64 on a scale of 1 to 4 with 4 being most important. The importance of the work trip was greatest for the non retirees, still working a five-day work week than for any other group. On a scale of 1 to 4, with 4 being most important, the non retirees assigned the work trip an average importance of 3.18, making it the singular most important trip purpose for any of the age groups. The new retirees rated the average importance of the work trip at 2.83, making it also the most important activity to this group as well. The older retirees placed an average importance of 2.02 on the work trip, making it second only to recreation in its importance to this group.

Visiting Friends

The second most common activity reported by the respondents was visiting friends. Respondents reported visiting friends on average 2.16 times weekly. For all age cohorts, visiting friends was reported as a more frequent activity than any other non-work activity.

The non retirees reported more weekly visits to friends than any other age group, with an average of 2.53 visits per week. The new retirees and older retirees reported, on average, 2.15 and 1.93 weekly visits to friends respectively. This indicates a larger level of social activity among non retirees than current and older retirees. This also indicates that when people enter into the retirement cycle, the number of visits to friends does not increase as the number of work trips decreases. This is not true of other social activities, as will be reported later in this report (see *Social Activities*).

Even though the new retirees reported fewer friend visits per week than those not yet of retirement age, the importance of friend visits was slightly more important for new retirees than for any other group. On the 4-point scale, those near or just beyond retirement age rated the importance of visiting friends as 2.09. The non retirees rated the importance of visiting friends as 2.04, and the older retirees rated the importance of this activity as 2.01. Unlike other trip purposes, visiting friends is the one activity for which there was relatively little variation by age cohort on the importance of the activity. All age cohorts rated the importance of this activity just above 2.0, indicating that throughout the retirement cycle, individuals consistently place an importance on interaction with friends that does not change as other activities and lifestyle issues change.

Medical Activities

Medical activities were the least common type of activity reported in the survey. On average, respondents engaged in a medical activity less than once per week. In the survey, medical activities were not defined solely as doctor visits, but as any activity involving a health or medical professional.

On average, respondents said they had engaged in one medical- or health-related activity in the previous week. It is important to note that the non-response rate for this question was 40 percent, the lowest for any of the questions about activities. Because 40 percent of the respondents to this survey did not answer the question regarding medical activities, it is likely that those who did answer this question were those who had engaged in this type of activity. This could account for the seemingly high number of medical trips throughout the sample. Sixty-five percent of the non retirees in the sample responded to this question; whereas, only 57 percent of new retirees and older retirees answered the question.

The number of medical trips reported among age groups was consistently less than one per week, with non retirees, new retirees, and older retirees averaging .89, .8 and .88 medical trips per week respectively.

The non-response bias affecting the question regarding the number of medical activities was not present in the question regarding the importance of medical activities, with an overall percentage

of 94 percent of respondents answering the question about the importance of medical activities. The importance of medical activities declined as age cohorts increased, with non retirees assigning medical trips an average importance of 2.35, new retirees assigning medical activities an importance of 2.28, and older retirees placing an importance of only 1.78 on medical activities. The apparent lower level of perceived importance of medical activities to older retirees warrants further study and could be an indication of any number of different lifestyle factors influencing why and how older retirees view health and medical related activities.

Recreational Activities

Overall, recreational activities were less common than work, visits to friends, and other social activities but more common than medical activities. On average throughout the sample, respondents reported between 1 and 2 recreational activities per week; with an average of 1.79 activities of this type.

The non retirees and new retirees reported an average of approximately 2 recreational activities per week (1.96 and 1.94 respectively). The older retirees reported fewer weekly recreational activities, with an average of 1.6 activities per week.

The most interesting finding regarding recreational activities was the added importance new retirees placed on these trips. The survey finds that recreational activities become significantly more important when people retire. The non retirees rated the average importance of recreational activities as 2.06 on a scale of 1 to 4. The new retirees placed the importance of recreational activities at 2.42, and the older retirees rated the importance of these activities at 2.26 making recreation the second most important type of activity (second only to work) for new retirees and the single most important activity type for older retirees.

This finding indicates that access to activities that enhance quality of life becomes greatly more important to people as they retire and continues to be important well into old age.

Social Activities

Social activities were reported as slightly more common than other recreational activities, visits to friends, or work activities but more common than medical activities. The average respondent reported between 1 and 2 social activities per week (average 1.83). The new retirees had the greatest average number of social activities, averaging 2.04 per week; whereas, non retirees reported only 1.81 social activities per week, and older retirees reported the least social activities, averaging 1.75 social activities per week. This indicates that as with recreational activities, social activities may increase with retirement, but become less common as the retiree grows older.

This is also indicated by the importance rating given to social activities by respondents. Non retirees rated social activities with an average importance of 2.04. The importance of social activities increases to 2.28 for new retirees and returns to 2.03 for older retirees. This finding coupled with the finding regarding recreational activities suggests that upon retirement, work activities decline and are replaced with social and recreational activities, which then decline as the individual ages and the overall level of activity declines.

Modal Preferences

Respondents were asked to rate different ways of accessing their activities on a scale of 1 to 4 with 4 being the most preferred. Table 2.3 shows the average level of preference which the respondents attributed to different ways of accessing their activities.

Modal Preferences							
	Drive Alone	Walk	Bus	Internet	Computer Comfort	Ride Share	Bike
Boomers	3.77	2.84	1.69	2.56	3.18	2.3	2.21
New Retirees	3.67	2.86	1.77	2.14	2.62	2.17	2.17
Old Retirees	3.44	2.57	1.95	1.85	1.9	2.75	1.68

Table 2.3 Modal Preferences

With an average score of 3.58, driving alone was by far the most preferred means of accessing activities for all respondents. The second most preferred way of accessing activities was walking, with an average preference of 2.72. Riding together with others was rated at 2.52, using the Internet as a means of accessing activities was rated at 2.14, and bicycling was rated at 1.91 as a way of accessing activities. Riding the bus, rated at 1.84, was the least preferred way of accessing activities. With the exception of riding together, most ways of accessing activities, overall, had higher average scores from younger respondents, with older respondents giving lower scores to all of the modes.

Driving Alone

Driving alone was preferred by all age groups, with its highest score among non retirees who had not yet reached retirement age. New and older retirees also had driving alone as their most preferred way of accessing activities, rating it 3.67 and 3.44 respectively.

Walking

Walking was the second most preferred way of accessing activities for non retirees and for new retirees, who expressed preferences for walking at 2.84 and 2.86 respectively. Older retirees also had a preference for walking, with a rating of 2.57, but on average indicated that they preferred ridesharing over walking as a means of accessing activities.

Riding Together

Sharing a ride in a vehicle was the third most preferred way of accessing activities for non retirees and for new retirees, with preferences for this mode rated at 2.3 and 2.17 respectively. As indicated above, older retirees had a higher preference for riding together, with an average rating of 2.75 for ridesharing, and had the highest preference for ridesharing of any of the age groups.

Internet

Accessing activities by using the Internet was significantly more preferred among non retirees than by new retirees or older retirees. Non retirees, internet trip substitution received the third highest rating, at 2.56, as a means of accessing activities. This alternative was significantly less appealing to new retirees, who rated it, on average, 2.14. Unlike the non retirees, the new retirees expressed a higher preference for ridesharing and biking. Only riding the bus was less preferred by new retirees than internet substitution.

This difference was even more evident among older retirees, who also rated internet substitution 1.85 (second to last), with only biking as a less preferred means of accessing activities than internet substitution.

Different levels of computer comfort among the age groups were also reported, with the non retirees rating their level of computer comfort (on the 1 to 4 scale) as 3.18 on average, new retirees rating their computer comfort as 2.62, and on average, the older retirees rating their computer comfort level as 1.9.

This finding gives a strong indication that non retirees are significantly more open to internet computer substitution than other groups, reporting not only a greater level of comfort with computer technologies, but also a significantly higher preference for accessing activities by using the Internet relative to traveling by bus or bike or by ridesharing.

Biking

The preference for biking was very weak across age groups and was weakest for older retirees. Biking was rated second to lowest for non retirees and for new retirees with average ratings of 2.21 and 2.27 respectively. Biking was given the lowest average preference of all alternatives by older retirees, who rated it only 1.68.

Bus

Bus transportation was consistently rated low by all groups as a means of accessing activities and had the lowest preference rating of all modes for non retirees as well as new retirees with average preference ratings of 1.69 and 1.77 for these groups respectively. Bus transportation was rated slightly higher by older retirees with 1.95, but still received the second to lowest preference score from this group.

Sensitivity to Trip Features

Respondents were asked to rate the importance of trip features on a scale of 1 to 4, with 4 being the most important. The most important element of a trip feature for all respondents was the availability of the transportation at the exact time and place where the individual wants to access the activity. On average, respondents rated the importance of transportation alternatives that are ready to go when the respondents are ready to go as 3.42. Safety was the second most important feature, with an average importance of 3.22. Transportation alternatives with a direct point-to-point connection and the physical comfort of this alternative were rated at 3.19 and 3.17 respectively. Less important trip features included personal security, ease of access, and privacy; which were rated 3.07, 3.03, and 3.02 respectively. Affordability and short wait times were not rated as highly important, with ratings of 2.92 and 2.87 respectively.

One key survey finding was that overall, the older retirees are much more sensitive to trip features than baby non retirees and new retirees. Table 2.4 shows the average importance of trip features for each age group on a scale of 1 to 4 with 4 being most important.

Average Importance of Trip Features (1 to 4)									
	Short Travel Time	Safety	Point-to-Point	Easy Access	When I'm Ready	Security	Physical Comfort	Privacy	Cost
Boomers	2.86	3.16	3.12	2.98	3.12	2.95	2.98	2.86	2.84
New Retirees	2.76	3.11	3.07	2.88	3.19	3	3.23	3.01	2.76
Old Retirees	2.94	3.31	3.3	3.15	3.16	3.2	3.26	3.11	3.03

Table 2.4 Average Importance of Trip Features (1 to 4)

Key Features for Baby Boomers

For the non retirees, the level of safety, the availability at the right time and place, and the availability of direct point-to-point connections were the most important elements of a transportation alternative, with scores of 3.16 for safety, 3.12 for availability when the traveler is ready to go, and 3.12 for point-to-point connections. Physical comfort, easy access to and from the transportation mode, and personal security were mid-level features for non retirees, with access and physical comfort rating 2.98 and security rating 2.95. The less important features to the non retirees include privacy, speed, and travel cost, with ratings of 2.86 for speed and privacy and 2.84 for travel cost.

Key Features for New Retirees

For new retirees, physical comfort was the most important trip attribute, with a rating of 3.23. Other highly important features for new retirees include availability of transportation when the traveler is ready and safety, rated at 3.19 and 3.11 respectively. Mid-level preferences for new retirees include point-to-point access, privacy, and personal security with ratings of 3.07, 3.01, and 3.00 respectively. Ease of access to the vehicle, travel cost, and speed were among the less important features for this group, with ratings of 2.76 for travel time and travel cost and 2.88 for ease of access.

Potential Matches and Prospects for ATIS, Teletravel, Community-Based Transit, and Carsharing

Non Retirees

Given the significantly greater computer comfort and ratings for internet substitution among non retirees than other age groups, it is likely that internet activities geared towards this group could be a promising alternative for this group as they retire. The finding that recreational and social activities tend to increase in number in early retirement suggests that internet options for social and recreational activities could have broad appeal as this group begins to retire. Further research into the nature of social and recreational activities for this group may identify specific types of recreational and social activities for which this group would be most likely to substitute internet use for travel.

With the strong preferences of this group for safety, point-to-point connections, and transportation alternatives that are available at the exact time when the traveler is ready, advanced traveler information services (ATIS) that provide trip directions, transit route information, or weather and road conditions via telephone or internet, for example, could significantly enhance the quality of the transportation system for this group, which greatly prefers to drive alone. While driving alone is strongly preferred as a mode by this group, ITS applications to enhance community-based transit (CBT) will be important as this group ages, and as significant numbers of this population may become unable to drive for health or other reasons. ITS-enabled CBT may provide an option for meeting this group's strong preferences for immediate point-to-point connections and transportation that is available at the precise time and place of travel.

Carsharing is not likely to be a promising alternative for this group because of the high levels of auto ownership reported in this group.

New Retirees

With the strong emphasis this group places on availability of transportation when the traveler is ready to go, physical comfort, safety, privacy, and point-to-point connections, ATIS alternatives also are likely to appeal to this group. Specifically, ATIS systems that enable the driver to avoid hazardous driving conditions in inclement weather or other potentially unsafe situations could be especially appealing.

As these retirees age and some are unable to drive alone as they most prefer to do, their strong preferences for physical comfort and privacy also will create challenges for CBT providers. This study finds this group less open to internet substitution than their younger non-retired counterparts, suggesting that as driving becomes less of an option for some, they will seek means of transportation that continue to ensure as much physical comfort and privacy as possible. Options such as walkable communities also are likely to appeal to this group, who place walking as the most preferred transportation alternative second only to driving.

Older Retirees

For older retirees, with their strong preferences for safety, physical comfort, and transportation ready to go when the traveler is ready, using ITS is a challenge. Given this group's low level of comfort with computers and very low preferences for internet substitution, solutions such as ATIS and teletravel, that is, using telecommunications and computers to substitute or enhance physical travel regardless of purpose, are unlikely to be appealing options. When older retirees become unable to drive, as they strongly prefer to do, ITS is most likely to meet their needs by improving the security, ease of access, and ready availability of CBT services. While carsharing may not be necessary for this group with its high levels of auto ownership, as this group becomes less able to drive, it has indicated a preference for sharing rides with friends. It is possible that ITS could provide ridesharing and carpooling programs among non-drivers in this group by connecting non-driving older retirees with people they know and trust and helping them develop a network of people to ride with. Ridesharing programs for older retirees would have to take advantage of networks of people the traveler knows and with whom the traveler is comfortable in order to meet the security criterion indicated by this group. This study finds that because of security concerns, older retirees are unlikely to accept a ridesharing program that would require riding with strangers.

Chapter 3

Foreign-Born and Non-White Populations

Focus Group Methodology and Organization

The Task 1 report states African Americans, Asians or Pacific Islanders, and Hispanic/Latino groups are the principal racial and ethnic groups contributing to population growth in Minnesota. According to this report, along with 2000 Census Data and Minnesota State Demographic Center information, Somali, Hmong, and Latino populations are the largest African American, Asian or Pacific Islander, and Hispanic/Latino subgroups in Minnesota. The Humphrey Institute's State and Local Policy Program (SLPP) organized a series of focus groups to analyze the transportation needs of these foreign-born and non-white Minnesota subgroup populations.

SLPP conducted focus groups in both rural and urban locations in Minnesota that contain significant numbers of immigrant subgroup populations. Researchers held seven focus groups from February to June 2004, with four in the Twin Cities and three in out-state Minnesota. The researcher team contacted and worked with rural and urban social service organizations that provide services to immigrant populations. The organizations assembled focus group participants and provided meeting locations. SLPP staff acted as focus group moderators and contracted with interpreters who provided both language translation services during each focus group meeting and transcribed each group discussion.

Focus Group Participants

The rural and urban focus groups were matched based on subgroup immigrant populations. Focus groups with Spanish-, Somali-, and Hmong-speaking residents were held in the Twin Cities and out-state Minnesota (see Table 3.1). SLPP identified two rural counties and communities with large numbers of Spanish-, Somali-, and Hmong-speaking populations. Spanish and Somali focus groups were conducted in Faribault (Rice County), Minnesota. A focus group with Hmong residents was held in the city of Tracy (Lyon County), Minnesota.

Spanish and Somali focus groups were conducted in Minneapolis (Hennepin County), Minnesota, while one focus group with Hmong residents was held in St. Paul (Ramsey County), Minnesota. Specifically, two Minneapolis-based Somali focus groups were held: one group of women and one group of men, to accommodate the needs of Somali women who often defer to their male counterpart viewpoint in group discussions. A mixed-gender Somali focus group was held in Faribault; these participants had a significant comfort level with this arrangement having participated in mixed-gender English as a second language (ESL) classes. The other focus groups had a combination of male and female participants. The following table identifies the location, date, and language spoken of both the rural and urban focus groups, as well as the social service organizations contacted to gather participants.

Focus Group Organizations	Location		Date	Language
	Rural	Urban		
Centro		Minneapolis	February 6, 2004	Spanish
Faribault ECFE	Faribault		February 24, 2004	Spanish
Brian Coyle Community Center*		Minneapolis	March 9, 2004	Somali
Hmong American Partnership*		St. Paul	March 23, 2004	Hmong
Faribault Adult Learning Center	Faribault		May 19, 2004	Somali
Roselle Apartments		Minneapolis	June 5, 2004	Somali
Tracy ESL	Tracy		June 15, 2004	Hmong

Table 3.1 Rural and Urban Focus Groups

*The Somali focus group held at the Brian Coyle Community Center and the Hmong focus group held at Hmong American Partnership were conducted during a strike by Metro Transit bus drivers and mechanics. Many of the participants urged SLPP moderators to end the bus strike and resume bus service.

Focus Group Discussion Guide and Objective

The focus group discussion guide used to conduct the meetings (see [Appendix C](#)) contains a series of questions aimed at identifying the transportation needs of the rural and urban immigrant subgroup populations. The questions consist of five main categories:

1. Discussion of Activities;
2. Discussion of Trips;
3. Discussion of Computers;
4. Discussion of Transportation Modes; and
5. Final Questions

The series of final questions relate to language barrier issues and participants' knowledge of new transportation innovations or ideas. The objective of the final questions is to examine how intelligent transportation systems (ITS) can meet the diverse transportation needs of foreign-born and non-white populations. The results from the focus group discussions of activities, trip preferences, computer use, and mode choice help define the travel needs of the participants, which, in turn, help to identify possible matches with ITS services and transportation alternatives that may suit the requirements of the growing immigrant populations in Minnesota.

Following is a descriptive analysis of the raw focus group data translated by the contract interpreters [1]. The results of each focus group are reported individually (see [Appendix D](#)) and are segmented and summarized by rural or urban location. While all focus group participants reported that language barriers affect their transportation needs in various ways, their cultural background and geographic location present a more significant barrier to meeting their mobility needs.

Rural Focus Group Summary

The discussions with Spanish- and Somali-speaking residents in Faribault and with Hmong-speaking residents in Tracy are summarized as follows:

Spanish Speaking

According to these participants, dedicating time to family was the most important of a variety of daily activities that include going to work, attending classes, shopping, and doing household chores. These people reported spending a great deal of time traveling by car or bus outside of Faribault, and by taking a bus or taxi, walking, biking, or ridesharing in the city. This group prefers to stay and travel in Faribault but shop in Burnsville, Mankato, or Northfield at larger and less-expensive stores.

Safety when traveling is not a concern to this group, although they are aware of safety issues when traveling in Minneapolis or by bus out of state. Many in this group do not have their driver's license and face financial barriers to vehicle ownership. The participants who do not have a license either walk or use the bus to get to work or other places. If those alternatives are not viable for a particular trip, these participants travel by taxi, which they report is expensive and often not reliable. According to these participants, they are comfortable using the transit

system, because its use is “common among their culture,” and many say they learned to use the bus system at an early age while living in Mexico. The participants report that their local bus system has only one route. Limited connections and long wait times associated with bus riding are both problems for this group. They would like to see faster bus service with more routes. This group perceived advantages to walking and biking, but felt these modes were effective only for short trips. Participants in this group say they often share rides, but agree that this mode also can be unreliable.

Having to miss appointments or to deal with emergencies also emerged as problems for these participants; they report wanting readily available transportation, first, to reduce travel time and get to appointments on time, and second, to have a reliable means of traveling in the event of a personal/family emergency.

Several participants indicated that they own computers and use computers to pay bills or purchase plane tickets. They report that their children also use the computer. The majority of the participants say they would like to use computers to shop or work if it saves a trip, time, and money, and better enables them to care for their children from home.

Finally, participants report that communicating with bus and cab drivers and cab dispatchers is difficult, and say that cab drivers often do not have patience when dealing with them.

Somali Speaking

Working, attending school, and visiting friends and relatives are the most important daily activities for this group. The majority of these participants works at a company called the Turkey Store in Faribault. While they work and attend school in Faribault, they visit friends and relatives in Minneapolis, Owatonna, Rochester, and Faribault. Most of these participants prefer to stay in Faribault, saying that the city generally meets their needs, and they are able to access what they need to without a vehicle.

The group feels that traffic congestion is a problem in Faribault, in Minneapolis, and on the freeway, as it increases travel time. These participants have mixed feelings about accidents and physical security when traveling. In terms of accidents, most in the group feel safe on a bus or taxi but have mixed feelings about driving a car. The majority also feels secure riding on a bus or in a taxi, but do not feel safe at the bus stop or traveling in winter. Direct and readily-available transportation is important, they say, because it is safe and timely and is best achieved by owning a vehicle.

Privacy is also an issue for this group, and most of the participants feel that traveling by car with people they know is preferable, but say it is okay to ride with strangers only on a bus. These participants feel they do not have many viable transportation choices, and feel say that taxi service is unreliable and bus service in their area is limited.

This group reported having access to computers at school and said they use computers to send and receive e-mail messages and as a tool to help improve their English skills. These participants have mixed feelings about using computers to reduce the number of trips they take. Some in the

group would like to purchase products online, while others say they are skeptical of purchasing products in this way.

Some of the participants indicated they own a vehicle, and most in the group say they'd prefer to own a car. They agree that biking and walking have advantages; they feel that taxis are not safe; and they say taking the bus is time consuming. In addition, the group agrees that a language barrier makes it difficult to travel, to order or purchase goods and services, and to make appointments via the telephone.

Hmong Speaking

Working, going to the doctor, visiting relatives or attending social activities are the most important daily activities for these participants. Visiting relatives supercedes working if a social event such as a wedding or funeral occurs on a weekend. The people in this group travel to St. Paul to visit relatives and go to Marshall, Mankato or Sioux Falls to shop. Participants indicated that most of the larger stores at which they like to shop are located in Marshall. They prefer to travel within Tracy for work and health care and to purchase daily supplies. There is a health-care facility in Tracy that uses interpreters from the Twin Cities, but these participants must travel to Mankato for dental services. They report that they travel mainly by car, by sharing rides, and taking the bus.

Getting around quickly, the group reports, depends upon the destination of and reason for traveling, for example, are they going to a funeral or picking up a child at school? Fear of having a car accident is a concern to people in this group, especially when traveling to Marshall for work in the winter. They report being less concerned with safety issues when walking or biking in Tracy but say that physical security when walking is an important issue.

These participants agree that it is safer to travel with a friend, neighbor, or someone else they know; however, Hmong men will not travel in a car with Hmong women who are married.

This group also prefers to have direct connections and readily-available transportation rather than coordinate their transportation needs with others' schedules, and they believe it is easier to travel alone in one's own vehicle.

Generally, the participants have mixed feelings when it comes to having transportation choices. Some of the participants say they get sick when riding the bus and feel that bus service is too slow. On the other hand, some participants prefer taking the bus over driving. Most of these participants own a car, but will carpool if their car is not available.

People in this group say they travel out of state via individual vehicle, bus, or airplane. All of these participants have a computer, but report that their children are the primary users. These group members would like to avoid taking special trips by using the computer to purchase items such as airline tickets if they were more computer literate. Most participants indicate that their children purchase products via the Internet or telephone.

The participants say they have difficulty communicating in English. They speak limited English at work, but cannot hold conversations. They feel their lack of English skills prevents them from reading bus signs and learning how to use bus service.

Urban Focus Group Summary

The discussions with Spanish- and Somali-speaking residents in Minneapolis, Minnesota, and Hmong-speaking residents in St. Paul, Minnesota, are summarized as follows:

Spanish Speaking

For this group, working, attending school, and making sure their children get to school are the most important activities. The participants say they travel often both within and outside of their community for work or school and to obtain basic necessities. Most of the people say they prefer to travel outside of their neighborhood depending upon weather conditions and available bus service.

The group reported several problems with their bus service, including long wait times, missed transfers, too many stops, and racism from bus drivers. They also say that crime can be a problem for people waiting at or walking to a bus stop and have concerns for their physical security and safety in these instances.

Missing appointments and arriving late to work is a concern for these group members, who say that traveling by bus negatively affects their ability to get to work, school, or other appointments on time. They say they would prefer to take fewer buses and walk less. Participants say they feel comfortable using transit, or bus, service. They say also that they face many barriers to owning their own vehicle, with high maintenance costs one particular issue. Walking, biking, and ridesharing are common for these participants, but they acknowledge these modes do have some disadvantages.

This group says they are “more social” when traveling, prefer a friendly atmosphere, and are not especially concerned with privacy. These people indicate they are not interested in using computers and would rather leave home to shop or participate in other activities. The new Metro Transit service to the Mall of America in Bloomington is of interest to these participants.

Somali Speaking (Brian Coyle)

Cooking and going to school and to the doctor are the most important daily activities for these participants. They travel primarily within their neighborhoods and communities, but sometimes visit friends and relatives outside these areas. Group members say they would like to travel more often to other parts of town, but usually do not have a ride.

This group reports that while the bus takes them most places they need to go, this mode may cause them to miss appointments, so they call taxis or ask friends and family members for rides when they need to get somewhere quickly.

Although these participants travel primarily by bus, ridesharing, or walking, they were very concerned with and affected by the bus strike; they report having no transportation issues prior to the strike. These group members rely on bus service are very comfortable using the bus system and say they are “very social” when traveling. However, participants say they would like to own a vehicle yet feel it is impossible due to financial barriers.

They acknowledge that physical security is an issue when riding the bus and that discrimination is a problem. Generally, they do not really fear having a vehicle accident and trust in “God” to ensure their safety; nonetheless, they are concerned about having an accident when walking. Thus, these participants prefer riding the bus over walking.

Hmong Speaking

These participants report that their daily activities include working, going to school, handling household chores, and taking of children. They travel primarily outside of their communities to go to school, visit relatives, and shop and rely on their children for transportation or take the bus or walk to their destination. If their children are working or otherwise are unable to provide transportation, these participants say they sometimes have no transportation options, which is a problem for them. Although walking is a traditional mode of transportation in Laos and is something the group says they are comfortable with, the report a fear of getting lost when walking as many in the group cannot read or speak English. They also are fearful of and not comfortable with the transit system. Specifically, they worry about getting lost, hurt, or attacked when walking to a bus stop or riding on the bus; they also worry when driving themselves or ridesharing. The participants who use the bus, however, say they are very concerned with the bus strike and wanted it solved.

The group notes that they are concerned about their personal safety when walking and riding in taxis and are equally concerned about getting into car accidents, especially those who cannot read or speak English. They say they prefer to have transportation that takes them directly to and from their destinations. They report also that privacy is a concern and say they are less social when traveling. They do prefer to travel with relatives or friends they know when traveling by car, bus, taxi, and carpools. The participants say they also worry more about the safety of the driver when sharing a ride.

Few of these participants own computers. Those who do own computers state that their children are the primary users. These participants also say they are not comfortable using computers and distrust ordering products via the Internet. They do report that the transportation and telecommunication systems in the United States impress them, mainly because these systems decrease the need to walk.

Somali Speaking (Roselle Apartments)

For this group, working is the single most important daily activity. These participants say they travel primarily outside of their neighborhoods to other locations in the Twin Cities, to Faribault, and to Rochester for work, to visit friends and relatives, and for health care services. They say they would like to live near where they work; however, housing in those areas is too expensive.

Missing or arriving late to work is a concern, the group reports, and they say they spend money on taxi service when they must get to work, or other destinations, at a particular time. This group prefers transportation, including bus service, which takes them directly to their destinations, as this shortens the trip length, saves the cost of driving to a particular bus stop in order to catch a direct-connect bus, and provides more time for other activities. Readily available transportation service offers a “very efficient” means of getting around, they report, although they add that it is hard to predict travel time when traffic congestion cause unexpected slow downs. These participants suggest increasing bus service in order to shortening wait times. Few of these participants own cars as they have financial barriers to car ownership, and they typically ride the bus or carpool with another person who owns a vehicle.

These participants say that they are concerned about having an accident, especially when driving on the freeway, taking a taxi, or riding the bus. They are also concerned about their physical security when waiting for the bus or walking alone.

The group says that privacy is not an issue when traveling, adding that they prefer to travel in groups and feel that walking, driving, and riding the bus alone are not safe.

These participants say they are computer literate and use computers to search and apply for jobs, and to research and purchase products. The group reported that they would rather pay bills or do research on their home computer in order to save travel time and reduce the number of trips they take, but they feel this approach reduces personal interaction.

Finally, the report that a language barrier is one of the main challenges they face when traveling, and that they have difficulty communicating with taxi and bus drivers.

Focus Group ITS Technology Matches

The focus group discussions provided information that helped identify the transportation modes in which ITS technology enhancements may better serve the transportation needs of the Hmong, Somali, and Spanish cultural groups. The individual focus groups discussions are compared to the services provided by carsharing, community-based transit, telecommunications, and other transportation services. The following table shows the ITS technology matches identified from the focus group discussions (see Table 3.2). Note that these technologies are discussed at greater length in the [Task 3](#) reports.

Technology Matches	Carsharing	Community-Based Transit	Telecommunications /ATIS*	Other
Rural Focus Groups				
Hmong	X	X	X	
Somali		X		
Spanish	X	X		
Urban Focus Groups				
Hmong	X	X		
Somali		X?	X (telecom only)	X
Spanish		X		

Table 3.2 ITS Technology Matches

*ATIS: Advanced Traveler Information Services

Rural Focus Group Results

The ITS technology matches for discussions with Spanish- and Somali-speaking residents in Faribault and Hmong-speaking residents in Tracy are summarized as follows:

1. Faribault Early Childhood Family Education (ECFE)—Spanish Speaking
Carsharing is the preferred technology match for this cultural group. This group is comfortable using transit, and transit use is common to their culture. Community-based transit would address their need for readily available transportation, the lack of convenient bus service, and the barriers to vehicle ownership and expensive taxi service in Faribault. Carsharing also is an option, as this group is familiar with ridesharing. Carsharing enables residents to travel within Faribault and to the Twin Cities to shop. Use of computers to reduce the number of trips taken and to save time and money also is a preference; however, their responses did not make it clear whether or not telecommunications is a technology match for this group.

2. Faribault Adult Learning Center—Somali Speaking
Community-based transit is the preferred technology match for this cultural group. Taxi service is unreliable and there is only one bus in Faribault, which prevents people in this group from using needed transportation services. Direct and readily-available transportation is preferred, and members of this group feel safe riding on a bus or taxi and have no privacy issues on the bus. This group also has financial barriers to car ownership. Language barriers and skeptical use of the computer limits telecommunications as a technology match. Community-based transit service can provide transportation for most of these participants who work at the Turkey Store and also to bus stations, as these participants often travel to the Twin Cities, Rochester, and Owatonna to visit relatives.
3. Tracy ESL—Hmong Speaking
Carsharing, telecommunications/ATIS, and community-based transit are all possible technology matches for this cultural group. Community-based transit service can handle work, healthcare, and shopping trips from Tracy to other cities like Marshall. Carsharing is another option for those who prefer to drive than ride the bus. Carsharing can mitigate barriers to vehicle ownership, provide quick travel service, alleviate issues of traveling with non-relatives or friends, and give those who are comfortable driving another transportation alternative. Telecommunications and ATIS are also options as computer ownership and increased computer use to purchase supplies, order bus and plane tickets, and obtain travel information occur.

Urban Focus Group Results

The ITS technology matches for discussions with Spanish- and Somali-speaking residents in Minneapolis and Hmong-speaking residents in St. Paul are summarized as follows.

1. Centro—Spanish Speaking
Community-based transit is the preferred technology match for this cultural group. A friendly, safe, and social traveling atmosphere is important. Traveling by bus negatively affects these participants' ability to arrive to work, school, or other appointments on time. They are more interested in leaving the home for activities, but have barriers to vehicle ownership. Missing appointments is an issue, and they prefer direct transportation connections. Problems with the bus service, including long wait times, missed transfers, slow schedules, and racism from bus drivers, as well as crime and security issues point to community-based transit as a better transportation alternative.
2. Brian Coyle Community Center—Somali Speaking
No clear technology match exists for this cultural group, and more research is needed. Community-based transit is a possible option, but people in this group rely on the bus for the majority of their trips. Members of this group would like to travel to other locations in the Twin Cities, but are hindered by limited ride availability and limited bus service. Missing appointments is an issue, so this group relies on taxi service when they must get somewhere quickly. This group is very comfortable using the bus system, are social when traveling, and do face barriers to vehicle ownership. Physical security and discrimination is an issue when riding the bus, and community-based transit may mitigate those concerns.

3. **Hmong American Partnership—Hmong Speaking**
Community-based transit is the preferred ITS technology match for this cultural group. People in this group travel primarily outside their neighborhoods for daily activities, and they currently rely on their children or take the bus for transportation. This group is not comfortable using transit and fears getting lost, hurt, or attacked. The language barrier further compounds these concerns. These participants prefer direct connections when traveling. The group is not comfortable using computers and distrusts using the Internet to purchase goods and services. Privacy is a concern when traveling, so this group prefers to travel with relatives or friends they know, which makes community-based transit an ideal match.

4. **Roselle Apartments—Somali Speaking**
Community-based transit and telecommunications are possible ITS technology matches for this cultural group. While people in this group are very computer literate and would like to use the computer for e-commerce and other business needs in order to eliminate the number of trips they make, they did not express a desire to use the computer to obtain travel or transit information. They prefer readily-available transportation service and travel primarily by bus or ridesharing. Missing work or arriving late to work is a concern, and these participants prefer direct transportation that saves the time and costs associated with driving. They prefer to live near their work, but cannot afford to do so. Physical security is a concern when walking, waiting for the bus, or traveling alone. The language barrier is an issue when traveling; thus, community-based transit can mitigate this issue.

Chapter 4

Disabled Persons

The fundamental challenge in ascertaining the transportation needs, preferences, and behaviors of disabled persons lies in the complexity of disability itself. Because there are many types of disabilities—mental, physical, and emotional—it is difficult to generalize about specific qualitative targets for serving “disabled persons” as identified in the previous task. Distinctive research methods must be developed for interacting with people of different types of disabilities, requiring expertise not only in transportation planning and research, but also in the provision of care for disabled persons. Unfortunately, this task was far too comprehensive to be addressed adequately within the context of this study, but should be addressed in future research.

In order to obtain a general sense of issues arising in the provision of transportation services for disabled persons, care providers who serve the diverse needs of broad groups of disabled persons were consulted for input regarding transportation issues and needs. Many care providers were reluctant to participate in this process, and only two full interviews were accomplished, both of which were in the Twin Cities metropolitan area.

The following is a brief summary of issues raised by confidential interviews with disabled-person care providers in the Twin Cities.

General Facts about Transportation and the Disabled

Care providers cited the gap between poor disabled persons and non-poor disabled persons as a key determinant of transportation needs. The poor disabled are completely transit dependent, hence have significantly fewer transportation options, and in the Twin Cities, rely heavily on Metro Mobility, an area Americans with Disabilities Act (ADA) paratransit service. Current paratransit services available to the poor disabled often leave unmet needs that vary depending on the type of disability.

Mentally Disabled

For example, care providers have noticed mentally ill persons have at times been “suspended” from access to Metro Mobility because of difficulties they have comprehending and attending to Metro Mobility scheduling policies. When a poor disabled person is “suspended” in this way, he or she has no access to transportation whatsoever, which provides a source of serious concern for care providers. Another problem involving mentally ill persons is the issue of driver awareness of the nature of an individual disability. If drivers are not aware that a passenger is mentally ill, and the passenger gives the driver different directions from the original trip destination, care providers have noticed drivers may take the mentally ill passenger to the wrong destination and leave them there, with no means of safely getting home.

Physically Disabled

The physically disabled often have problems using existing transportation services because of the absence of appropriate seating and shelter when waiting for the transit vehicle. For example, if a

physically disabled person uses paratransit for a shopping trip then has to wait in the cold, with no place to sit and no place to set down the groceries, for two hours for the transit vehicle, the feasibility of the shopping trip is called into question. This is especially true in inclement weather.

Observations about Trip Purposes

Overall, care providers noticed that social and recreational trips are among the most important trips for the most severely disabled persons. Access to community and interaction with friends and loved ones provide a critical support network important to disabled persons. Walking is seen as a recreational activity more so than a mode of transportation within the severely disabled community; however, the opportunity to walk is important for those who are able.

Out of town trips were found to be extremely important among elderly disabled African-Americans. The primary trip purpose for this group was funerals. This is the one trip purpose for which care providers consistently have noticed that extended family will provide extensive transportation support. These trips were found to be made usually by air and were handled almost exclusively by the disabled person's family.

Critical Trip Features

As previously discussed, availability is the key feature of a desired transportation service for disabled persons as observed by care providers. The practice of suspending disabled persons from paratransit service for "no shows" when scheduling conflicts arise was seen as the most critical source of unmet transportation needs for the mentally disabled community.

Also as previously mentioned, the physical comfort of the trip is critically important to physically disabled persons. In addition to the comfort of the environment for waiting for the transit vehicle, the comfort of the ride itself also was seen to be important. Care providers relayed many anecdotes of patients who complained of fear, discomfort, and injury resulting from sudden maneuvers of the transit vehicle.

On-board security of people and objects was also cited as a concern of the physically disabled. Anecdotes were related about instances in which drivers were not fully aware of objects that were not properly stowed or not fully aware as to whether passengers were properly secured in their seats. In these cases, falling and shifting items in transit had created fears and concerns among physically disabled persons regarding the security of the travel environment.

More Research Needed

Overall, it is found that there are prospects for intelligent transportation systems (ITS) that may help drivers more efficiently secure and control the on-board travel environment, systems that assist with scheduling paratransit trips, and systems that provide the most accurate information for drivers about the specific nature of disabilities in their passengers.

However, significantly more work is needed regarding the transportation needs of each segment of the disabled population beyond the scope of this study. Specifically, gaps between the poor

and non-poor disabled, distinctive needs of those with mental disabilities, and different levels of comfort and security perceived by the physically disabled should be studied in more detail with research directly involving the disabled persons themselves.

SECTION III—TASK 3

Chapter 5 Tele-Applications

Telework

Following a surge of interest in the early 1990s, the idea of working from home seemed to lose momentum. By 1997, the New-York based firm FIND/SVP reported an 11 percent drop—9.1 million to 8.1 million—in the number of employees who worked from home one or more days per month during normal business hours from a year earlier [1]. Now that broadband services such as digital subscriber lines (DSL) and cable modems are widely available, telecommuting is experiencing renewed growth and is becoming a feasible option for large and small companies. In addition, broadband providers have proliferated throughout Minnesota in the past two years opening up more areas of the state for telecommuting opportunities. This is largely due to the emergence of fixed wireless broadband providers in rural Minnesota. Two years ago wireless broadband was just starting out in Minnesota. Today, more than 25 separate wireless broadband providers have been identified serving 141 communities in rural Minnesota [2]. Of these 141 communities, 41 have wireless broadband as their only technology option. For this, and other reasons, more employers will be offering telecommuting as an option, and more workers will embrace it as it suits their needs [1].

Telework/Telecommuting and Disabled Populations

Telework/Telecommuting is appropriate for physically disabled people looking to participate in the labor force. Interest in telework for individuals with disabilities is increasing. A number of nonprofit organizations, such as the American Telecommuting Organization and the International Telework Association and Council, provide resources to help employers plan and execute telecommuting programs and to assist individuals with disabilities to either telework in their current job or to enter a telework occupation. There are more than 54 million Americans living with a disability, representing a full 20 percent of the U.S. population. Almost half of these individuals have a severe disability affecting their ability to see, hear, walk, or perform other basic functions of life [3].

One of greatest employment barriers for many people with disabilities is the lack of dependable and reliable transportation. Many people with disabilities have the desire and capabilities to work from their homes, and they constitute a largely untapped labor pool. For persons with significant disabilities, telework offers the possibility of an accessible, barrier-free workplace, and flexible scheduling and the elimination of disability-related bias or discrimination [4, 5]. By one estimate, increasing the availability of telework for unemployed individuals with a disability in the United States alone would save employers between \$48 billion and \$96 billion dollars annually in reduced short- and long-term disability payments, workers compensation, and personnel replacement costs. (This estimate does not include the potential benefits to American taxpayers in increased tax revenues and reduced public benefits, such as Social Security Disability Insurance (SSDI), Supplemental Security Income (SSI), Medicaid, Medicare, and housing and food supplements [5].)

In Minnesota, the Midwest Institute for Telecommuting Education (MITE) provides expertise in strategic planning, manager/employee training, and policy development to assist successful implementation of telecommuting work arrangements. In 1999, MITE worked in collaboration with the Minnesota Department of Transportation (Mn/DOT) and AT&T to provide outreach and telework implementation training to rural and metro Chambers of Commerce throughout the State of Minnesota. The majority of the 300 participating employers were small businesses that had not implemented such arrangements earlier due to uncertainties about implementation steps, workers compensation, liability, supervisory strategies, costs, and technology concerns. During this time, many small businesses questioned the value or need for telework for persons with disabilities due to concerns about the Americans with Disabilities Act (ADA), costs, technology, and time needed for implementation. These barriers constituted the greatest hurdle to marketing this concept to businesses [4, 5]. However, MITE has many case studies that demonstrate that telework is a sound alternative to help persons with disabilities work a regular 40-hour workweek (see [Appendix E](#)). Other benefits are listed in Table 5.1. Many job tasks (e.g., customer service, writing, data entry, analysis, reporting, phoning, programming, proofing) are conducive to telework, at minimum on a part time basis [4]. During MITE's 14-year history working with employers to hire persons with disabilities, more than 90 percent of the employers were small businesses [4].

Benefits of Telework for Disabled Populations
1. Retain valuable employees who become disabled, thereby lowering employee recruitment and training costs.
2. Respond to particular employees medical situations without losing productivity; keep morale high and retain employee loyalty.
3. Fill positions with qualified applicants with disabilities who have trouble accessing reliable transportation in positions that have been hard to fill due to hours or corporate locations
4. Provide new employment opportunities in rural settings where rates of unemployment are high for people with disabilities, resulting in economic growth.
5. Expand corporate diversity programs.

Table 5.1 Benefits of Telework for Disabled Populations

Source: Virginia Commonwealth University Rehabilitation Research & Training Center on Workplace Supports, *Tapping New Talent for Business Success: Employing People with Disabilities*. 2000.

Social Dimension of Telecommuting

Much has been written about the economic and environmental benefits of telecommuting (also known as teleworking). An important aspect of telecommuting for disabled populations is its impact on quality of life. Many respondents in a telework study from 2002 [6] validated a link between telework and good quality of life. The study demonstrated that while many teleworkers missed interacting with other people at their workplaces, they did work longer hours and showed greater ability to concentrate and better work performance. The apparent contradiction between longer working hours and improved quality of life could be explained by the amount of time saved by not commuting and reduced stress and by being able to better manage one's time. Various studies also have found that teleworkers take fewer sick days. Interestingly, a large majority of respondents in the James study [6] felt that telework actually had a beneficial effect on their health due to factors such as reduced stress, less driving, more exercise, and better diet. A good number reported also that teleworking made it easier for them to be involved in organized local community activities [6]. While the research considered a number of potentially negative effects of telework, it found these effects can be minimized by proper program management and are outweighed by many more potentially positive effects [6].

Telemedicine

As mentioned earlier, increased broadband access in the state of Minnesota is creating new telework opportunities by allowing large amounts of data to be transported to and from people's homes, which means that tasks requiring frequent access to large files now can be done remotely with ease. Great progress has been made in extending broadband service to all of Minnesota, which will benefit those participating in telework *and* telemedicine opportunities.

Telemedicine enables all study populations to be linked together with physicians despite geographical separation and travel costs. The increasing number of persons over age 65 indicates that the share of the population whose driving may be impaired by physical limitations may also increase, thus leading to greater need for access to transportation options other than automobiles is. Minnesota's overall median age is projected to increase from 35.4 in 2000 to 40.2 in 2030. The trend in aging is expected to continue along the same course as it has in rural Minnesota and even increase in counties attracting retirees.

A high percentage of seniors remain in rural counties. The higher percentage of seniors remaining in rural counties has many implications such as a demand for increased levels of medical services. Today, approximately 85 percent of rural places in the state currently have access to broadband technology [2].

Physician Shortage

There appears to be a shortage of physicians available to serve some parts of the state. Aside from the distinct cluster of physicians around Rochester, physicians are concentrated in counties with large hospitals—but not necessarily large cities. The Twin Cities and Duluth rank high as do the counties of Blue Earth (Mankato), Stearns (St. Cloud), Kandiyohi (Willmar), and Pennington (Thief River Falls) [7]. Some explanations for this shortage are that the very lowest numbers of physicians appear in counties that are adjacent to a county with a large facility, such as Sherburne and Benton Counties (St. Cloud), Fillmore County (Rochester), Houston County (La Crosse), and Clay County (Fargo) [7]. However, moving farther west and north there is a distinct drop off in the number of physicians in many rural counties. Most counties in western Minnesota reported having fewer than 22.5 physicians per 10,000 residents, which is the state average [7].

Increased availability of broadband access will provide opportunities for healthcare services via telemedicine, which offers many advantages. This can make specialty care more accessible to underserved rural and urban populations, which will lead to improved access to medical specialists in addition to quicker, more accurate diagnosis and treatment, not to mention decreased costs and decreased professional isolation for medical specialists.

Teleworking also is becoming increasingly attractive for non retirees who want to semi retire and work from home or work from a second home.

Chapter 6 Carsharing

Introduction

The term “carsharing” is used to describe the act of sharing of one or more vehicles by many people in close proximity to one another. This activity offers members of a carsharing organization access to a car without the burden of car ownership. Proponents of carsharing insist that it is the missing link towards an ecologically sustainable transportation system, giving transit users the flexibility and mobility that transit service is increasingly unable to provide in the polycentric metropolises of the twenty-first century. Carsharing has seen remarkable success in Europe, where it began, and it is showing promise in a few American cities where it was introduced in 1998. However, it is still worth asking, “How viable is this idea in sprawling urban America, and will it substantially alter the transportation landscape in the few dense cities where it may find a market?” As well as, “Who is attracted to using this adaptation to the transportation system, and can this market be expanded to include a more diverse cross-section of the population?” This report begins with a brief description of the history of carsharing, how it works, and the latest market trends in the carsharing business in the United States. This is followed by a brief analysis of how the carsharing market could be expanded to include a more diverse cross-section of the population as well as what threats face the future of carsharing. The report concludes with recommendations about developing a new carsharing program in the Twin Cities.

Data and Methodology

This study occurred between fall and spring of fiscal year 2003/2004. All findings are based on a literature review of carsharing reports up until spring 2004 and interviews with managers of carsharing operations in Seattle, Portland, San Francisco, Madison, Boston, and Washington, D.C. Much of the information gleaned from these interviews is not attributed in order to preserve confidentiality.

Carsharing: History and Overview

Carsharing began in 1987 simultaneously but independently in Berlin and throughout Switzerland. The first carsharing business involved only one car shared by a few friends, and the idea quickly spread through word-of-mouth until the organization was able to buy a second car. This pioneering organization, Stattauto, is now one of the largest carsharing enterprises in the world with 270 cars and locations in Berlin, Hamburg, and Rostock (www.stattauto.de). Mobility CarSharing of Switzerland boasts an even more impressive record since its inception in 1987. It has become the largest carsharing business in the world with close to 1,700 cars and 58,000 members (www.mobility.ch). Today, there are many large carsharing organizations in cities throughout Europe. Using the European experience as a model, some entrepreneurs began the first carsharing operation in the United States in Portland, Oregon. Initially called CarSharing Portland, it has since joined the Seattle-based for-profit company Flexcar, which had subsequently initiated service the following year. Flexcar has a large operation with substantial operations in Seattle, Portland, and the Washington D.C. metropolitan area (www.flexcar.com).

Flexcar is now beginning to see growth in San Diego, Los Angeles, and Denver and has recently collaborated with the non-profit startup company called I-Go in Chicago by offering the use of its technology and consolidating some other administrative operations. Zipcar is another for-profit enterprise based on the East Coast, and it has experienced fast growth in Boston, New York City, New Jersey, and Washington D.C. (www.zipcar.com). Zipcar uses little public assistance in its operation and approaches its mission as more of an information technology firm than as a transportation company. The nonprofit organization City CarShare (www.citycarshare.org) began operations in San Francisco in 2001 and has since grown to an operation with more than 100 cars. It has collaborated with Philly CarShare (www.phillycarshare.org) in Philadelphia, which operates under a similar model. ZipCar, Flexcar, and City CarShare comprise more than 90 percent of the carsharing market nationwide, but new startup companies in Philadelphia, Chicago, Madison, and elsewhere may become more prevalent in the coming months and years.

While a carsharing program can be as simple as a few friends or community members owning a vehicle together and reserving it by signing up for the car on an accessible registration sheet, carsharing operations of any size use a great degree of technology to function. In fact, it is precisely internet and wireless technology that has led to the rapid proliferation of carsharing in the last five years both in the U.S. and in Europe.

The process for joining and using a neighborhood carsharing program is as follows. A new member registers on the organization's Web site and pays an application fee and a refundable deposit that can range from \$75 to \$400. The organization performs a credit and driving history check, which takes about two days. Upon acceptance into the program, the new user can use the service immediately. The fees vary by organization, but there are typically two rate plans to accommodate both frequent users and occasional users. Most organizations combine distance and time factors into the rate structure (usually \$4 to \$12 per hour plus \$0.40 to \$0.80 per mile, although at least one organization offers 10 free miles for each trip). A member can reserve a car via the phone or Web site for a particular time and duration. The member opens the car using a "smart key card" or key fob. Because the car is equipped with a cellular communication system connected to the reservation and billing system for the organization, the user is identified, and the car can be opened or started. The car continues to communicate with the reservation and billing system and tracks mileage and time until the member returns the car. The member is then billed a monthly fee that varies depending on the member's rate plan plus all fees for use of vehicles during the month. For some organizations, members are allowed to change their rate structure each month if they suddenly expect to drive less or more than they had originally anticipated. According to carsharing company managers and the literature on the subject, carsharing users spend less money on transportation than car owners if they travel less than 10,000 miles per year by car on average.

Current Trends

Carsharing programs have seen steady growth in the United States since 1998. Dr. Susan Shaheen's survey of carsharing operations shows that the growth is almost exponential. In just five years, the United States now claims more than 25,000 carsharing members and almost 700 cars in carsharing programs [1]. This should not be entirely surprising considering how new the technology is in the United State. It also says little about long-term viability since most

carsharing operations are not yet financially solvent. Most of the growth in carsharing since 1998 has been the result of the aggressive expansion of Zipcar and Flexcar as well as the increasingly popular City CarShare in San Francisco. All three appear to be reaching self-sufficiency in a number of markets.

Station Cars vs. Neighborhood Carsharing

These three largest operators provide a service known as neighborhood carsharing. Another carsharing program model that has been attempted in the U.S. with little success is the station car model. This model operates the cars in the same way as the neighborhood carsharing model except that the cars are kept at transit stations and are used by commuters who use a station car to get to work from the station or to get home from the station. This model anticipated that in two-way commute transit corridors, such as along the Caltrain corridor between San Francisco and San Jose, the cars would be used continuously since one commuter would take a car to the closest station in the morning and a reverse commuter would pick it up to take it to work near that same station. Most of these programs have closed since 2001. Dr. Shaheen believes that this is partly due to increased insurance costs and the loss of public funding [2]. However, this method may be fundamentally flawed, because it relies solely on the work commute, which happens only twice per day. According to one carsharing operator, carsharing organizations must see their cars used at least seven hours per day if they are to break even. While station cars might have been useful to a few people, the market is not large enough to sustain such a program.

Where is Carsharing Effective?

Neighborhood carsharing programs typically locate their cars where they feel a market exists for their service. These are densely populated mixed-use areas well served by transit. They are usually in areas of predominantly middle-income residents or areas of mixed income. As a carsharing business expands its membership, it leases more cars that are placed in areas nearby its existing cars. This practice, known as clustering, allows users to choose from among a number of available cars within reasonable distance thereby increasing the flexibility that the program offers. It also serves to increase the visibility of the program in a particular area. All three of the major carsharing operators in the United States begin by placing their first vehicles in areas where they anticipate there will be a market instantaneously. These are areas with a high number of residents who are in the median-income to high-income range and are well educated. They are always areas where it is difficult or expensive to park, areas with excellent transit service, and areas with high residential density and some mixed uses. Some organizations are experimenting with placing cars in lower density suburban areas, but have seen only limited success so far.

Who Uses the Service?

Carsharing users are usually middle-income, white or Asian, and between the ages of 30 and 55. According to a study of Flexcar Seattle users, carsharing users exercise more than the general population, are in households with no more than one car, listen to National Public Radio for their news, and attend at least 10 live performance events per year. The most striking characteristic of carsharing users is their high level of education. Flexcar reported that more than 85 percent of its users have bachelor's degrees, 30 percent have master's degrees, and 10 percent have doctoral degrees [3]. This particular characteristic of carsharing members is reported for all of the carsharing organizations in the United States. Most attributed this to the novelty of the idea in the United States; it is conventional wisdom in marketing that new products are usually adopted by people with more education before finally being accepted by a larger spread of the population. One would anticipate that this is beginning to happen, and a study by Robert Cervero on City CarShare in San Francisco confirms that the diversity of membership has indeed begun to increase as the program matures [4]. Cervero's study found that most City CarShare members lived in "non-traditional" households, which is somewhat typical for San Francisco; more than 70 percent of users did not live in a household with children. Members were disproportionately employed in a professional occupation, with many of these professionals affiliated with the urban planning or architecture professions [5]. The high number of such professionals is probably because they possessed privileged information about the service at its outset and are likely attracted to a progressive transportation alternative like carsharing.

Another possible reason for the lack of diversity among the membership of carsharing programs is the way in which the organizations market the service. Carsharing operators all employ "guerrilla marketing" approaches to getting the word out about their service. Few have the resources to mount aggressive advertising campaigns. Word-of-mouth, press coverage, tabling at neighborhood street festivals, dropping off literature in apartment buildings and coffee shops, and some advertising in free weekly papers provides the bulk of marketing. This approach attracts new members who are similar to existing members. However, partnerships with existing institutions can help to bring in a new audience to pitch the service. All but one carsharing operator uses the transit agency's resources to market to new members. These agencies usually provide free advertising on buses and bus shelters, include information on their Web sites, and sometimes facilitate membership in the carsharing program through their commuter pass programs.

Trip Purposes

Most individual members of carsharing organizations bike, walk, or use public transit to get to work. Carsharing is rarely used for this purpose. If it were, it would fast become more expensive than owning a car. Instead, most members use the service to run errands, access healthcare, haul things within a neighborhood, and visit friends in a less accessible neighborhood. Few individual members use the cars to go out of town for a significant amount of time and instead use discounted rental cars that some organizations have arranged with rental car companies. However, one carsharing operator reports that its members take the cars out of town frequently, which poses few problems for it since this organization has enough cars in its system to absorb the absence of a few cars. Perhaps as carsharing services grow, the need to collaborate with

rental car companies would disappear, as the impact of removing a car from the system for a few days would be minimal. About 50 percent of one for-profit organization's membership signs up for the service as a form of mobility insurance and rarely accesses the vehicles. These members typically pay a lower monthly rate (in some cases there is a no monthly fee option) that comes with a higher per-use rate. Some of these people might live in very dense neighborhoods with excellent transit accessibility and rarely need a car or are in a household with a car and sign up with the carsharing organization as a back-up second vehicle. Forty percent of Flexcar members do not own a single car [6], and almost 70 percent of City CarShare members are car-free. According to Cervero's study, more than 90 percent of City CarShare members lived in zero-to-one-car households, significantly higher than the average for the Bay Area [7].

Business Members

Most carsharing operators like to locate their cars in areas with a mix of high-density residential uses and employment. Some of this is due to the low car-ownership needs of individuals in such neighborhoods, but also because businesses can use the cars during the middle of the day when there is little demand from individual members. Businesses often sign up with an operation to replace a fleet of vehicles or to offer their employees an additional benefit and encourage them to take transit to work. This works particularly well for downtown businesses that already have a transportation demand management program in place to encourage alternative transportation for their employees like commuter checks, free bus passes, vanpooling, etc. A number of carsharing organizations also are developing relationships with universities and other public agencies that are interested in reducing fleet costs in the face of the current government budget crisis. In one case, at the University of North Carolina at Chapel Hill, the university simply uses the technology of the parent organization (Zipcar) and manages the fleet itself. While in the case of Madison's Community Car, the University of Wisconsin offers trial memberships to employees and eligible students and provides marketing assistance to Community Car but does not manage the fleet. When a business signs up with an organization, it enrolls all or some of its employees who must go through the same background check and application process as an individual member. Typically, some employees rarely use the vehicles while others use them considerably.

Impact on Travel Behavior

Robert Cervero has undertaken the only substantial study on the impact of carsharing on travel behavior and the environment. This study determined that vehicle miles traveled and per capita gasoline consumption went down while mobility for transit users increased as the program matured. In the one or two years since new members joined City CarShare, they used the vehicles less and carpooled and trip-chained more as time passed as they adjusted their travel behavior to account for the new option [8]. This is attributed to an increased awareness of the cost of various modes of transportation. The induced vehicle travel that carsharing programs may produce for previously car-free households is far outweighed by the reduction in use by users who forgo the purchase of a vehicle or who sell a vehicle. While San Francisco is hardly typical for North American cities, there is little reason to suspect that these impacts on travel are not being played out in the other cities where carsharing is gaining presence.

Opportunities for Expanding the Market

The potential benefits of carsharing are countless; however, it is difficult to tell whether carsharing will be successful in most American cities without being subsidized for many years. Where carsharing is appearing to be successful, it is unclear whether it will significantly alter the transportation environment in the long run. One constraint that carsharing operations face is the limited market that they serve. Three additional groups of individuals could benefit considerably from carsharing but have not adopted the alternative in a widespread fashion where it is offered. These are low income people, retired people, and young students.

It seems like carsharing would be an excellent opportunity for lower- to middle-income transit riders who live in the inner city to benefit from increased mobility at a fraction of the cost of owning a car. While all carsharing providers believed that their service would work well for this population, few were actively targeting this market at this stage in development. One carsharing operator has received a grant from its regional metropolitan planning organization (MPO) to offer subsidized memberships to individuals in a welfare-to-work program. These new members are able to operate the vehicles at a reduced rate and would not have to pay the deposit, which can be prohibitive for people who live paycheck to paycheck. This is the only direct intervention in the carsharing business to promote the alternative among low-income people currently in existence. Most organizations are concentrating on improving and expanding their service and becoming financially solvent before going after this new market. While most operators believed that their service would be a good option for low-income people, most concurred that the extremely poor would not benefit from this service, because transit is too expensive for them already and carsharing would just add to their transportation costs. Expanding carsharing operations into low-income areas may require public partnerships and subsidies at least in the short term. Partnerships with workforce development centers, transit agencies, and low-income housing developers would be necessary. The main carsharing operators all have placed vehicles at low-income housing projects, but they admit that most of the members who use those cars are not from those projects. These housing projects are in areas with a significant number of middle-income residents as well. One carsharing program has developed a partnership with a low-income housing provider. In this case, residents receive a reduced-cost membership, and the building provides parking spaces. Another carsharing operator has had some trouble with placing vehicles in low-income housing projects, because parking is not accessible to outside users; the vehicles always need to be accessible to people both in the development and in the surrounding neighborhood.

Another group of users who could potentially benefit from carsharing is the retired. People in this group typically have lower mobility requirements than younger people and are often on fixed incomes. However, insurance companies often will not insure carsharing members above age 65, prohibiting their participation. Some organizations have placed cars at or near retirement homes in order to go after this market when their insurance plans allow it, but adoption rates are not typically strong. One organization, however, has had some success with a program where it placed a car in a retirement community, and the city subsidizes membership, which makes the program more affordable to members of the community. One carsharing organization is considering developing a program whereby younger members could drive elderly members

currently ineligible to drive and in return would receive a discount when they needed to use the cars themselves.

A third group of users that could significantly benefit from carsharing is youth. Students and young workers are more likely to use transit than most other demographic groups, and many more might use it if the carsharing option were available. However, this group of people is underrepresented in most carsharing operations. Two operators reported that they are very interested in targeting this market, but said that once again, insurance will not cover people in carsharing programs who are under age 21. One carsharing program is exploring the idea of allowing parents to co-sign on applications for university students. If this insurance option were available, universities and colleges could join a carsharing operation as an organization and offer lower fees to students. This seems like it would be a particularly good match since U-Pass programs have been remarkably successful at attracting students to transit. Students are a cost-sensitive population and typically live in areas with high transit service. Trying to better serve this market should be carefully explored. Madison Community Car has a partnership with the University of Wisconsin to promote membership among students and employees, but its insurance provider will not allow membership to individuals with fewer than five years of driving experience, which significantly limits participation.

The Role of Technology

Carsharing could face a very bright future in the United States as evidenced by the fast growth of City CarShare, Flexcar, and Zipcar. Considering how homogenous the current membership generally is, it seems likely that this idea could catch on among other groups once it becomes more mainstream. Technology is playing and will continue to play a huge role in the success of carsharing in the United States. The new Web-based reservation and billing system is very new and has significantly increased the amount that members use the carsharing services. While technology makes it easier to use the system, it also can make it more cost-effective as the fleet of cars can be managed better through global positioning system (GPS) technology, and trip data can be better gathered and analyzed. Some organizations are learning more about their members' travel behavior through online surveys and are exploring a new technology where drivers can enter information about their trip from within the car such as number of riders, purpose of trips, etc.

Threats to Success

Carsharing, however, is not without its share of threats. High insurance rates, while slightly improving in some cases, continue to plague carsharing operators and present a significant barrier for new start-up companies who have no operating history. As carsharing becomes better known to the insurance industry, insurance should become less of a problem; however, it is a serious impediment to getting a successful operation up and running. Insurance also is the reason that large potential markets are not served by carsharing programs such as the elderly, individuals under age 21, and anyone with recent driving violations. One carsharing operator indicated that insurance is the main area where public policy action could have a wide impact on the success of carsharing organizations. If insurance could be subsidized for start-up companies or for extending the service to individuals currently ineligible to participate, carsharing operations could grow considerably. In a bit of good news on the issue, one non-profit

organization has been able to access lower-cost insurance through a non-profit insurance provider because of its non-profit status.

Another clear problem with applying the European carsharing model to the United States is that American cities are, by and large, much less dense and transit-accessible than European cities. Without a monumental public commitment to providing a dense network of shared cars, the travel patterns of most Americans will continue to be better served by owning a vehicle. While carsharing proponents state that carsharing is a more cost-effective alternative to owning a vehicle if one drives less than 10,000 miles per year, owning one's own car is still more convenient than being a member of a carsharing program. One manager also indicated that a significant barrier to attracting new members is a widespread perception that it costs more than it does since per-use costs are more transparent than the fixed costs of ownership.

All carsharing managers indicated that the best locations for carsharing are dense traffic-plagued areas where owning a car is expensive due to parking constraints and traffic congestion. Therefore, widespread adoption of this alternative in the Twin Cities may be difficult to achieve since owning a car is relatively cheap here; parking is abundant and free in most neighborhoods. However, traffic congestion in the Twin Cities is increasing. The Texas Transportation Institute's Urban Mobility Study reported that the Twin Cities' 2001 roadway congestion index was 1.25, in between that of Seattle (1.23) and Portland (1.28) where carsharing programs are growing rapidly [9].

Carsharing programs also need plenty of start-up capital in order to become useful to their members. This is especially going to be true in lower density auto-oriented cities like Minneapolis than in transit-oriented San Francisco because the service must be much better immediately in such environments in order to compete with the private car. In San Francisco, there already exists a substantial population that does not perceive car ownership as useful or desirable. In the Twin Cities, convincing a significant number of people not to own a car when they otherwise could is likely going to be more difficult. Therefore, a new carsharing program in the Twin Cities must be almost as convenient as owning one's own car.

Non-profit Versus For-profit: Can Carsharing be Profitable?

While Zipcar and Flexcar were funded primarily with private venture capital and operate as for-profit businesses, there remains a lot of skepticism as to how profitable carsharing really can be. There is no compelling evidence that either the non-profit or for-profit model is better than the other except that the for-profit companies in existence seem to have more incentive to grow faster than non-profit operations. Proponents of the non-profit model, however, believe that the for-profit model shifts the priorities in the wrong direction by encouraging more use of the vehicles and are more likely to just serve communities where they see a huge market. Also, city and regional governments are often more comfortable partnering with non-profit agencies than businesses, and non-profit agencies also may have access to certain resources like reduced insurance rates than for-profit companies. The non-profit companies have been funded primarily with a mix of government and grant funding, and their models typically require a little bit more time before the operation is expected to break even. In an age of reduced government funding where governments have less funding, and private foundations are overburdened, this presents a serious challenge to new non-profit start-up companies. Some of the for-profit models have

engaged in extensive public-private partnerships while others have not. These public-private partnerships have been quite successful in a few cities. However, the nonprofit model might be more realistic in the Twin Cities where significant public attention will be required for it to get off the ground and where profitability is far from proven. One thing that has not been tried on a large scale is a cooperative model, which might be an option for raising funds with less government intervention.

Conclusion

Carsharing has been most successful in the cities with the highest transit mode split and/or cities with a strong presence of ecologically-minded people. These are cities where middle-class people regularly take transit. Since carsharing operations require that their members rely on transit, walking, or cycling for their regular routine trips, this is going to be a major challenge to implementation in most American cities that are extremely auto-dominated. The liberal progressive political views of much of the population of Minneapolis may boost the prospect of a successful operation getting off the ground here; however, there isn't a culture of public transit among middle-class people in the Twin Cities, which may hinder a traditional carsharing operation's success.

That being said however, offering a reliable and useful carsharing option could be the missing link that would make transit-oriented living work for people in Minneapolis. This is especially true for lower- to middle-income people, people in life transitions (such as beginning school, relocating, divorcing, immigrating, etc.) and people who do not enjoy driving for whatever reason. But implementing such a program will require more attention and public assistance than was required in places like San Francisco and Boston. While certain neighborhoods in the Twin Cities appear to present initial opportunities for carsharing based on the experience of national organizations, a carsharing operator here may have to approach the expansion of its service by relying less on geographic marketing. It will have to pursue creative partnerships with other organizations and employ a more targeted approach to its marketing.

A start-up organization in the Twin Cities will need temporary government assistance in order to grow substantially enough to make a difference. It should then pursue a much more comprehensive partnership with Metro Transit than has been undertaken in other cities. This would include the usual marketing assistance that most carsharing organizations receive such as free advertising on buses and bus shelters and free parking at transit facilities plus a more integrated partnership. This could include promotions such as smart cards that could be used to access the cars and use the bus. The carsharing organization also could offer a cross-promotion such as a Metropass for all of its members at a reduced rate. Metro Transit could in turn offer carsharing membership at a reduced rate to current Metropass holders. At least one carsharing program has a program like this where employer-provided transit passes can be extended to include carsharing membership for a discounted rate. Metro Transit also could perform the bulk of the marketing work in promoting carsharing to its commuters. Metropass holders and other commuters who commute to downtown Minneapolis regularly and who live in the cities of Minneapolis or St. Paul would be obvious targets. The downtown Minneapolis transportation management organization should be heavily involved in this project. Finally, the state should target some funding to help low-income transit-dependent people access carsharing. Most carsharing operations are geared towards getting people out of their cars and taking transit and

other modes more often. In Minneapolis, it might be just as useful to take an approach that touts the increased mobility that it can offer to the transit-dependent population. This would require long-term subsidies or some sort of creative financing, but it would be worth the cost in both delivering better transportation equity and increasing the number of cars in the shared car network. Expanding the carsharing network generates positive feedback as more cars means more efficient operations, lower average costs, and better service to members.

A Twin Cities carsharing provider also should aggressively pursue business memberships with downtown Minneapolis and St. Paul businesses and public agencies. They also should find ways to extend the service to the under-21 student population and partner with the University of Minnesota and other universities and colleges to offer an affordable service to this population. The Twin Cities is in many ways a big college town, and this market of low-income highly mobile people would be well served by a carsharing alternative. Introducing the service to young people also would benefit the organization's long-term sustainability.

Most carsharing managers recommended that a start-up company in Minneapolis would need to first focus on developing its service and examining carefully its market before getting off the ground and pursuing investments in technology. The first step is to study residential and commercial density and transit access in the city as well as look at the demographic composition of neighborhoods to determine where carsharing might have a future. After the operation is up and running, the local carsharing operator could partner with one of the existing carsharing organizations in the nation to provide some of the Web-based technology that would make the service more useful to members. I-Go in Chicago, a non-profit organization, recently joined the Flexcar Network which means that it uses the same billing/reservation system, its Web site is linked to the Flexcar Web site, and members in Chicago can reserve cars in Flexcar cities when they need to (probably not a hugely important feature but it is an extra perk). I-Go remains an independent non-profit agency and still manages the fleet and the operation but uses the Flexcar technology that it would otherwise be unable to afford. Zipcar and City CarShare also actively promote the use of their technology by other organizations. While this seems like a promising development, the novelty of these arrangements makes them difficult to assess at this point.

Carsharing has demonstrated that it is a viable transportation option in its few years of service in cities in the United States. It should be more seriously considered by transportation policy makers and private investors and attempted in a wider variety of urban environments. Like any new product or service, however, it is likely to lose money in the short run; therefore, significant subsidies will be required until organizations receive a critical mass of users. This already has occurred in a few cities, and hopefully these positive experiences will give a boost to the cause of carsharing throughout the country.

Chapter 7

Intelligent Transportation Systems in Community-Based Transportation

Introduction

Project Overview

This component of Task 3 of the FY 2002 State and Local Policy Program Guidestar Research Project, *Using ITS to Better Serve Diverse Populations*, looks at the potential use of various intelligent transportation systems in various community-based transportation services.

Community-Based Transportation

Community-based transportation (CBT) is a general term for transportation geared toward transit-dependent persons who have difficulties using public mass transit. In cities designed for automobiles, some segments of the population long have been constrained by their mobility as well as access to transportation. The United States' population is diversified; there are people who cannot afford automobiles and people who cannot drive. There are people who cannot use mass public transit and people who are out of the service areas and/or scheduled times of paratransit options. People need to move themselves and move themselves at affordable prices. This is a fundamental and basic human need. Yet, much more must be done to help these people improve their quality of lives. These people are collectively termed the "transportation disadvantaged." They fall into one or more of the following categories: people in poverty, elderly, children, women, disabled, and non English-speaking populations.

Intelligent Transportation Systems

Intelligent transportation systems (ITS) refers to systems engineering of transportation services that use advanced telecommunication and other technologies that are increasingly making their way into transportation systems.

ITS in CBT

Technology is a needed tool to improve CBT service quality. Technologies can improve CBT services in ride scheduling, dispatching, telecommunicating, vehicle location identifying, inter-agency coordinating, multi-source funding reporting, and invoice reporting. Technology also can improve the minute details concerning safety and security when riding CBT. ITS discussed in this paper specifically refers to those most commonly used in CBT systems.

Research Methodology

Overview

The CBT research has three stages: survey research, in-depth interview, and data analysis. The survey was designed to provide a context of CBT providers in Minnesota and evaluate the potential effectiveness of various ITS. CBT service managers were then interviewed to obtain greater insight into the benefits, challenges, and lessons learned from ITS deployment.

Survey

The first stage was to survey community-based transit service providers. A list of those providers is attached to this report ([see Appendix I](#)). The survey was designed to gather basic information about different providers and help the researchers identify which types of providers are more likely to use ITS. In Twin Cities and Greater Minnesota, there are many transit service agencies. These include public, non-profit, or private organizations serving diverse populations in urban, suburban, small urban, and rural areas. At the end of the survey, the researchers invited these agencies to participate in a follow-up interview, if they currently use ITS technologies and/or plan to deploy these systems in the future.

In-depth Interview

The second stage involved interviewing 10 to 20 service providers. The candidates were selected from those agencies that replied the survey and expressed interests in the interview. These interviewees were selected so that they represented different categories of transit services. Interviewees were offered a choice regarding how the interview was conducted: most chose to be interviewed by telephone and/or by e-mail messages, while two interviewees generously offered their time for face-to-face interviews. In this stage of the research, open-ended questions gave respondents opportunities to detail their agencies' experience and expectation of ITS deployment in their system and how it will better meet their riders' current needs and expected needs.

Data Analysis and Summary Report

In the last stage, the quantitative data from the survey and the qualitative data from the interview were analyzed. Tabulated information and graphs present the result of the analysis.

Identifying CBT System Needs

Demand for CBT Services

On the demand side, different riders require different CBT services. Imagine four people riding a CBT vehicle at the same time: a senior going to his or her doctor for routine health care; a disabled person in a wheelchair riding to work; a financially-strapped farmer going in town to grocery shop; an a high school student going school. Although these riders share the same vehicle, their demands may be very different. Suppose the dispatcher calls to tell the driver that he may need to pick up another rider down the road. Maybe the farmer does not mind making that stop, but the senior, the disabled person, and the student all must get to their destinations in time. Different riders value their time differently. Even individual riders value his or her time differently throughout various times of day. On their way home, maybe none of the four riders would mind another ten minute ride on the bus. Perhaps the farmer and the student would prefer that the driver drive faster, while the senior and disabled person would oppose that. This fictitious example shows only partially how complicated and flexible a CBT system must be in its daily operation to meet the demand of various riders and ever-changing schedules.

As Minnesotans age, they are likely to demand more and better CBT. As the non English-speaking, foreign-born population increases, the demand for non-English CBT services also increases. As the general population grows and concentrates at regional trade centers (RTCs), there also may be a demand increase for CBT service in small urban and rural areas. Many agencies in Minnesota provide CBT services with public and non-profit agencies making up the majority. [Appendix K](#) shows the geographical location of public transit systems. Some areas lack public transit services, although these areas have a quickly increasing growth of the number of non retirees living there. This quick population growth area may, in the near future, require more CBT services as more and more baby boomers retire and continue aging.

Professor Richard Bolan, Professor Emeriti at the University of Minnesota's Humphrey Institute, discussed the potential demand for CBT in a report called, *Evaluation of GPS Technology as Used in Services-on-Demand Public Transit*.

“Paratransit services actually come closer to offering the advantages of single-occupant-vehicle (SOV) travel than do traditional bus and rail systems. This transportation is often targeted to special population—particularly the disabled or the elderly. In general, paratransit agencies serve to provide transportation for those who cannot drive or do not have a car. Seldom is there an effort to try to divert young, able-bodied automobile drivers to these services. This is in marked contrast to proposals for light rail, commuter rail, and fixed-route bus systems, where the hope is that these facilities will actually get people out of their cars and off the highways. Service-on-demand public transportation might actually have a better prospect for reducing SOV automobile usage than fixed-route bus or rail services. Such promise is based on two factors. The first is that the growth of American cities today has developed at very low densities—in both population and jobs—and thereby cities have become so sprawled and dispersed that it is very difficult to design fixed-route services of any type except on the relatively few reasonably high-density corridors. The second factor is based on the promise of

material improvements in efficiency, reliability, safety, and convenience that might be offered by the use of computerized scheduling and dispatch technology accompanied by GPS technology.”

In Minnesota, not only is the general population growing fast, among most of whom are likely SOV drivers, but also the senior, disabled, and non English-speaking populations, among whom are more likely to be CBT clients than the general population, are growing at a fast pace.

Growth of Senior Citizens and Baby Boomers

Access to transportation decreases with increasing age and health problems, and Minnesota’s senior population is spreading out from the Twin Cities area. Twin Cities’ suburbs, small urban areas, and rural areas will face the greatest challenge of serving transportation needs of the seniors who choose to reside there. Within 20 years, there would be an expected significant increase in demand for CBT services for the seniors living in areas without adequate public transit. As noted in [Chapter 1](#), the overall percentage of those aged 65 and older will increase from 12 percent of the state’s population to 20 percent in 2025. Already, a disproportionate number of people aged 65 and older live outside of the Twin Cities Metropolitan Area (TCMA): 41 percent of those aged 65 and older, even though this area accounts for only 30 percent of the state’s population. In addition, this population size is expected to double in counties surrounding the TCMA. There were significant increases in the population size of those aged 65 and older throughout the state during the 1990s with the most dramatic growth occurring within the TCMA. The population of those aged 65 and older increased by 129 percent in Dakota County from 1990 to 2000, by 96 percent in Scott County, by 146 percent in Washington County, by 144 percent in Anoka County, and by 108 percent in Sherburne County [1]. [Appendix K](#) provides a geographical clue to where CBT might be needed most in places currently without public transit in Minnesota. Specifically, there are two maps in [Appendix K](#): one map shows the percentage of change in the number of non retirees in each county; the other map shows public transit availability in each county. By comparing the two maps, one can see the potential CBT service demand in certain counties.

Growth of Labor Force

“Minnesota’s labor force grew 16 percent from 1990 to 2000 and is expected to grow another 16 percent from 2000 to 2010. This projected labor force growth is influenced by a growing population and increasing rates of labor force participation. Labor force participation in the 45-to-64-year-old cohort will grow the most between the years 2000 and 2010 [1].” An aging work force is likely to enjoy advanced CBT services as a transportation alternative and to substitute driving to work. So far, however, “none of the elderly workers in the 13 ring counties reported to commute by transit [1].” The extent to which the door-to-door service feature of CBT will attract senior workers is critical for policy discussion.

Growth of Non-English Speaking Population

CBT serving the non English-speaking population requires special linguistic features. Some CBT services specifically target non English-speaking populations in Minnesota. These populations have specific needs for transit services regarding scheduling, dispatching, and communicating

with CBT agencies. Sometimes the barriers that prevent these people from taking general public transit are beyond linguistic issues and may include cultural or racial issues. The increasing growth of the non English-speaking population clearly indicates potential increase for CBT services specifically for them. “In 2000, eight percent of Minnesotans did not speak English at home compared with six percent in 1990. In the Twin Cities metropolitan statistical area (MSA), the foreign-born population increased by 140 percent from 87,380 in 1990 to 210,344 in 2000. Nine percent of Twin Cities residents do not speak English in the home. [The Office of Strategic and Long-Range Planning] Minnesota Planning projected that by the year 2025, Minnesota’s African American population will grow by 113 percent, the number of Asian and Pacific Islander residents will grow by 104 percent, and the Hispanic-origin population will more than triple, growing by 248 percent [1].”

The travel behaviors of non English-speaking populations also suggest niche markets for CBT services. “The 2000 United States Census revealed four interesting trends in non-white travel behaviors in Minnesota. First, the non-white population has a higher rate of using public transportation than the white population. African Americans use public transportation at the highest rate, 18 percent, among all of the race groups. Second, the non-white population also has a higher rate of carpooling than the white population. The Hispanic/Latino group carools at the highest rate among all race groups with a rate of more than 26 percent. Third, African Americans commute by taxi at a rate of nine percent compared with two percent of the white population. Finally, the non-white population has a higher rate of walking than the white population [1].” The other component of this Guidestar project would provide a more in-depth study of different travel behaviors of non English-speaking populations with focus group research.

Growth of Disabled Population

People with disabilities are especially dependent on carpool, vanpool, transit, and CBT options. As more disabled persons join the work force, the needs of CBT increase. “According to the National Organization on Disability, 32 percent of all working-age Americans with disabilities (ages 18 to 64) are employed full or part time, compared with 81 percent of people without disabilities. Today, 56 percent of people with disabilities are able workers, whereas in 1986, only 46 percent of people with disabilities reported that they were able to work. Lack of transportation is one of several contributors to disabled persons’ lack of involvement in their communities. According to the National Organization on Disability, people with disabilities are much more likely to consider inadequate transportation to be a significant problem in their lives versus people who do not have disabilities. The disability rate is much higher among the elderly than the general population according to the 2000 Travel Behavior Inventory (TBI), indicating a need for specialized transportation for the elderly with disabilities. In particular, the gap is larger in the 13 collar counties (10.4 percent versus 2.5 percent) than in the seven core counties (5.9 percent versus 1.6 percent) [1].”

Supply of CBT Services

On the supply side, CBT systems vary in size, function, mission, service, funding, regulation, riders, and many aspects in operation. There is no one-size-fits-all technology solution to all problems and barriers in CBT services. The unique characteristic of CBT is its flexibility and multiple facets. What any one CBT provider can do to meet its individual needs is to shop

around for available technologies and use them creatively. Given the fast pace of technology development, today's adapted technology may well be tomorrow's constraint. Also, CTB providers should be cautious about buying "redundant" technologies that are over-designed and out-perform the tasks of a given CBT system.

Requirement of Technology in CBT

There are several criteria to note when selecting appropriate technologies for CBT in a specific context. The successful technology must be available, accessible, affordable, acceptable, applicable, and adaptable.

- Available: the selected technology must exist on the market and be scientifically feasible. The technology also must be available at operation times and places.
- Accessible: the technology must accommodate needs for wheelchair accessibility and for other requirements identified in the Americans with Disabilities Act (ADA).
- Affordable: the technology chosen by agencies must be affordable, both in money terms and in operational terms. Fewer costs and less effort in using the technology is the key to employing the technology.
- Acceptable: administrative, staff, drivers, and riders all should accept the technology. The technology should not place physical or psychological burdens on service members and riders.
- Applicable: technologies commonly seen in most CBT cases are not very sophisticated. Applicable means adequate, but not excessive. If the technology can fit into the service well enough, there is no need to deploy advanced and expensive technologies.
- Adaptable: Since flexibility is the nature of CBT, the accompanying technology should be adaptable to future situations. The system should be open for upgrading and adding other components. To begin with an applicable technology, it shall be able to fit into future demands of constantly modified technologies.

Note that these criteria are not independent of each other. A successful technology employed in a given CBT system should embody all of the above characteristics.

Technologies Available to CBT

Computer-based technologies can be applied to virtually every aspect of CBT operations. The first step is to identify what type technology can help meet the individual CBT system needs. There are often multiple options for each need, and the options range from sophisticated ITS applications to simple programs that can be operated with a few keystrokes or computer mouse clicks.

Better communication among drivers, dispatchers, and riders increases the potential for better service. Greater efficiencies can come from new routines for scheduling runs and trips. Geographic positioning system (GPS)-based vehicle locators can help schedule on-demand trips more easily and in real time. More comprehensive and accessible vehicle inspection and maintenance records can improve system safety and security [2].

The following is a list of some of the typical, ITS technologies currently available for CBT providers. For a detailed definition of each of these, see *Improving Transportation Services for Disadvantaged Populations* [3].

- *Accounting Software*
- *Automatic Passenger Counters*
- *Automatic Vehicle Location Systems (AVL) and GPS*
- *Communications*
- *Customized Spreadsheets and Databases*
- *Demand-Responsive Transit Software*
- *Geographic Information Systems (GIS)*
- *Internet Web sites*
- *Maintenance Software*
- *Silent Alarm Systems*
- *Mobile Data Terminals*
- *Palmtop Electronic Manifest Devices*
- *Personnel Management Software* [2]

Of all the available ITS applications, communicating, scheduling, and dispatching capabilities are the essential functions of CBT services. [Appendix L](#) shows several best-practice standards where several combinations of ITS technologies are used in real cases and technology significantly helped improve service efficiency and quality.

Analysis of Survey and Interview Results

Quantitative Analysis of the Survey Result

The following section analyzes the survey research component in this study. This section begins with an explanation of the agencies selected and contacted and the survey instrument used, followed by the coding of results, and then finally an analysis of the data collected. The survey instruments were mailed to agencies on February 18, 2004.

Explanation of the Agencies Selected

The “population” of research subjects in this study includes all of the transit service agencies in Minnesota. This is a collection of public, non-profit, and private entities located in large urban, small urban, suburban, and rural areas. In this study, survey instruments were sent to 247 organizations. Given the wide variation across these providers, it is unlikely that a representative sample could be drawn. Thus, instead of probability sampling, this survey took a census approach in an attempt to reach as many Minnesota CBT agencies as possible. The selection of these organizations follows the procedures below: 1) organizations listed in the “inventory of community-based transportation service providers in the Twin Cities” in the report *Improving Transportation Services for Disadvantaged Populations* [3]; 2) *Metropolitan Area and Greater Minnesota Transit System Fact Sheets, Section 5310 Recipients from 2003 Minnesota Transit Report* [4] (Note: The *2003 Annual Transit Report* provides an overview of the Minnesota Department of Transportation and Metropolitan Council projects and events in 2003. This report was prepared by the Minnesota Department of Transportation with assistance from the

Metropolitan Council and is designed as a guidebook to Minnesota's public transportation network.); and 3) some private organizations identified on the Internet. Thirty-eight valid survey responses were collected out a total of 247, with an overall response rate of 15.4 percent. This response rate is lower than expected, and thus the result of quantitative analysis should be taken with caution of response-selection bias.

The inventory of CBT agencies in the report, *Improving Transportation Services for Disadvantaged Populations*, was largely created from information in the *2002 Minnesota Transit Report*. The *2003 Minnesota Transit Report* captures nearly all of the public and non-profit agencies, while some private for-profit entities were identified through Internet search.

The list of 247 organizations was developed based on the above selection procedures. See [Appendix I](#) for a complete list of agencies contacted in this study.

Explanation of the Survey Instrument

The survey instrument is six pages long and contains 19 questions (see [Appendix G](#)). The questions are divided into three parts.

Part I asks basic information regarding the CBT service of various agencies. It contains questions as to the nature of the agency (public, non-profit, private, for-profit), the nature of the CBT services provided (fixed-route, flexible fixed-route, dial-a-ride, etc.), the service area, location of the service (urban, small urban, suburban, rural, etc.), average riding time, and fleet size.

Part II asks about the characteristics of the various agencies' ridership. It contains questions of the ridership size, the mix of the riders (senior, disabled, general public, etc.), the expected demographic trend, and trip purposes.

Part III asks about the characteristics of ITS deployment within these agencies. It contains questions regarding the demand-response requirement (i.e., requirements for riders scheduling time in advance); transfer requirement (i.e., do any riders need to transfer to other vehicles); types of ITS deployed and the usefulness of these systems; desirable ITS capabilities; expected requests from riders; and the observed effects of ITS in providing CTB services.

An open-ended question, "do you have any suggestions and comments on 'how to use ITS to improve the services of CBT'?" is provided to allow agencies to share their thoughts.

Respondents' Representative Characteristics

The survey responses, as broken down in the following pages, represent a fairly even distribution of all kinds of CBT services, as shown in Table 7.1. Although some small urban CBT providers may have selected "urban," the general spread of agency feedback is satisfactory. Of all the agencies, the ratio of number of agencies serving fixed-route, flexible fixed-route, and dial-a-ride services is about 1:1:2. As expected, rural services tend to have more dial-a-ride systems than urban services. Regarding service area, agencies differ greatly with some serving less than 10 square miles and some more than 500 square miles. In terms of ridership, the majority of

agencies serve 10,000 to 20,000 riders annually (i.e., about 27 to 54 rides provided a day; see Table 7.1).

Number of Respondents	Urban	Small Urban	Suburban	Rural	Total
<i>Organizational Characteristics</i>					
Public	4	6	2	10	22
Non-Profit	9	5	4	14	32
Private	0	0	0	0	0
Total	13	11	6	24	54
<i>Service Flexibility Characteristics</i>					
Fixed-Route	5	5	3	6	19
Flexible Fixed-Route	4	5	2	10	21
Dial-A-Ride	8	11	4	19	42
Total	17	21	9	35	82
<i>Geographic Characteristics</i>					
0-10 square miles	1	1	0	3	5
11-100 square miles	2	3	1	4	10
101-500 square miles	2	1	2	3	8
500+ square miles	1	3	2	5	11
Total	6	8	5	15	34
<i>Annual Ridership</i>					
More Than 200,000	2	2	2	0	6
10,000-200,000	6	7	3	15	31
Below 10,000	5	1	1	4	11
Total	13	10	6	19	48

Table 7.1 Survey Respondents' Representation

Note: Some agencies answered more than once regarding their geographic locations and their agency characteristics. It is important to note this in reading tables throughout this part of the study. Not all totals add up to the total number of survey respondents because of double or sometimes triple selection and/or non-responses to a question. The survey instrument intentionally allows respondents to choose more than one option because of the flexible and complex nature of CBT services. Respondents choosing "other" in question number two answered "on-demand" or "senior transportation." The author shifted these answers into the "dial-a-ride" category.

Part I: Service Characteristics

Agency Organizational Characteristics

Out of 247 agencies, the respondents are predominately public and non-profit organizations (see Figure 7.1). There were no private for-profit agencies that responded the survey. Of the 38 responding agencies, 16 are public entities and 21 are non-profit organizations (one agency did not respond, thus the response rate for this survey was 97 percent).

Nature of Agencies in Respondents

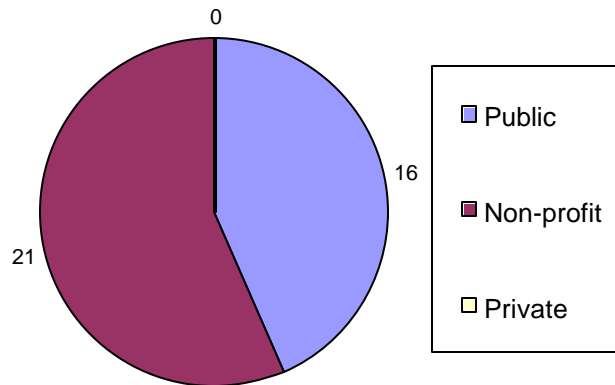


Figure 7.1 Nature of Agencies in Respondents

Service Flexibility Characteristics

This is a multiple-choice question where respondents can choose more than one answer (response rate: 100 percent). Out of the total 38 responses, 12 agencies (or 32 percent) indicated their service is fixed route; 13 (or 34 percent) indicated their service is flexible fixed route; 28 (or 74 percent) indicated they offer dial-a-ride service. Nearly all respondents who checked “other” indicate their services are either “senior” or “on-demand.” Note: For the purpose of this study, these responses are combined into the dial-a-ride services category (see Figure 7.2).

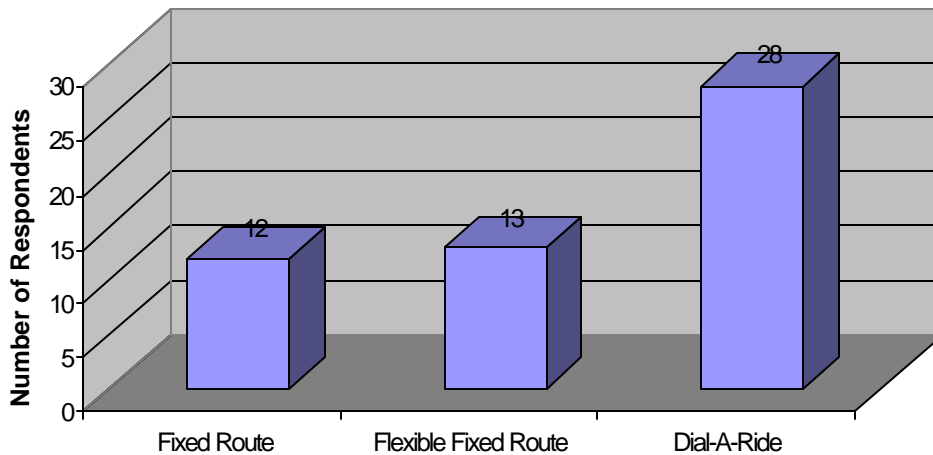


Figure 7.2 Service Flexibility Characteristics

Service Geographic Characteristics

- Service Areas

This survey question is intended to get at the geographical scope of each service. It is possible that the larger the geographical scope, the harder it is to coordinate ride schedules and the more desirable ITS capabilities are to the agency. About 80 percent of respondents answered this question. The service areas indicated range from 3 to 3,600 square miles. Some agencies serve a focused geographic area of not more than 10 square miles, while some serve a very large area of 500 or more square miles. See Figure 7.3 for response details.

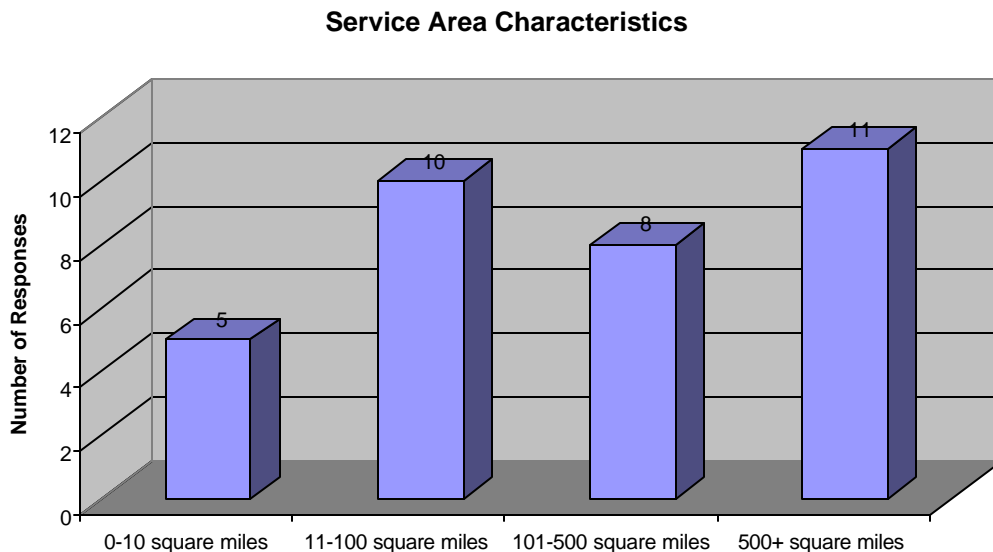


Figure 7.3 Service Area Characteristics

- Service Locations

This is a multiple-choice question in which respondents are allowed to choose more than one answer. The distribution of CBT service representation is shown in Figure 7.4. Of those who chose more than one category, most answered both “urban” and “suburban,” and both “small urban” and “rural.” This conforms to the general notion that transit services in large urban areas typically also serve suburban areas, and those in small urban areas also serve rural areas.

Service Location Characteristics

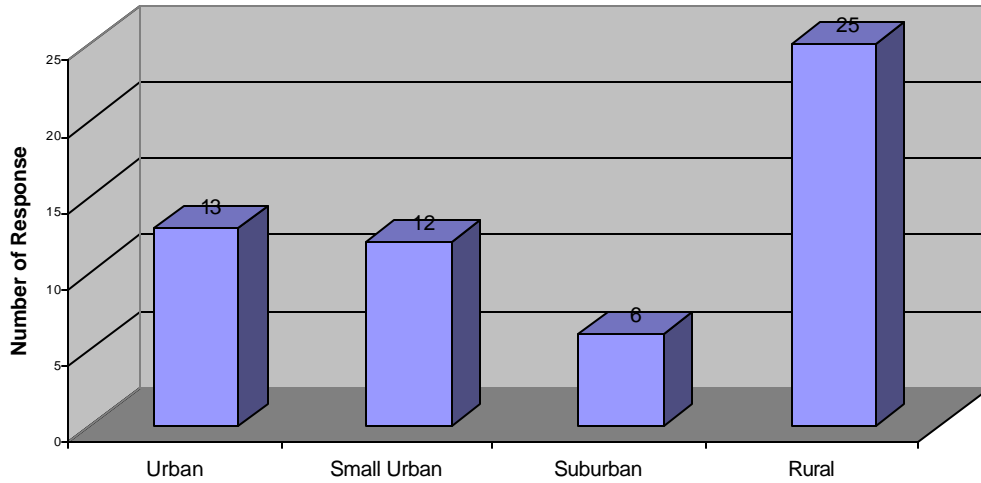


Figure 7.4 Service Location Characteristics

Riders Time Spent on Vehicle

The majority of respondents (33 out of 38) answered the question associated with travel time (response rate, 87 percent). The average travel time a CBT rider spends on a CBT vehicle typically ranges from 20 to 30 minutes (see Figure 7.5).

Average Riding Time

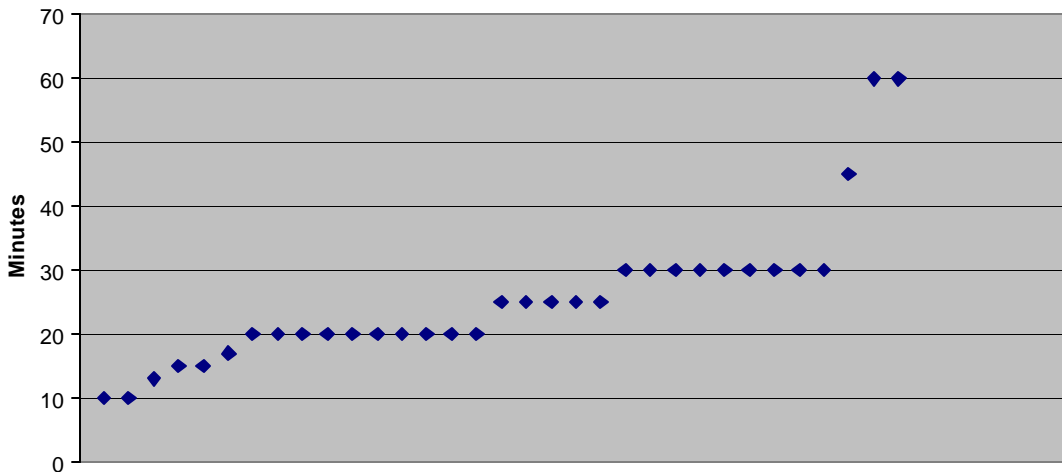


Figure 7.5 Average Riding Time

Fleet Size

In the question regarding fleet size, 37 out of 38 respondents responded. The result shows that small buses (defined as shorter than 40 feet) serve as the backbone of the CBT system in Minnesota (see Figures 7.6 A to 7.6 C). Thirty agencies out of a total of 38 reported using smaller buses, all of which are wheelchair accessible. Thirteen agencies (or 34 percent) reported using more than one type of vehicle.

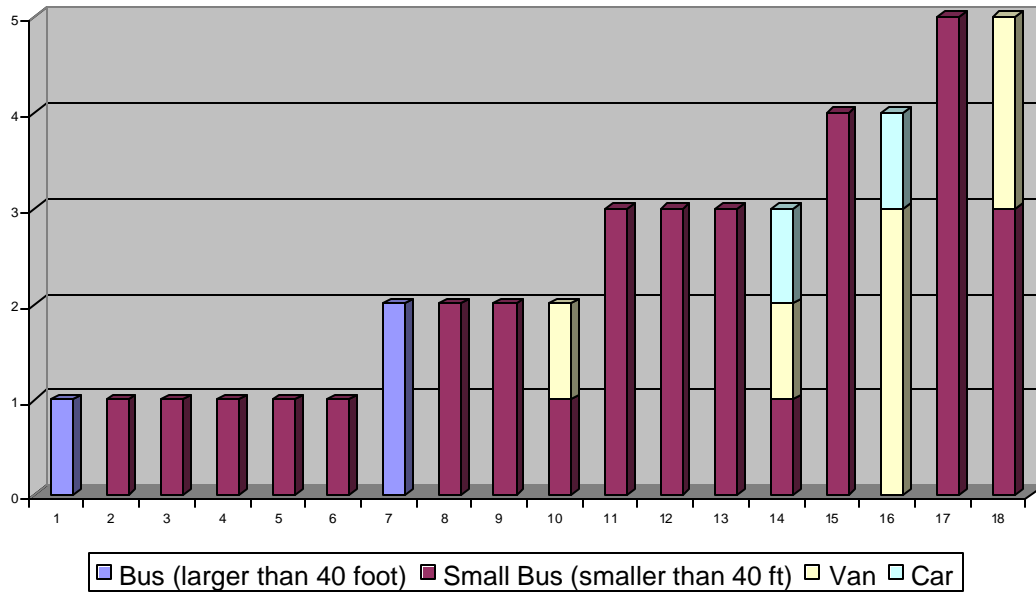


Figure 7.6 A Fleet Size of 18 Small CBT Systems Having 1 to 5 Vehicles

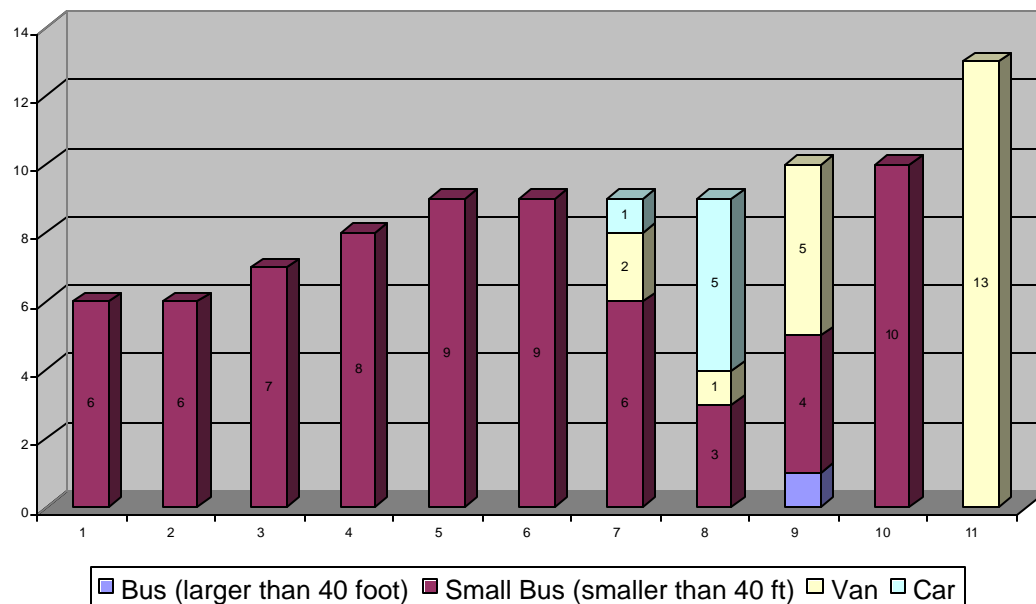


Figure 7.6 B Fleet Size of 11 Medium CBT Systems Having 6 to 14 Vehicles

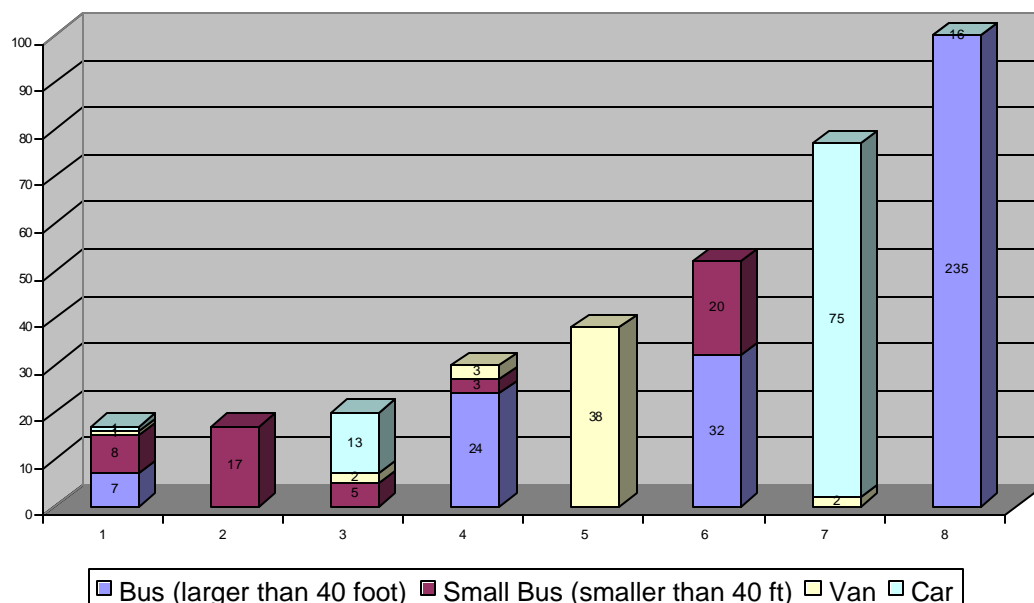


Figure 7.6 C Fleet Size of 8 Large CBT Systems Having More Than 15 Vehicles

Note: The last agency has more than 100 vehicles and the bar is not to scale.

Part II: Ridership Characteristics

Annual Ridership

Thirty-four agencies among the 38 respondents answered the question regarding ridership. Annual ridership of these agencies varies from 200 to 1,500,000 (see Figure 7.6 D). Agencies with the largest ridership are either public transit agencies providing paratransit services or large public CBT providers in Twin Cities (all four are public entities). These agencies serve primarily urban, small urban, or suburban areas; two agencies reported serving suburban areas, the other two selected both urban and small urban categories in their answers (see Table 7.1). The second group of CBT systems sees its annual ridership ranging from 10,000 to 160,000. Most of the respondents selected both rural and urban, or rural and small urban. Approximately ten percent of the second group of CBT providers serve suburban areas. Four of the five agencies that serve a geographic area larger than 500 square miles belong in this category of CBT providers. The third group of CBT systems sees an annual ridership of fewer than 10,000. These agencies serve primarily either urban or rural populations. Fewer than 20 percent of them serve small urban or suburban areas. Thus, according to ridership numbers, the responding agencies can be characterized as:

- Large public providers serving large urban areas, including large Minnesota regional trade centers (RTCs) and suburban population.

- Medium public/non-profit providers serving disperse rural populations and linking these areas to urban and small urban areas (small Minnesota RTCs) with some clients transferring to other agencies' vehicles.
- Small public/non-profit (primarily non-profit organizations) providers serving either only urban populations or only rural populations, with limited urban-to-rural or small urban-to-rural connections. This type of service assists certain types of clients specifically, with zero transfers to other vehicles reported.

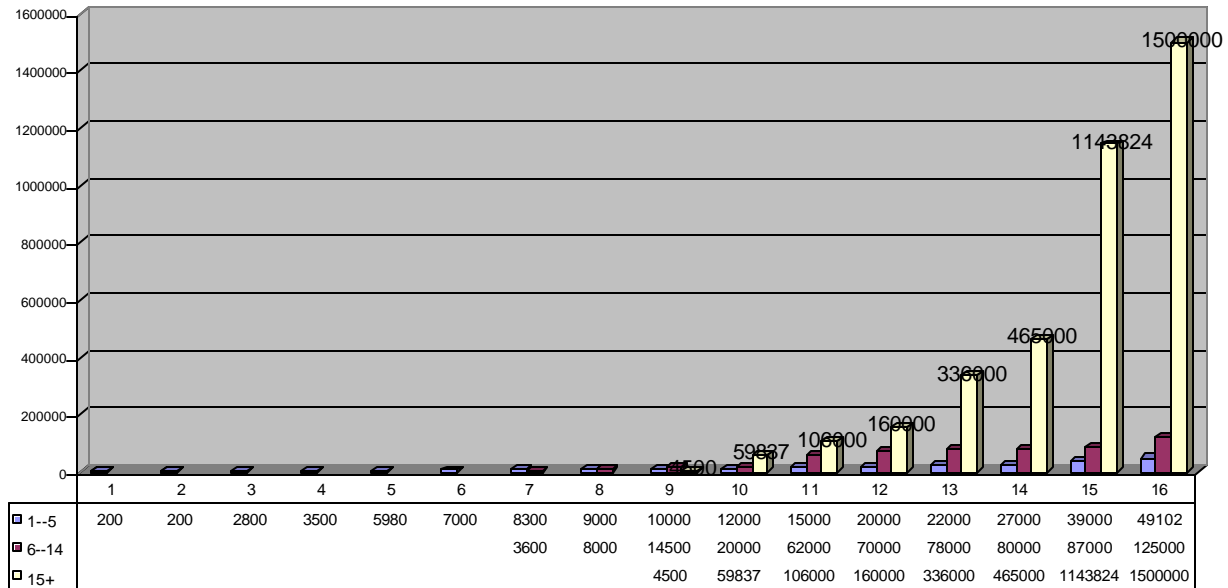


Figure 7.6 D Annual Ridership of CBT Systems Shown with Fleet Size Category

Ridership Mix

The agencies were asked about their ridership mix. This question is not an easy one to answer specifically, since there are varying factors, such as accounting, service orientation, and special boarding procedures for different type of riders, which come into play. Generally, CBT service providers have a better idea of the percentage of senior and disabled riders than non English-speaking and general public riders. More respondents left the last two categories unanswered than they did in the previous categories. The result, represented in Table 7.2, does not necessarily reflect the real clientele mix, but rather an average of the respondents' perceptions. Senior and disabled riders represent 37.6 percent and 38.1 percent of ridership, respectively. Among CBT riders, 3.6 percent are non English-speaking people and 22.3 percent are general public riders. It should be noted that some public transit systems in Greater Minnesota serve both general public riders and paratransit riders, so the percentage of general public riders reported by these agencies is much higher than other CBT services.

Among disabled riders, about half (or 18.5 percent) of the total ridership are considered senior disabled riders. Among general public riders, half of them are people without private automobiles, and the other half are those having private automobiles but chose to ride CBT. The breakdown of the number of people with or without private automobiles is strictly the perception of respondents, and since the response rate for these two questions is especially low, the result is for reference only.

Senior	Disabled	Non-English Speaking	General Public	
37.6%	38.1%	3.6%	22.3%	
	Within which, Senior Disabled		Without Car	With Car
	18.5%		9.1%	8.3%

Table 7.2 Ridership Mix

Note: Some numbers do not add up to 100 percent due to non-responses.

Ridership Trends

Ridership trends constitute the base of planning future CBT operations. Of all CBT managers who responded the survey, most perceive senior and disabled people, people without cars, and non-English speakers to be the majority of their riders. Whether more of those with cars will choose to ride CBT is not certain. Among 38 respondents, 35 provided an answer regarding senior and disabled ridership trends, 27 responded to the question about non English-speaking riders, and 29 provided an answer about general public riders.

- Of all the answers, only one respondent predicts fewer senior riders in his or her CBT system. The remaining 97 percent predict more senior riders are expected to ride their vehicles.
- All 35 respondents predict more disabled persons will be using their services.
- Four out of 29 respondents expect fewer general public riders without cars will use their services, while the remaining 86 percent answered more of these riders.
- Ten out of 29 respondents expect that fewer general public riders with private cars will ride with them, while 19 managers believe more of these “choice” riders will come on board.

Part III: Service Technologies

Reservation Requirement

Reservation requirement refers to how early a rider must request a CBT trip in order for the service providers to accommodate the request. The ability of a CTT provider to accommodate shorter-notice requests gives riders more flexibility and ease in scheduling their lives, but it also demands more flexibility and higher performance on the part of providers to respond in a timely manner.

For this question, 36 out of 38 agencies responded. The answers indicate the shortest booking time each agency is capable of handling. For example, if an agency allows booking a week in advance as well as one day prior to the scheduled trip, the schedule requirement is recorded as one day. Responses of the survey indicate two main types of schedule-in-advance requirements. One-day notice is the minimum requirement by 38 percent of Minnesota CBT service providers. The second-most accepted requirement is 30-minute notice, as noted by 22 percent of the respondents (see Figure 7.7).

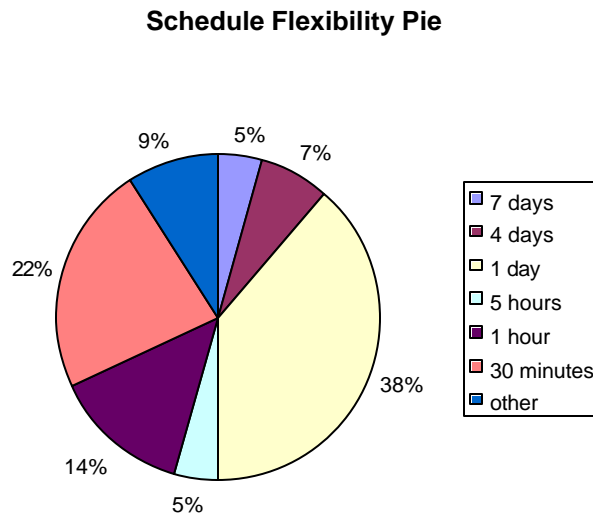


Figure 7.7 Schedule Flexibility Pie

Transfer Requirement

In CBT systems, one CBT service provider typically provides door-to-door service to its clients without transfers. Transfers from one vehicle to another vehicle mostly happen in between two CBT services (transfer to fixed-route public transit is not in the scope of this study), which require coordination and cooperation among agencies. From a technical standpoint, advanced ITS can be very helpful for providing this coordination. In Minnesota, timed transfer is especially important for fragile senior and disabled riders in harsh winter weather. Most respondents (36 out of 38) answered this question. Most agencies (71 percent) reported that their riders do not transfer to other vehicles. Among those who responded “a few transfer,” 3 to 10 percent of those riders transfer to other agencies’ vehicles. Among those who responded “some transfer,” 10 to 20 percent of their riders transfer vehicles (see Figure 7.8).

Transfer Requirement

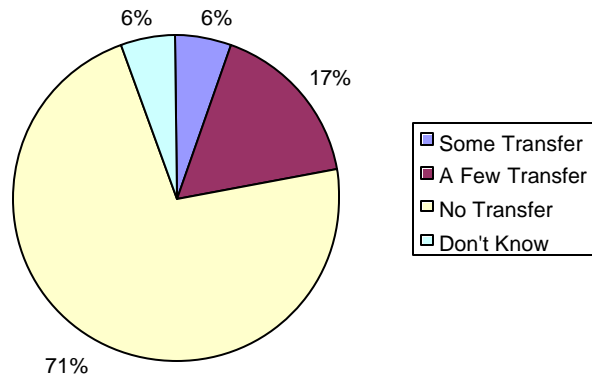


Figure 7.8 Transfer Requirement

Evaluation of Currently Used Technologies

- Technologies currently being used
Of all technologies CBT agencies are currently using, dispatcher-driver communication systems (often in the form of two-way radio or cell phone) are most widely used. Accounting software and spreadsheet/database usage follow as the second most widely used technology. Schedule/dispatch software is also commonly used in most of medium and large CBT systems. Other ITS was less used in Minnesotan CBT systems than the above four major components (see Figure 7.9).

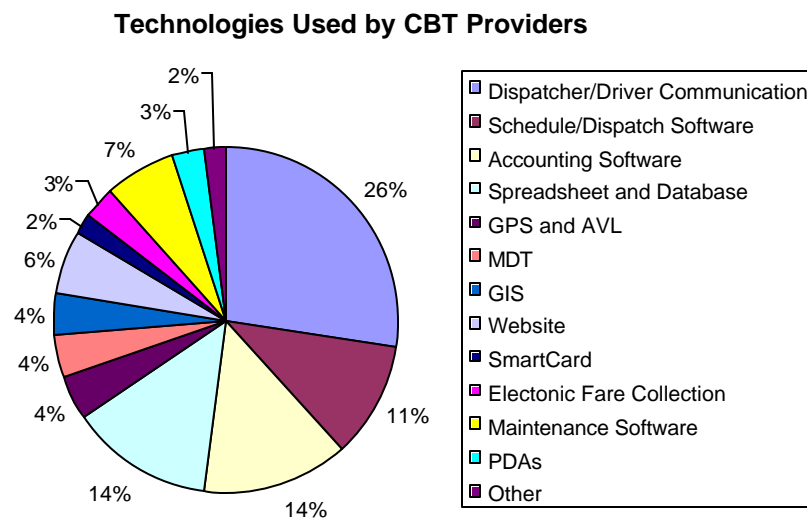


Figure 7.9 Technologies Used by CBT Providers

Note: The percentages are based on the total count of all forms of technology used by survey respondents. If an agency uses two kinds of ITS, it indicates “two” in the total count of ITS used. The percentage breakdown is the count of each ITS application used among the total count of ITS applications used. For example, 26 percent of dispatcher/driver communication means among all counts of ITS used, 26 percent is dispatcher/driver communication.

- Usefulness of Each Technology
The “usefulness” question listed 12 technologies commonly used in CBT systems and asked managers to rank each of them, on a scale of 1 to 4, in terms of effectiveness according to their experiences with 1 being “not helpful at all” and 4 being “very useful.” Figure 7.10 shows the average ranking of these technologies according to those managers who responded. Of the four most widely used ITS applications, dispatcher/driver communication, scheduling/dispatch software, accounting software, and spreadsheet and database software, most managers found them all quite useful. Within a few agencies that use GPS/AVL, mobile data terminal (MDT), SmartCard, and electronic fare collection technologies, these ITS applications are rated as more useful, while other ITS

components, such as GIS, Web sites, and personal data assistants (PDAs) were given lower ratings (see Figure 7.10).

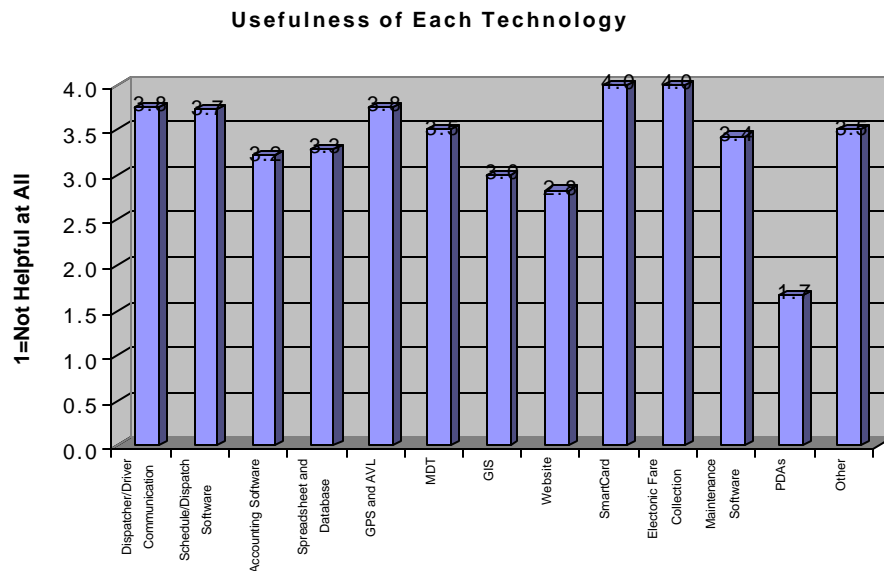


Figure 7.10 Usefulness of Each Technology

- **Features of Each Technology**

Different ITS applications may provide specific benefits including added efficiency in dealing with repetitive information processing, error reduction, staff time and cost savings, real-time information reporting, etc. Table 7.3 indicates the number of responses within the 38 agencies who replied (not all agencies responded to this question, mostly because these agencies do not use ITS).

From the summary of responses:

- Dispatcher-driver communication is the most helpful ITS application in use for many agencies. Specifically, this application offers more efficiency to scheduling on-demand trips and saves staff time and personnel costs.
- Computer-aided schedule/dispatch software offers more efficiency for scheduling reoccurring trips, saves time and costs, and reduces errors.
- Customized spreadsheet and database software reduces operation errors.
- Maintenance software would save staff time and costs.

ITS in CBT	These ITS are helpful because they are...								
	More efficient to schedule reoccurring trips	More efficient to schedule on-demand trips	Easier to schedule transfer with other agencies	Easier to track down different payment types with subsidies	Saving staff time, personnel cost	Reducing errors	Providing real-time information of the system	Easier to coordinate with other agencies	Other (please specify) _____
Dispatcher-driver voice/text communication	11	18	5	2	16	10	12	4	1 ^a
Computer-aided schedule/dispatch software	9	9	4	6	8	8	6	1	
Computer-aided accounting software	3	2		5	8	8	3	3	
Customized Spreadsheet and Databases	6	3	1	5	9	14	5	3	1 ^b
Global Positioning System (GPS) & Automatic Vehicle Location (AVL)	2	3	1		3	3	3		
Mobile Data Terminal (MDT)	1	1	1	1	2	3	3		
Geographic Information Systems (GIS)	2	2	1		3	3	2		
Web site for customers to schedule a trip	2	1	1		3	3	1	2	
SmartCard technologies				2	3	2	2	1	
Electronic fare collection				2	4	3	2	1	
Maintenance Software	1			1	7	6	3	1	
Palmtop Computer/ Personal Data Assistants (PDAs)									
Cell Phone ^c								1	1 ^d

Table 7.3 Agency Responses Towards Features of ITS

Note: The higher the score, the more respondents who selected the “benefit.”

a. Text messaging is quiet for passengers. b. Good for record keeping. c. The only other ITS used by CBT provider are cell phones. d. Good in case of emergency.

Desirable Technologies

CBT agency managers also were asked to list desired ITS applications according to priority (see Table 7.4). Five managers listed dispatcher/driver communication as their top pick for ITS desired (typically small agencies that have not yet employed this technology); seven would like to have schedule/dispatch software; while eight managers hope to have GPS/AVL capabilities as

a subsequent technological innovation in their CBT system. Some other managers would choose accounting software, SmartCard, and/or Internet scheduling technologies as a priority for a technological upgrade. The priority chosen, of course, depends on the current ITS status of each individual system. More sophisticated systems require more advanced, and therefore more expensive, technologies such as GPS and AVL, while smaller agencies will need basic technologies such as voice communication between dispatcher and driver.

Priority Chosen of Potential Usage	Number of Occurrence of Desirable ITS					
	Dispatch/Driver Communication	Schedule/Dispatch Software	GPS and AVL	Accounting Software	SmartCard	Web-based Reserving/Scheduling
1	5	7	8	2	1	2
2		6	2	2	2	
3	2		2	4	1	1
4		1	3	3	2	
5	1			1	3	
6			1			

Table 7.4 Desirable ITS Listed According to Priority by Survey Respondents

Riders Requirements on Technologies

Managers were asked to provide perspectives on their clients' needs and wants. Most managers (21 out of 38) replied the riders would want more on-demand services and more predictable pick-up times. These capabilities require computerized scheduling and dispatching technology. Managers also feel clients would want to know where their bus is, which would require GPS/AVL system use in conjunction with real-time customer service capabilities and would require mapping technologies. Smaller numbers of managers feel riders would require more non English (other languages) services, timed transfers, easier payment options, weekend and night rides, and expansion of service area. Four managers answered "don't know" to this question.

More On-Demand Service	Predictable Pickups	Where is the Bus	Easy Pay Options	Non English Service	Timed Transfers	Other ^a	Don't Know
21	14	6	1	4	2	2	4

Table 7.5 Agencies' Perspective of What Their Riders Demand Regarding Better Services

Note: Two responses in the "other" category answered: Riders' requests currently not met are: weekend and night ride requests and expanded service area and operation time requests. The number denotes the number of agencies out of a total of 38 responses.

Part IV: Integrated Information

Fleet Size and ITS

The sophistication of the ITS applications employed appears to vary with the size of the CBT system. Larger systems appear more likely to use a combination of ITS technology to perform the relatively complex task of coordinating a large number of riders with many schedule

changes. ITS technology plays less of a role in the operation of smaller agencies, because data processing and schedule changing are still able to be handled manually.

Table 7.6 shows the percentage of agencies using different kinds of ITS technologies, within the 38 survey respondents. This table clearly shows that as fleet size becomes larger, agencies use more ITS technologies. When a certain agency has more than 15 vehicles, it may need to use a combination of several of the 12 listed technologies. An interesting result shows that while medium-size agencies use scheduling/dispatching software less often than large agencies, they tend to use accounting software more often than large agencies. This may result from the fact that medium-size agencies have fewer vehicles and numbers of riders with which to justify the purchase of scheduling and dispatching software, but also have fewer staff members available to handle billing and other accounting functions. The first four technologies listed can be regarded as “basic” technologies needed to run a CBT service with a Web site considered as a “bonus.” However, not all CBT providers’ Web sites have user-scheduling functions. Small agencies do not appear to use maintenance software, although this technology is beginning to appear in medium- and large-size systems. GPS/AVL, MDT, GIS, SmartCard, electronic fare collection, and PDAs are seemingly “luxurious” technologies for small- and medium-size agencies.

Percentage of Agencies Using Each ITS By Fleet Size	Small: 1-5	Medium: 6-14	Large:15+	Total
Dispatcher/Driver Communication	74%	64%	88%	74%
Schedule/Dispatch Software	16%	27%	63%	29%
Accounting Software	26%	55%	38%	37%
Spreadsheet and Database Software	11%	55%	75%	37%
GPS and AVL		9%	38%	11%
MDT		9%	38%	11%
GIS	5%		38%	11%
Web site	5%	27%	25%	16%
SmartCard			25%	5%
Electronic Fare Collection			38%	8%
Maintenance Software		36%	38%	18%
PDAs			38%	8%

Table 7.6 Percentage of Agencies Using Each ITS, Breakdown by Fleet Size

Note: Empty cells indicate no use of that specific ITS technology. There are 19 agencies that have 1 to 5 vehicles, 11 agencies with 6 to 14 vehicles, and 8 agencies with more than 15 vehicles.

Managers were invited to rate the “usefulness” of each ITS technology used by their agency (see Table 7.7). It appears, generally, that larger systems gave higher ratings than smaller systems. Specifically, with regard to dispatcher/driver communication and schedule/dispatch software, the rate of satisfaction increased with fleet size. It seems that larger agencies are more dependent on these two technologies. However, large systems rate their accounting and spreadsheet software and Web site lower than small- and medium-size agencies, possibly because larger providers have relatively higher expectations for other ITS technologies.

ITS Rating by Fleet Size	Small: 1-5	Medium: 6-14	Large:15+	Total
Dispatcher/Driver Communication	3.6	3.9	4.0	3.8
Schedule/Dispatch Software	3.3	3.7	4.0	3.7
Accounting Software	3.8	3.3	2.0	3.2
Spreadsheet and Database Software	3.5	3.5	3.0	3.3
GPS and AVL		4.0	3.7	3.8
MDT		3.0	3.7	3.5
GIS	3.0		3.0	3.0
Web site	3.0	3.3	2.0	2.8
SmartCard			4.0	4.0
Electronic Fare Collection			4.0	4.0
Maintenance Software		3.5	3.3	3.4
PDA's			1.7	1.7

Table 7.7 ITS Rating by Fleet Size

Note: Empty cells indicate no use of that specific ITS technology. A 4.0 means “very useful,” while 1.0 means “not helpful at all.”

Qualitative Analysis of the In-Depth Interview

The second phase of the study involves an in-depth interview with CBT managers. It should be noted that in this case, the “manager” title refers loosely to transit managers, coordinators, supervisors, etc., in various public and non-profit organizations. They are not necessarily people with technical expertise, but rather those people who supervise the planning, implementing, and evaluating of ITS use in their respective organizations. This session serves as a “reality check” and complements information found in the first phase of survey research. The choice of interviewees, list of questions, and results discussions follow.

Choice of Interviewees

The interviews with CBT managers were conducted between March and June of 2004. Interview invitations were attached to each survey mailed. Twenty-one managers signed the consent form and agreed to be interviewed. Eventually, 15 managers were interviewed either in person, by phone, or via e-mail message communication. Interviews typically lasted from 20 to 90 minutes. Table 7.8 shows the distribution of interviewees.

System Fleet Size (Number of vehicles)	Large Urban and Suburban	Small Urban	Rural
Large: 15+	3	2	0
Medium: 6-14	0	2	3
Small: 1-5	0	1	4

Table 7.8 Number of Interviewees

The interviews provided in-depth information regarding the opinions and experiences of large systems (those with more than 15 vehicles) in urban and suburban areas; small, medium, and large systems in small urban settings; and small and medium systems in rural areas. The interviews did not touch upon small urban systems and large rural systems. Large urban systems

and small rural systems seem to be more engaged in the study. Large urban systems have a lot of ITS experiences to share with others, while some small rural systems are interested in beginning to climb up the technological ladder.

Interview Questions and Explanations

The interview format consists of mainly open-ended questions. [Appendix H](#) includes the list of questions asked of each CBT manager. Each interview began with a dialog about what needs are currently not adequately met and how ITS might be helpful in meeting these needs. The conversation then leads in to questions about what types of ITS technologies are currently being used in the agency. The next questions explore the planning experience, evaluation of ITS currently used, and lessons learned in ITS deployment.

The last question, “what information in this study do you think can best help you?” is intended to gather information about what would be the best focus of this study from the perspective of future readers. Almost all of the managers stated that it would be helpful to learn more about what other agencies are doing with ITS, especially those of a similar scale in terms of fleet size and/or ridership per year. Managers are interested in what problems other agencies had in common and how these problems were solved. Peer sharing and discussion is important for managers, especially with peers of similar-size systems.

On the other hand, small agencies (especially in rural areas) were not as interested in ITS applications, because their fleet sizes are still small enough to be handled manually. As one manager from a small urban agency stated, “I don’t expect any real tangible help from this study. Just thought my voice as a small operator needed to be heard.” (Henceforth, this report contains a series of other comments obtained directly from the manager interviews.)

Some managers say would be curious to learn what mistakes other agencies made. These factors show that small agencies may not need sophisticated ITS technologies, because such technologies sometimes bring more hassle than benefits, especially for small-scale operations.

Interviews Findings

General Description

As occurred in the survey, the interview results indicate that larger CBT systems use more sophisticated ITS technologies and more systematic strategies towards planning, deploying, and evaluating ITS performances. Smaller systems with fewer vehicles and fewer riders still are able to use “paper and pencil” methods to handle scheduling and dispatching tasks. Larger systems benefit from some form of automation within daily operations because computers can improve efficiency in recording and retrieving recurring information and can aid in handling complex dispatching tasks as the number of routes and vehicles increases.

Complexity in CBT operations often stems from having to accommodate unscheduled, on-demand trips and cancellations. The ability to quickly react to various kinds of riders’ requests, such as changes in pick-up and drop-off times and locations or last-minute ride requests or cancellations, relies on decent CBT system operation designs. Smaller systems can react to

changes manually via voice communication between bus drivers and dispatchers. Larger systems, as observed in this study, need the aid of computers to automatically re-route, re-time, and re-design subsequent operations after accommodating on-demand rides.

Of course, technologies only can be as good as how people use them. Many managers agreed that a certain threshold, be it geographical expanse of service, fleet size, or annual ridership, dictates the level of technologies that are appropriate, that is, primarily most cost-effective, for efficient operations.

Many factors determine these thresholds. While price is certainly one factor, the technical aptitude of the manager and his or her staff also plays a role. Consequently, the manager of each system may be in the best position to determine when more technology is necessary. This study focuses on the perception of managers towards several types of the most-widely used ITS technologies.

Radio and Cell Phone

Voice communication between dispatchers and drivers is a basic technology used by CBT providers. Schedule changes must be communicated to drivers in real time for more effective and efficient operation. Ride add-ins and cancellations affect not only a certain pick-up or drop-off time/location, but also the subsequent stops the driver may be making.

Two-way radios and cell phones are two of the most commonly used communication technologies used by Minnesota's CBT providers. There are several trade-offs between the two technologies.

- If an agency has more drivers than vehicles, on-board radios may be more cost-effective than cell phones, as the agency needs only to equip each vehicle with a radio. If there are more vehicles than drivers, cell phones may be better, as they are assigned to individual drivers.

A manager of a medium-size system in a small urban area pointed out that

“Our radio system was shared with other agencies and is now exclusive on our own channel. With nine vehicles it would be easier and cheaper to use [a] radio system. If we were smaller in fleet size we would share a channel with others or look into cell phones.”

On the other hand, a manager of a medium-size system in a rural area described the following benefits of using cell phones:

“Before cell phones, we had radio, a big, clunky thing. I am not sure it would be cost-effective to put radios on each vehicle: we have more vehicles than drivers. When you have a driver selecting vehicles between vans and cars, cell phone is cheaper.”

- Cost considerations tend to lead larger agencies to use a radio system. A manager of a large urban system stated,

“If we have only a few drivers, then cell phone may be practical. But with large numbers drivers, you don’t have the control on the cost and how they use it.”

- Cell phones are more user-friendly for drivers. They offer more interaction between drivers and dispatchers, because drivers and dispatchers can talk simultaneously via cell phones, while two-way radios require one end to finish speaking before the other end can begin speaking.
- Cell phones can provide benefits to riders who wish to make last-minute changes and talk to drivers directly. A rural manager of a medium-size agency stated that, “We issue cell phone numbers to all of our clients. We encourage them to call our drivers if there are last-minute changes.”
- Signal blind-spot issues and back-up systems: Both radio and cell phone services have signal blind-spot problems in difficult terrain, such as hilly areas, or in some cases, service simply may be out of range. This problem is more significant for rural CBT services. Having both radio and cell phones provides an emergency back-up communication system for some agencies. One rural manager with a medium-size agency stated,

“We have [a] communication system of both radios and cell phones. Our logic is that some areas are dead for one or the other, or both [technologies]. Drivers may leave the bus in dead time, but they are required to take a cell phone with them to be called [back to service].”

Another rural manager stated,

“One thing nice about our system is that our geographic area is smaller. We do have a cell phone in our vehicle, most used for confidential communication and emergency backup.”

Finally, a rural manager from a small agency pointed out that they developed other back up communications systems as well:

“About 20 percent of the time, we have a hard time calling drivers. Blind spots may lead to loss of ridership. Sometimes we call in the next pick-up/drop-off area, say a grocery store, to have grocery store staff tell our drivers of changes made [while the driver was in a blind spot].”

- Safety: Drivers need to use one hand to operate either a radio or a cell phone, often at a time when the vehicle is in motion. Most managers, when asked this question, replied with a bit of surprise when they realized there could be a safety issue in dispatcher/driver voice communication. However, some managers think drivers should pull off the road before answering, while others think otherwise. Riders may agree or oppose to this additional stop, because that means more time spent in the vehicle.

A manager of a large agency in a small urban area simply stated that,

“Drivers should stop before talking on cell phones.” On the other hand, a manager from a medium-size provider in a small urban area noted that, “We have a hands-free cell phone system, [which is] probably safer than a two-way radio system.”

A rural manager of a medium-size agency stated that the issue is not closed for them:

“We don’t have rules on that. We have never had problems of that [nature]; we may have to address that at some point. I would be interested in having a cell phone policy when vehicle in motion.”

Finally, a manager from a large agency in a large urban area stated that further technical innovations might help solve this problem:

“Better version of MDT will assist the driver. It does cut down voice communication. Anecdotally, we are safer now. Drivers now can choose when to answer a page. In the old system, they did not have any choice but to answer the voice paging. Now, for example, when driving on the highway, they can ignore the paging and stop later to look at the MDT.”

- Usage abuse issue: Some managers are concerned that issuing cell phones to drivers may result in excessive personal use and high phone bills. This is a management matter rather than a technical matter. A manager of a medium-size agency in a small urban area noted that they address the problem this way:

“Cell phones are cost-prohibitive because you pay by each cell phone number you own, and it is a bit leery to have cell phones for staff. We use our drivers as third-party contractors.”

Computerized Scheduling and Dispatching

Scheduling and dispatching are core processes of any CBT service. Generally speaking, until the early 1990s, almost all CBT providers used “paper and pencil” scheduling and dispatching methods before computer software became available. The manual method is labor-intensive, and daily information processing is repetitive (e.g., Mr. Johns’ ride pick-up address would always be his home address). Computerized scheduling and dispatching applications replace the labor-intensive and repetitive parts of CBT service operation. Nevertheless, smaller, and some medium-size, CBT providers currently still use traditional, manual scheduling and dispatching methods.

In the interview, managers from medium- and large-size CBT operations said they use computerized scheduling and dispatching systems. Specifically, they use *Pass* or *PassLite* scheduling and dispatching software provided by the vendor Trapeze™. Trapeze software dominates Minnesota’s CBT market. Box 7.1 and Box 7.2 show the specifications of what *Pass* and *PassLite* software can do for CBT operations.

Box 7.1: Trapeze Pass Features

(from <http://www.trapezesoftware.com>)

Sophisticated Scheduling and Dispatching

- Automatically generate schedules and scenarios
- View detailed itineraries including pick-up and drop-off times and locations for each run
- Calculate accurate arrival times based on board/alight times, route, speed, and more
- Monitor vehicles and runs and adjust service in real time
- Instantly track incidents, cancellations, and no-shows

Accurate Details

- Use and track detailed client information including multiple addresses, special needs, demographics, mobility aids, funding sources, eligibility, trip history, and more
- Use scanned documents and photos for further detail

Simple Trip Booking

- Book subscription or casual trips with full access to passenger data
- Indicate fare types, multiple billing sources, and trip purpose

Integrated Mapping

- View and define service areas including street names, zip codes, boundaries, barriers, and ADA corridors
- Geocode locations, origins, destinations, clients, and more
- View multiple itineraries and runs on one map

Quick Report Generation

- Generate standard and ad hoc reports on performance, fares, revenue, ridership, individual clients, specific vehicles, and more

Easy to Use

- Intuitive Windows-based application with easy-to-follow menus and help screens
- Complete installation, training, and customer support services

Box 7.2: Trapeze PassLite Features

(from <http://www.trapezesoftware.com>)

Zone-Based Scheduling and Dispatching

- Color-coded zones for fast, logical scheduling
- Determine “best-fit” for schedulers and dispatchers
- Simple drag-and-drop functionality
- View multiple itineraries and runs
- Monitor vehicles and runs and adjust service in real time
- Track incidents, cancellations, and no-shows instantly

Accurate Details

- Use and track detailed client information including multiple addresses, special needs, demographics, mobility aids, funding sources, eligibility, trip history, and more
- Use scanned documents and photos for further detail

Simple Booking

- Book subscription or casual trips with full access to passenger data
- Multiple comment fields for additional information

Quick Report Generation

- Generate standard reports on performance, fares, revenue, ridership, individual clients specific vehicles, and more

Easy to Use

- Intuitive Windows-based application with easy-to-follow menus and help screens
- Complete installation, training, and customer support services

The following explains, in detail, the threshold of software deployment, experiences using Pass and PassLite, and experiences using paper and pencil operation in traditional ways.

- **Threshold of using scheduling and dispatching software:** As mentioned above, different CBT agencies have different thresholds for implementing scheduling and dispatching software. Many factors influence this threshold: fleet size, ridership, geographic coverage, route complexity, roadway network density, staff number, staff computer competency, funding source, scale, and structure, among many other factors. Of all these factors, fleet size appears to be a major issue, because each vehicle is a moving dot on a map and real-time scheduling and dispatching operation revolves around vehicles. A manager from a large agency in a large urban area describes the advantages of this software in their situation:

“When you get to around or above 30 vehicles and a large ridership, you will need a computer-based scheduling system. The threshold will depend on the competency of your staff. You can probably get 30 vehicles working using paper and pencil. You will need to be very labor-intensive. You won’t have reliable same-day services.”

Another manager in a similar setting agreed:

“The reason we looked at ITS is that we were getting too big: too many vehicles and riders to do it by hand.”

A manager of a medium-size provider in a rural area further emphasized this point by stating:

“We are kind of an in-between service. We started the planning process five years ago; Trapeze did not work for us. Of all the computer programs we looked at, not all of them met our needs. None of the programs fit our needs. We don’t have the volume to go thorough the whole training. We are small enough to keep up with the low-tech. If we came in with new dispatch software, it would need to include billing and make things easier for drivers and riders. The software would have to win in all those categories. The ones we tried so far don’t fit us well. We are too big for some programs and too small for some programs. Also, if our staff numbers go down, we may need to change to a computerized system.”

Finally, a manager of a small system in a small urban area pointed out:

“We may not need it [ITS] here due to the small number of ridership. I really don’t see any advantage to implementing a software package for a small system like us.”

- Experiences with *Pass* and *PassLite*: There is a great deal of efficiency acquired with the help of *Pass* software for some large CBT agencies. Agencies using same or similar software developed inter-agency assistance through their practices. The Trapeze company now offers online, remote diagnosis of how well CBT agencies are doing with their software and can provide suggestions for improvement and solutions to program bugs. Remote data archiving also is possible.
 - Efficiency acquired through computerization: By using *Pass* software, agencies are able to drive fewer miles and transport more people. This may be attributed to the software’s ability to reduce dead time, unnecessary routes, and so forth. Efficiency also is achieved through increased staff capacity. Agencies can keep up with ridership increases without having to increase the number of staff. In general, computers are good at handling overall dispatching tasks for multiple vehicles. At the individual vehicle level, drivers still have the best sense of local conditions such as weather, road, and congestion, which also affect schedules and routes.

One manager of a large provider in a large urban area stated:

“[Pass] was way different than a type-written scheduling [process]. At the time we were doing 85 rides a day. We put in a computer, which was far more efficient: we got 120 rides a day. We used to drive 100 miles in four hours to transport five to six people. Once we got the scheduling software, we could accommodate 10 to 12 riders in four hours with only 50 miles of driving. [That was] four times more efficient. Number of rides went way up and mileages way down. We are not driving as many miles, and we are providing more rides.”

Another similarly-situated manager described similar experiences:

“Staff time would be better used for individual caring versus everyday mundane routine things. We expected to provide more rides with the same number of resources. As we expand, we can take on more responsibilities with fewer outside resources. Obviously operating dollars would expand, but staff size may not need to expand. The capacity to grow is important. We are providing more same-day trips than in the past, which is the success of the ability of the computer to find rides for them. The computer makes rescheduling easier in terms of vehicle breakdowns and sick drivers. It had become easier than in the past to keep track of riders, statistics, etc.

“In some cases, the ultimate impact of time reduction is in terms of scheduling for drivers. The computer is very good at scheduling 50 buses. But down to the individual driver’s level, the driver can tweak schedules better than the computer. Drivers know which streets are busy, something computers do not know. Drivers know the nuances of preferences of each individual rider, which the computer does not know.”

A manager of a large provider in a small urban area also found benefits:

“Before, we had two rides an hour [per vehicle], afterwards, Pass doubled our efficiency to four rides per hour [per vehicle]. We can see by our data it has doubled our capacity. We increased the number of buses. With only maybe a 5 percent increase in dispatchers, we have twice the capacity. Our vision of the scheduling package was even surpassed by reality. Pass gave us more capability than we thought. Originally we thought we could increase our capacity, now we can also do route evaluation—look at ways to make our routes more efficient.”

- Interagency technological assistance: Agencies using the same or similar software voluntarily began to have conversations with each other in terms of how to best use the software and help each other with deployment.

A manager of a large provider in a large urban area stated:

“Pass generates all our reports for billing, in conjunction with Crystal Report [software]. Pass was best for us since 1995. We compared products on the market and talked to our staff. If everyone has it, it is easy to do problem-solving together. Some people [from other CBT agencies] have been helping us and other agencies with problem solving.”

A rural manager of a medium-size provider noted similar benefits:

“More than one of us purchased the software [PassLite], which gives us some peers to talk about in terms of problems of the software. Small network of Q and A among agencies: we would meet about every 3 to 6 months to talk about issues. There was a period of time we did meet regularly from a large geographical area. That has been mutually beneficial.”

These benefits were also noted by a manager of a medium-size provider in a small urban area:

“We brought together the dispatchers from other agencies who were going to use PassLite and systems using the software already.”

- Internet Diagnosis: The Trapeze company has the capacity to diagnose and evaluate their *Pass* and *PassLite* software through the Internet. The online-diagnosis is real time and can save travel time and costs. Many agencies find this service helpful for debugging and for data backup.

From a manager of a medium-size agency in a rural area:

“The biggest challenge in implementation is the fact that the vendor [Trapeze] is from another state-Arizona. We have difficulties right after the program was installed. It was really hard to get communication from vendor, especially when there was no online help. Now the vendor can get into our program database via the Internet. Five years ago it was hard to work out the bugs. The [online help] has been terrific for debugging. We had just upgraded two months ago. It was fairly smooth when they can view the exact screen we can see here online. The upgrading process is done remotely via the Internet. It is also able to transfer old database into new system. Now we can archive (also remotely) data.”

- “Paper-&-Pencil operation—experience without using software: For small operations and those with relatively fixed routes (such as a school bus, day training transport for disabled persons, etc.), the traditional way remains relevant and functional.

The following comments are from managers of medium-size agencies in rural areas:

“We have 13 routes. They are dial-a-ride routes. The routes evolved over time. Depending on season, labor forces changes, etc. Dispatchers look at the screen and see pick-up and drop-off locations and see which route would be the best fit. A problem could be a route filled up, and then they would need to go to alternative route or time. There is no calculation done by computers. Dispatchers typing in rides, they would call the driver. If it is for the next day, we print out the schedule to let the bus drivers have it the next morning.”

“We have only 60 clients. It is kind of like a school bus system. Both at the beginning of the day and end of the day we have pretty predictable travel patterns. During the day we operate on a flexible schedule. The major technology here is a blackboard on the door. That works pretty well. Drivers and dispatchers look at the blackboard. Clients will call and change the schedule, most likely happening in the morning.”

GPS and AVL

GPS and AVL technologies track vehicles in real time and provide drivers, schedulers, and dispatchers with a physical display of pick-up and drop-off locations and vehicle locations. This

facilitates the scheduling and dispatching of route design and real-time adjustments (although local conditions such as congestions level still may be factors the drivers, rather than computers, had to acknowledge). GPS and AVL can prove very useful for larger CBT systems. For smaller operations, GPS and AVL may not be appropriate.

A manager of a large agency in a large urban area said:

“Dispatchers know where the buses are and where they are supposed to be. Part of Pass has a mapping capacity. XY latitude and longitude ordinance were shown for pick-up and drop-off locations.”

Similarly, a manager of a large agency in a small urban area stated:

“We use Pass to communicate with MDTs, and AVL/GPS are parts of Pass. They map the buses. Right now the maps reflect on dispatchers’ screens so we can track where the buses are. Now drivers can see text addresses of next pick-up and drop-off times and locations. In the future, bus drivers can see the map of next ‘best rout to get there.’”

Meanwhile, a manager of a medium-size agency in a small urban area noted:

“GPS may not be necessary because we are rural and our buses will be operating on major roadways. It is easy to figure out where our vehicles are.”

For small agencies that want to coordinate rides, however, GPS may provide a critical technical link among agencies. Some non-CBT agencies in the public sector, such as highway patrol vehicles and ambulance fleets, may already possess GPS capabilities. For smaller CBT agencies, this provides a possibility to share the GPS technology with these agencies. As one manager of a small agency in a rural area told us:

“We are looking at planning right now—the GPS system would make it a little easier for our dispatchers. Dispatchers now operate manually. Switching over to a GPS-based system will cut staff time in half. The GPS system is now provided with the county. What we need to do is to hook up with the county system. The system now connects with the highway department, ambulance (511), and so on. Map-based systems will be installed on the buses. Drivers and dispatchers can see where the buses are. GPS also can improve efficiency. Everybody will be on the same link, same system, looking at each other for where vehicles are. New billing arrangements will be made for transactions for interagency works. Large rural areas need coordination for efficient use of vehicles. Currently we have eight dispatchers. [GPS] may cut that staff number down.”

Interagency Coordination

In 1999, Mn/DOT developed a pilot program for a statewide deployment of unified software. Trapeze was the primary vendor. It was hoped that systems across the state would have the same software so riders could dial in and see all the systems in the state. Purchasing this software was to be achieved through a state subsidy of an 80:20 match, with the State contributing 80 percent of the funding; however, that program has been dropped, according to information collected from the interviews. Although the statewide program did not materialize, some large CBT agencies are trying to use ITS technologies to pilot some coordination with other agencies with

the same idea of standardized system. The feasibility of future ITS deployment lies here. Currently there is a certain degree of coordination existing among agencies: some call others to fit in ride requests.

From a manager of a medium-size agency in a small urban area:

“We are going to integrate other transit systems in our county. When that happens, we could dispatch to other cities. Some of the systems, the drivers dispatch themselves now. We do have a regional system. Some agencies do want to be integrated with us.”

A manager of a large provider in a large urban area noted similar progress:

“We are currently looking at coordinating with four other counties to upgrade to most recent software, Pass 4.61. The idea is there will be more inter-county travel. With the same version of software, it would be easier to share data, clients, and eventually vehicles, as long as we (the four counties) standardize reporting and billing.”

And these efforts are also taking place within small rural providers:

“Coordination with other agencies: access to others’ scheduling database, vehicle/ride sharing based on openings or lack of openings, etc. We use phones right now to reach others to see if they have buses available to accommodate same-day requests to our agency.”

Other ITS Used in CBT

- Computerized billing and accounting has been useful for at least one large provider:

We use Pass to generate all our reports for billing, in conjunction with Crystal Report software. Then we [use the Internet] and the MINNITS billing system to [coordinate billing with] the state. To bill our other contracts, we use Excel. We are still using the customized report from Pass, which is very cost effective. The program was written specifically for our agency.”

- Web-based scheduling also has been useful with the larger providers in large urban areas. Two different managers indicated:

“It is a very small fraction of the population who will be using the Internet to schedule their trips. But it is enough for a test. It may slow down the increase of demand for reservationists. The single biggest reason for deploying such a technology is that it is convenient for our costumers. We provide an option for our clientele.”

“One of the things we need is easy access for adults with disabilities to do online scheduling. If they [schedule rides] online, our dispatchers will have a much easier job. Also, people can do online scheduling for disabled relatives or friends.”

- Fleet Maintenance Software

A large provider in a large urban area stated:

“Fleet tracking following the life cycle of vehicles...fleet maintenance diagnostics...we take samples and send them for diagnostics for engine wear and tear. This kind of program is important. You also can lease this service to contractors. There are companies out there specialized in doing this.”

- Digital Video Recorder

A manager from a large provider in a small urban area noted:

“We are forward thinking. Digital Video Recorder (DVR) and audio is now installed on our vehicle for liability and safety purposes. We will be able to show records of events that happened. The idea is similar to the black box on an airplane.”

Planning Experiences

- Planning process: Because of the substantial costs involved, formal planning, in terms of ITS purchasing and implementation, is more likely to take place in larger CBT agencies. Smaller CBT operations typically involve the following stakeholders in their planning process: “Mn/DOT,” “our own agency,” “our staffs and volunteers,” “vendors,” “our riders (informal or formal focus groups).”

From a manager of a large agency in a large urban area:

“We actually did a strategic planning with our key board members and key volunteers. In 1995, we did not have a computer. It was a big capital outlay for hardware and software.”

From a manager of a large agency in large urban and suburban areas:

“Standard type of process. We put together a planning team composed of DOT, Met Council, FHWA, and the steering team drafted an RFP and found consultants and a vendor to work with us to launch [ITS].”

From a manager of a medium-size agency in a small urban area:

“We do have a transit advisory committee, which includes board members from various agencies that help to fund us. Decisions are made by the agency board under which we operate with recommendations from the transit department.”

- Time of planning and implementation: Planning and implementation typically takes more time and effort than expected. Many managers had expressed that purchasing the technology seemed rather easy compared with actually using it. Keeping up with technological innovation is hard and time-consuming.

From a manager of a large agency in large urban and suburban areas:

“I think the initial start up realized our expectation. Technology changes; and trying to stay ahead of the curve is difficult. Especially the MDT, it stretches more time than expected. By the time we had it correct, the

vendor changed and forced us to begin again at the drawing board. We cannot use the old technology in terms of MDT. We wanted to have communication equipment that we would have for a lifetime. Again it changed. We are hoping it won't change again."

From a manager of a large agency in a small urban area:

"It took about six months to fully implement the ITS. We have Trapeze staff on site to work with us. Software installation took a couple of weeks. Afterwards,[we went through] testing, training, piloting, and debugging. We did some more experiments with Trapeze on ADA identification. When ADA riders called and scheduled, scheduler will record ADA identification. For the general public, we do curb-to-curb service; for ADA clients, we do door-to-door service. Drivers know what type of riders they are picking up before they arrive."

- Customer outreach: Generally, riders are not involved in planning what type of ITS technologies to employ by a CBT provider. All managers interviewed reported that riders are informed in the later stages of ITS deployment. It is not clear whether it would be worthwhile to involve customers in ITS planning and implementation.

From a manager of a large agency in large urban and suburban areas:

"We publish newsletters and service guides, which will reach our customers. In the future after GPS/AVL deployment, customers will be able to call and figure out where the bus is and see how many minutes more to wait."

From a manager of a large agency in large urban and suburban areas:

"We do a first-time rider survey. We give regular updates to our riders about what ITS technologies we are implementing. Of course we have Web site as well. Drivers can [give] passengers [updates] as well."

Training and Learning Curve

When asked, "What were the greatest challenges in implementation," most managers interviewed talked about the unexpected hurdles and difficulties of training the staff to interact and get accustomed to the new ITS application. Training schedulers and dispatchers to put away "paper-and-pencil" methods and begin to use software, or "climbing up the technological curve" as some manager described, presents one of the central challenging experiences all CBT services face and/or will face. It is clear that most managers feel that training is a critical piece of ITS implementation, and many of them feel they should have done a better job with the training piece. The main training difficulty is primarily a management problem in that it is hard to get staff members accustomed to new technology and to put away the old ways of operation. Among staff members, there is some degree of distrust with technology to begin with and some sense of fear of being replaced by technology. However, once staff members get used to the technology, they typically become increasingly fond of it and are reluctant to go back to the old, manual operation. Another training difficulty is that training is actually more time consuming than many manager expect. However, there is a limit to technology in that technology can be as good as how people use it. "Staff and technology have to go hand-in-hand," noted one manager.

Generally, training CBT staff members generally is handled by one of three common strategies: 1) outside training, where the vendor or people from other CBT agencies come in and help facilitate the training; 2) upfront overview training, which introduces the staff to how the system works as a whole; and 3) in-house training, in which senior staff members help new staff members.

- Importance of Training

From a manager of a large agency in large urban and suburban areas:

“Training is critical. We had four-hour training upgrades for Trapeze and two weeks of training for drivers to use equipment on the vehicles.”

- Reluctance to Learn Computer Software

From a manager of a large agency in large urban and suburban areas:

“The greatest impediment to any technology is after you commit the funding, the biggest resistance [comes from] staff members[having to deal with a] learning curve. It is really a management problem. You need very good leadership.”

From a manager of a medium-size agency in small urban areas:

“Overcoming some of the dispatchers’ resistance was the greatest challenge. Once they found out how complicated it was, some frustration existed when the software was being [customized for us]. Whenever the software vendor changed one part of the system to accommodate our unique needs, it affected other parts of the software and created problems. I talked to the dispatcher the other day; they do not want to go back to the paper and pencil way of doing it, however. We invested a lot of time and effort [in training]. It is something that the dispatchers have gotten used to. There were trade offs. They like some parts of the software, but not all. It is something they get used to. It reduced errors.”

- Afraid of Computer Breakdown and Lost Data

From a manager of a large agency in large urban and suburban areas:

“We were scheduling everything with pen and pencils. Our staff were afraid of computer broke down with no backup schedules because [at that time] nobody in our department used computer.”

From a manager of a large agency in large urban and suburban areas:

“We have backups for backups. We don’t dare lose data.”

- Unexpected Long Training Time and Adaptation Process

From a manager of a large agency in large urban and suburban areas:

“Overall, the training has been a high cost of time, which is unexpected. In some cases, the technology adds more time than [it reduces]. Reporting is taking more time [with computers]...sophistication of report writing—ridership, billing, things that could be pretty simply done by hand.”

From a manager of a large agency in small urban areas:

“Our drivers never used computers. It was a big transition for them. MDT is not really complicated, but it does take some time to train the drivers. That was hard for some drivers. We produced a one-page “cheat sheet” for drivers. That was very helpful.”

- The Human/Technology Interaction

From a manager of a large agency in large urban and suburban areas:

“Technology is able to handle all the data much more efficiently than a human could. In some ways, you would have the staff that wishes to make it work. Staff and technology has to go hand-in-hand. I think the technology is invisible to riders. They are happy. Maintaining the human touch of the customer relationship is important to us. We don’t want customers to get angry with computers [i.e., blame computers for ride problems].”

- Training Strategies

- Up-front, overview training

From a manager of a large agency in small urban areas:

“If we were to do it again, we would have more front-end training. We later found out if we did our homework, we could be much better in terms of overview training to get everyone on the same page at the same time.”

From a manager of a large agency in large urban and suburban areas:

“Along the way, it had been a lot of joint communication training with drivers and dispatchers to see what the drivers’ issues are, and then take those to computers. Let them [drivers] understand the overall workings of the system. Now the training has been on the use of MDTs. Now [the responsibility] is more on the driver’s side as to how to use MDT.”

From a manager of a medium-size agency in small urban areas:

“Train all the staff; at least let the drivers understand the overview of the software so we don’t have to re-explain everything.”

- In-house Training

From a manager of a large agency in large urban and suburban areas:

“Two of us have been here since 1995. If we have new employees, we do the training. For someone to learn our scheduling, we hired a temporary employee. We trained her in two days, and she could do as well as other schedulers. Dispatching is much harder. Training new dispatchers takes three to four months. They must know the city, and sometimes bus drivers get lost.”

From a manager of a medium-size agency in rural areas:

“Internally, our office manager will pass the information to dispatchers. She needs to learn the new version herself. She would train the

dispatchers (combined position of scheduling and dispatching in this agency).”

- Re-training

From a manager of a large agency in large urban and suburban areas:

“You always need to train your staff to make sure they understand what you are trying to achieve. As things change, we need to find time to do training. Technology changes so fast, you need to find time to accommodate that. Throughout the first phase, we used computer training. In the second phase, we were going from DOS to Windows and had to redo our training. Along with that, reporting became intensive. Training on report writing was needed to dig data out.”

- “Piggyback” Training

From a manager of a large agency in small urban areas:

“A new dispatcher really requires a six-month training. We put a new dispatcher with an experienced dispatcher. We now have one trainer doing front-end training on what we are doing as a whole to give an introduction and overview of the system. Detailed training would require new staff to work with senior staff, which we call “piggybacking.”

From a manager of a large agency in large urban and suburban areas:

“In terms of training, drivers comprise the biggest staff number. When GPS/AVL comes into place, they would need to be trained. For reservationists, after initial training, sitting in front of computer is required for hands-on training.”

Appropriate ITS and Comfort Level

ITS as discussed in this study brings both challenges and opportunities to CBT operation. On one hand, it can bring much frustration to staff members trying to better use computer programs; on the other, it can greatly increase operation efficiency and effectiveness. There is a comfort level with the appropriate ITS technology to be used in CBT. Even with the same ITS, there is a comfort level with how “deep” to use its technical potential. Keeping a human touch in CBT services may sometimes be more important.

From a manager of a large agency in large urban and suburban areas:

“We had expected a more accurate trip schedule with the computers; drivers still have to do some tweaking. I don’t think we expected technology that changed so often. I don’t think we have maximized all the capabilities of the technology. It is a tradeoff among staff time: is it worth it to upgrade more [often]? You get to a comfortable level. Once the template is set, you hate changing it. You need to be thoughtful about changing it.

“We call our riders and tell them the exact time they will be picked up. It is labor intensive, but it [fosters a] good customer relationship. We will

call individual riders each day to tell them the exact time the bus will arrive: at least 300 riders a day, mostly on-demand trips.”

Evaluation of ITS Used

Evaluation of ITS currently being used was mostly done by the ITS vendor or in-house by CBT agencies. Larger agencies tend to conduct operational evaluations in a more systematic and quantitative way. Smaller agencies typically do not have a rigid evaluation procedure with regards to how well they use the ITS technology and how appropriate the level ITS technology use is.

- By Vendor

From a manager of a large agency in large urban and suburban areas:

“We had an evaluation by Trapeze comparing how other people are using Trapeze. They tell people how to use it better after the comparison of 20 agencies. They told us what we were using really well and gave us more information on how to improve it.”

- In-house

From a manager of a large agency in large urban and suburban areas:

“We collected enormous amount of data. We have pretty good estimates on our performance. We would be able to tell certainly what the overall performance is annually. After three months of new technology implementation, we would be able to tell what the efficiency level is.”

Lessons Learned

Managers were asked what were the lessons learned through the ITS planning and implementation processes. Many managers feel it is a “smart move” to purchase a particular ITS application and hire key staff people to manage it. Generally, these managers wish that before implementing new technologies, they fully recognized that technology is not a panacea. Technology has to be used by human beings; thus, human development stands out as the single most important piece in ITS implementation. If they had to do it again, some managers expressed that they would set aside more time for training and setting up criteria for evaluating the technology about to be deployed. Some managers feel that a centralized source is needed to formulate standardized procedures and/or templates for tasks common to all CBT services, such as billing and reporting. Finally, managers were given opportunity to advise other agencies. Many offered the same advice; that is to shop around for various ITS options and talk to peers before purchasing or implementing anything. They suggested specifically that agencies talk to peers who have similar operational characteristics and to peers already using the particular technology agency is looking to implement. Managers with large scale ITS projects advise that agencies have a clear project plan, or “road map,” before setting out. “The Devil is in the detail,” noted one manager who mentioned also that patience is a necessary virtue when purchasing, implementing, and learning any ITS technology. Some managers warn agencies to make careful upfront investments on a reliable computer network and server. Finally, these managers

encourage others to keep ahead of technology and lead the industry into better operation via both human and computers.

- Smart Moves

From a manager of a large agency in large urban and suburban areas:

“We were fortunate to attract a person who understands the system very well. That helped a lot, and still is. The key thing is to find the right staff to do it. One of our best moves was to hire that person. We capitalized on it. The other thing is that the board supports innovation and looking at new technologies. They look not just at the cost but things that can lead us into the future. Finally, we take on new work with technology. We learn how to fashion the technology into different areas.”

- Wishes Before Beginning Again

From a manager of a large agency in large urban and suburban areas:

“I did not realize I’d have to sit eight hours a day in front of computer. Everything I do [now] has to be on computer.”

From a manager of a large agency in large urban and suburban areas:

“I wished I knew technology would take so much staff time. It requires a lot of staff interaction. Be realistic about the potential of technology. Every implementation is different. The complexity of implementation...you always run into some problems. You also expect staff to come and go.”

- Do-it-Again: The question of “If you had to do it again, what would you do differently?” generates interesting responses from managers.

From a manager of a large agency in large urban and suburban areas:

”I would spend more time in establishing the right criteria [for ITS evaluation]. It is kind of chicken-and-egg question. You don’t know what you don’t know. The better the benchmark at the beginning, the better you know how you are doing. I would spend more time in communicating expectations. We need to understand the expectations of technology from the drivers’ and dispatchers’ perspectives.”

From a manager of a medium-size agency in small urban areas:

“Set aside time for training and learning.”

- Reinventing the wheel: some managers interviewed mentioned the difficulties of “inventing” their own computer software for accounting or other purposes. Many small agencies use Excel or Access to accomplish daily operation tasks. Many of them had to design the template themselves. Some managers interviewed wishes that there are some ways where State or local agencies can create a template and distribute to CBT services for use.

From Manager of a small agency in rural areas:

“Rather than developing my own spreadsheet, I hope some software that

link people more efficiently [will be available] so that it is not a creation of my own. Why recreate a whole new wheel when there is one in place?"

- Advice to Others

From a manager of a large agency in large urban and suburban areas:

"Talk to as many people as you can. Especially those who have what you think you want. A couple of times we were ready to buy a certain kind of software. But when we talked to other agencies they told us not to buy it. Twice we were ready [to buy]. We checked references. We are grateful for that. It is important to look at yourself, but also talk to others."

From a manager of a large agency in large urban and suburban areas:

"[The] Devil is in the details. The best idea when it comes to implementing technology is to set up a road map. The road map is not only the technology you want to buy, but also the reason you want it, and the long schedule to implementation, the follow-ups of tracking results, evaluation, and the tweaking it as you go along. You need to set up an institutional and financial structure."

From a manager of a large agency in small urban areas:

"Our best approach to ITS utilization is our project plan. When you bring in a new system, well-defined goals lead to a good plan. Project management is crucial."

From a manager of a medium-size agency in small urban areas:

"Be patient with the new technology you are implementing. Give your staff time to learn the program. Re-train them from time to time. Communicate with other agencies that are using the same software."

From a manager of a medium-size agency in rural areas:

"We spent a lot of money upfront on our computer server and networks. The network is positive. We never have viruses. It cost a bit of money, but it is a high-quality network. I know other systems have computer crashes. We paid for this little network here, and it is very beneficial."

From a manager of a large agency in large urban and suburban areas:

"I recommend anyone to do it. Don't wait. The longer you wait, the more you lose time and capacity. Make sure you have the right staff invested in it. Don't expect technology will eliminate staff time and wage costs. But if you use more technology, it will expand the capacity of your staff. Efficiency can be measured in many different ways. Make sure what qualities you want and use technology. Don't let technology lead your way. You lead the way."

Discussion of the Results and Suggestions

The preceding interview results show several general observations:

- Larger CBT systems use more sophisticated ITS and more systematic strategies towards planning, deploying, and evaluating ITS.
- There are system scale thresholds of different complexity level of ITS use. Implementing the appropriate ITS technology is better than implementing over-designed ITS technology. Technology can sometimes bring more hassle than efficiency.
- ITS use in CBT usually consumes more time and effort than people expected.
- Training staff to keep up with technological innovation proved the most time consuming and difficult part of ITS deployment.
- There is a limit to technology: it can be as good as how people use it. Staff and technology have to “go hand-in-hand.”
- Agencies do voluntarily talk to peers to exchange ideas and obtain opinions. Inter-agency assistance sometimes takes place, though it is not formally organized.
- With technological innovation comes a chance at new kinds of inter-agency coordination. Many larger CBT agencies are currently exploring this area.
- As technologies become marketable and available, technologically-savvy managers assimilate them into CBT operations.
- Larger CBT agencies conduct more formal processes of planning in terms of ITS deployment. But nearly none of the CBT agencies have involved riders in the planning process.
- Larger agencies are more likely to conduct formal, systematic, and quantitative evaluations on ITS performance and whether certain technology is appropriate.

According to these observations, several suggestions can be made:

- Information exchange among CBT managers—Many managers said they go to a Mn/DOT-organized transit convention every year to look at vendor exhibits, to find out about new technologies available, and to see demonstrations of these new technologies. The convention seems to be a positive experience since many managers mentioned it. Furthermore, it would be advantageous to organize peer information sharing sessions at the convention, where similar CBT agencies can discuss ITS planning, deploying, and evaluating.
- Mn/DOT also can set up functions or services to help facilitate CBT staff training. Training is obviously a must but is a difficult task in many agencies, especially smaller operations with limited technical staff. A common training facility, service center, or training personnel could be more efficient than each CBT agency trying to conduct in-house training or calling vendors in for help. Having the right staff to manage any new ITS technology is the cornerstone to successful deployment, which also means a degree of vulnerability to the agency should these key players leave the agency. A human resource center would be beneficial in this regard to prevent technical problems due to absent staff members.
- Better evaluation on how ITS applications are performing in each agency is needed. It is important not only to see if the technology is performing to its full potential, but also to keep up-to-date about innovations that take place everyday. Evaluating whether or not the technology deployed is appropriate helps in planning as well. Also, better customer

evaluation is needed regarding whether or not ITS technologies help provide better CBT services. The customer's satisfaction is a common end goal of CBT service providers; however, customers currently are seldom involved in the evaluation of the ITS technologies used by CBT agencies.

For Future Research

There are many areas ripe for additional research regarding how ITS technologies can best be used to improve CBT services. In the opinion of this author, the following aspects should be explored:

- What new ITS technologies can be used for better inter-agency coordination in terms of share clientele base, share vehicles, and share accounting information?
- How can better training assistance be provided to CBT services of different types, sizes, geographical areas, and riders?
- How can the quality of planning and evaluation of ITS deployment be enhanced?
- What are the thresholds (e.g., ridership, fleet size, staff size, funding level) for deploying certain kinds of ITS in CBT?
- How can ITS technologies mitigate driving challenges such as inclement weather and congested roads?

Chapter 8

Using End-User Preferences for Online Evaluation: An Advanced Traveler Information Services (ATIS) Assessment Tool

Note: This chapter contains results from Task 3, plus previously submitted findings for Tasks 1 and 2.

Introduction

As summarized in an earlier report (see [Appendix U](#)), use of the open architectural standards of the World Wide Web [1] in building Internet-based applications can help facilitate the integration of different types of information and systems through the use of multiple communication capabilities. Applications, built in this manner, also can provide multimedia and browsing capabilities to diverse, geographically disparate end users. As a result, Internet-based applications are increasingly being built to provide services previously realized through other less effective means. Advanced traveler information services (ATIS) are provided through various e-government initiatives to help travelers reduce trip uncertainty. ATIS seeks to acquire, analyze, communicate, and present information to assist surface transportation travelers in moving from a starting location to their desired destination. As stated by the Intelligent Transportation Society of America [2], ATIS delivers data directly to travelers, empowering them to make better choices about alternate routes or modes of transportation.

Quality in Use Research Model

For these reasons, and due to the diverse nature of trips and users, Internet-based initiatives for ATIS should: 1) adopt a user-centric perspective by implementing mass customization (e.g. Dell), personalization (e.g. Amazon), and more generally customer relationship management (CRM) [3]; 2) use design processes that are meant to serve users and that are modified to be more user-centric or user-centered [4]; and 3) evaluate what makes usability pervasive by including usability evaluation, client review of the design, quality assurance, and technical feasibility evaluation [4]. Figure 8.1 illustrates the approach that has been adopted for evaluating ATIS Web-based initiatives. The transparent rectangle labeled “Quality in Use” distinguishes three different approaches to product quality [5]:

- **Internal Quality:** This is measured by the static properties of the source code, typically by inspection such as path length.
- **External Quality:** This is measured by the dynamic properties of the source code when executed such as response time.
- **Quality in Use:** This is measured by the extent to which the software meets the needs of the user based on the context of usage. Quality in Use is the user’s view of quality and is dependent on external measures that determine external quality such as suitability or operability. External qualities are likewise dependent on internal attributes of a system such as static measures of code.

The rectangle with darker background labeled “ATIS Web site Design Process and Implementation” indicates user-centered design activities that need to take place during all stages of system implementation. These activities are adopted from ISO FDIS 13407 [6]:

- Plan the human-centered process;
- Understand and specify the context of use;
- Specify the user and organizational requirements (after considering diverse nature of ITS users labeled as “Diverse ITS Users”);
- Produce design solutions; and
- Evaluate designs against requirements (after identifying unique requirements of the system labeled as “Identify Unique ATIS Requirements”).

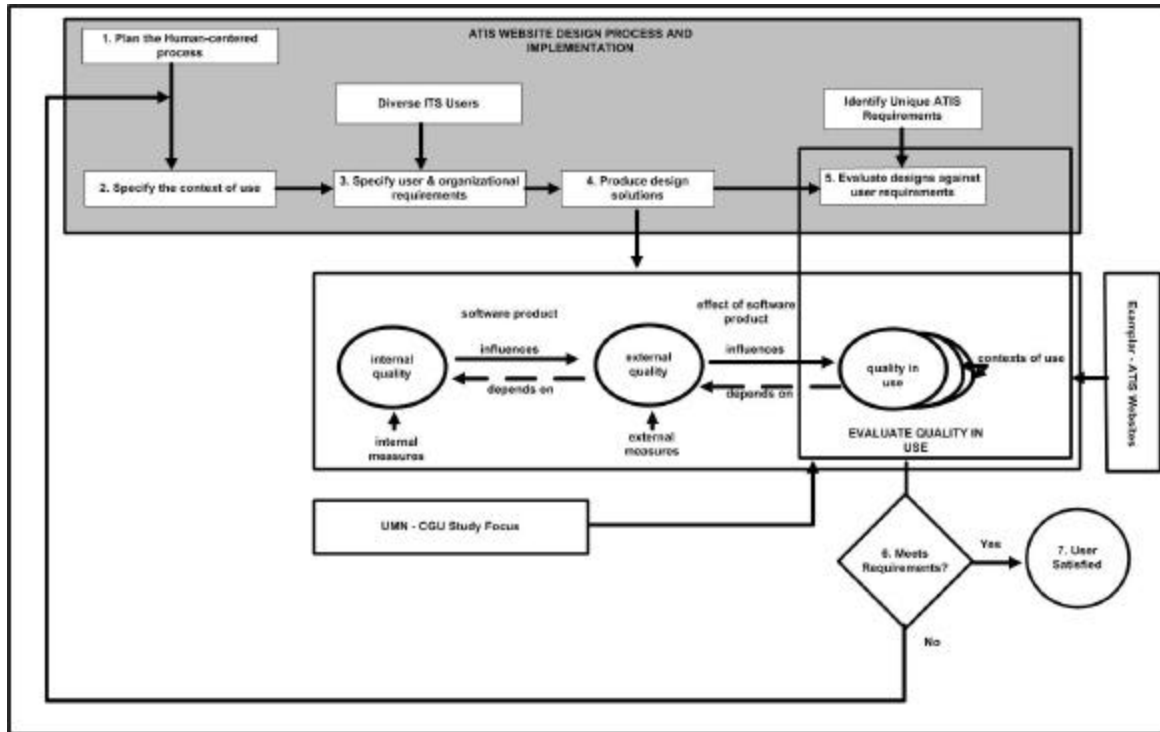


Figure 8.1 “Quality in Use” Research Model

The rectangle labeled as “Evaluate Quality in Use” is the focus of this study. This study evaluates quality in use in a given context of usage after considering the user requirements, which are considered while designing a system. It considers various ATIS Web sites such as the Los Angeles Metropolitan Transportation Authority (<http://mta.net>) and Regional Transportation Authority of Chicago (<http://rtachicago.com>) sites, in this study. If the requirements are met—it is labeled as “Meet Requirements?” as a decision box in Figure 8.1. If the requirements are not met, the process iterates back to the system developers as a way of recommendations by the assessment “tool.”

In light of these needs, this study was concerned with the development of an assessment “tool” that would be used throughout the design process and implementation of an Internet-based service such as ATIS. Therefore, the first research activity of task 3 in this study was to design a methodology to assess and rate the quality of an Internet-based service available to users. The second research activity was to then implement this methodology in the form of a “proof-of-concept” online assessment tool. The third, and final, research activity was to use the proof-of-

concept for the assessment of two Internet-based ATIS services in a pilot study. It is expected that the resultant methodology, proof-of-concept, and results from the pilot study will form the foundation of an advanced online assessment tool to automatically evaluate e-government services provided through Internet-based systems.

This paper focuses on results from Task 3 of the research study, with a summary of Tasks 1 and 2 in [Appendix U](#) and [Appendix V](#). The paper first describes the research design and methods used to develop the framework and metrics required to assess and rate the quality of an Internet-based service available to users. The implementation of the proof-of-concept online assessment tool is then presented, followed by a presentation of the survey findings. The final section discusses implications of this study.

Research Design and Methods

The research design is a specific application of a generalized approach for evaluating online usability [7]. Next, the method is detailed on the following pages in terms of four dimensions: method class, method type, automation type, and effort level. *Method class* refers to the type of evaluation, which in this case is an inquiry into user feedback. *Method type* describes how the evaluation is conducted within a method class, which in this case is through a software system that queries and records usability data. The *Automation type* describes the evaluation aspect that is automated; in this case the user provides answers to specific questions in an HTML forms-based questionnaire. And finally, the *effort level* describes the type of effort required to execute the method performed. In this study, the respondent completed a series of questions in response to a trip planning scenario.

Method Class: Inquiry

This section describes the dynamic nature of the survey design of the Inquiry, Method Class dimension. In the survey, one group of respondents was presented with a basic set of questions for a specified (origin and destination pre-determined) trip. The second group of respondents was presented with a more complex set of questions for both an unspecified (origin and destination not pre-determined) and a specified trip.

Referring to Figure 8.2, Minnesota respondents were provided with a Web site address or a uniform resource locator (URL) for the survey. Upon accessing this URL, the survey description and purpose were presented. After conveying the purpose, the respondents were provided with the directions, which they have to follow for providing survey responses. Subsequently, respondents were provided with a scenario involving the trip that they will need to plan. This scenario involved planning a trip from O'Hare Airport to Navy Pier for recreational purpose. The respondents were asked to use Chicago Regional Transportation Authority's Web site (<http://rtachicago.com>) for planning their trip. The researchers, as mentioned before, had verified the trip using the transit agency's Web site. After the users had planned their trip, their evaluation of the Web site was gathered. This was done by presenting qualitative questions—illustrated in Table 1 of [Appendix M](#), questions related to System Usability Scale (SUS)—illustrated in Table 2 of [Appendix M](#) and the final comments.

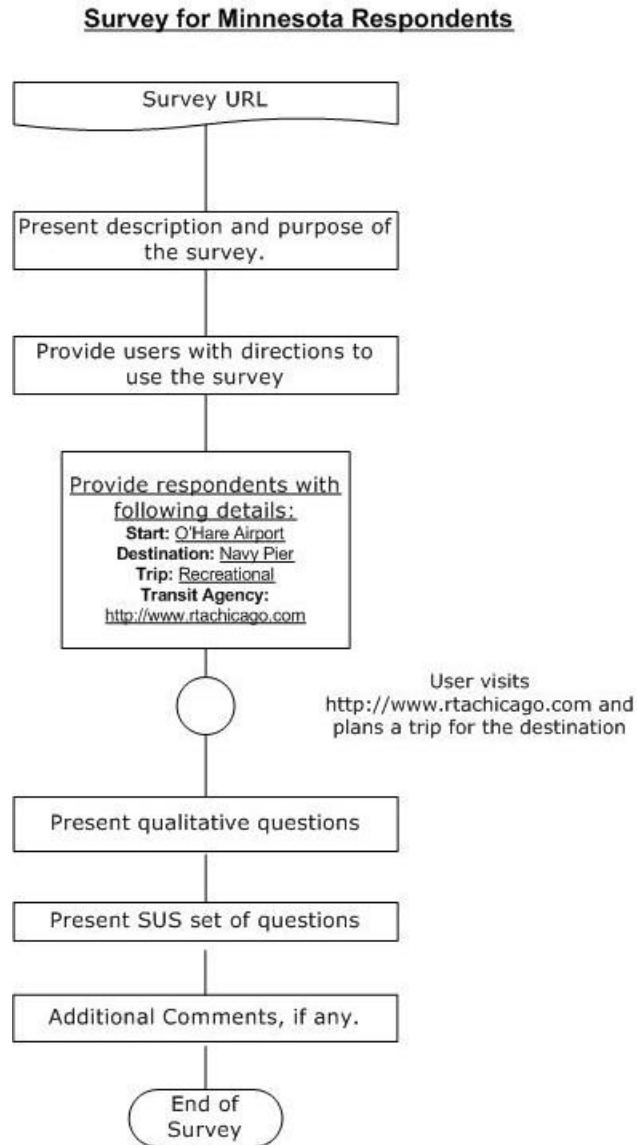


Figure 8.2 Survey for Minnesota Respondents

Unlike the Minnesota survey, the survey presented to Claremont respondents was dynamic in nature, as illustrated in Figure 8.3. After conveying directions to the respondents, the survey randomly would present a verified or a non-verified trip. The verified trip, here, was to plan a family trip from Claremont to Pasadena City College to watch a concert. The unverified trip involved planning a recreational trip with family, with the starting point and destination decided by the respondents. In both the cases, the users were asked to use the Los Angeles Metropolitan Transportation Authority’s Web site (<http://mta.net>) for trip planning. After the trip had been planned, the respondents’ evaluations were gathered. The survey was designed to present

qualitative questions and questions related to SUS, which was similar to the survey presented to Minnesota respondents. In addition, the respondents were presented with specific trip planning questions. These questions have been illustrated in Table 3 of [Appendix M](#). After being presented with trip planning questions, the respondents were asked to choose a feature from a list. This list is presented in Table 1 of [Appendix N](#). Upon choosing a feature from the list, respondents were presented questions related to the selected. These questions are illustrated in Table 4 of [Appendix M](#).

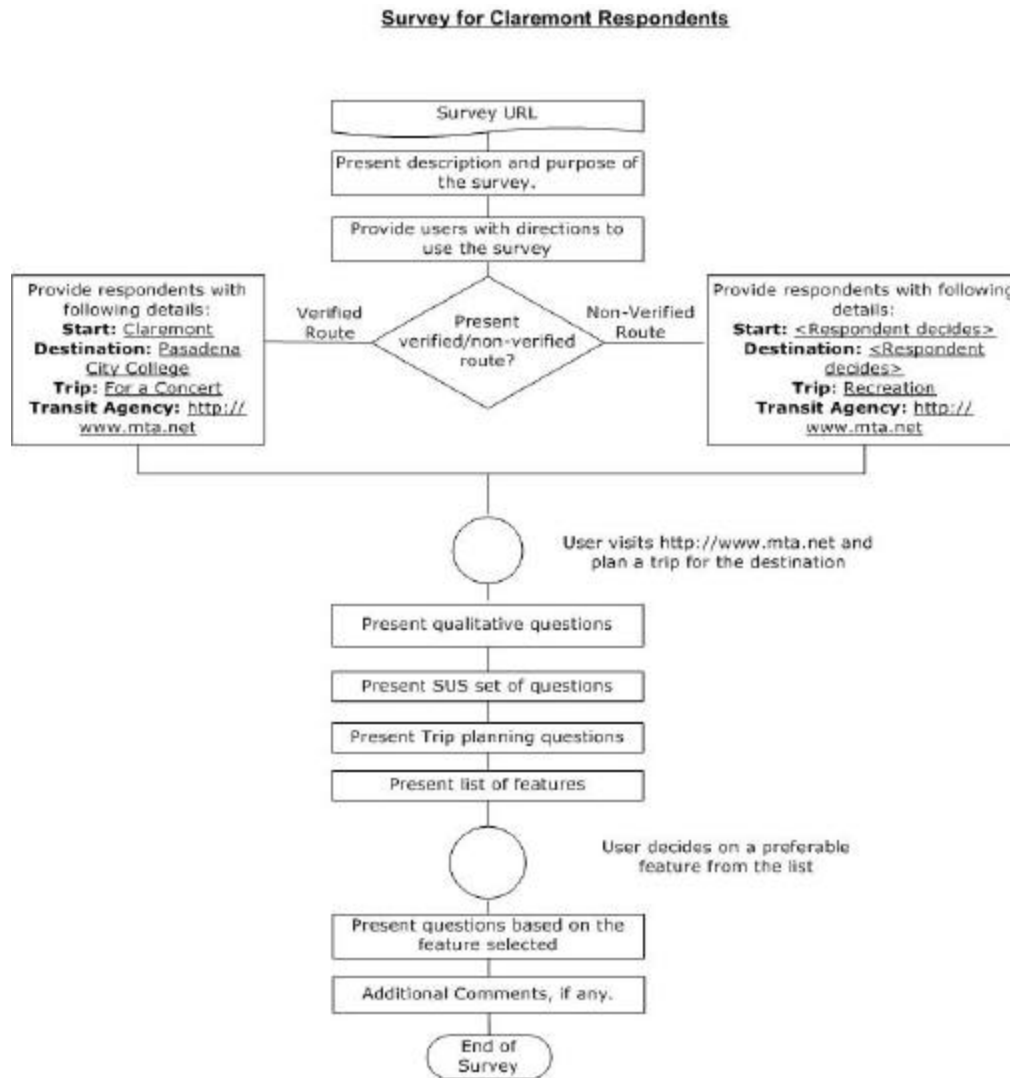


Figure 8.3 Survey for Claremont Respondents

Method Type: Automated Survey

This section describes the information system employed to acquire user feedback as part of the Capture, Method Type dimension. As discussed by Brinck and Hofer, automated support for Web designers and usability specialists will become an increasing necessity within the overall

usability process [8]. Moreover, automated usability tools can help save time and money in design and user testing, improve consistency and quality of site design, and improve the systematic application of usability standards. For this study, an online survey was used to automatically capture usability data for the assessment of two Internet-based ATIS services.

The survey consisted of a questionnaire that contained general, system usability, trip planning, and feature-based questions and asked participants to perform a specific task. In addition to automatically capturing the responses to the survey questions, the online survey also captured data related to the survey duration (time needed to complete the survey instrument for each participant).

The questionnaire consisted of both open-ended and Likert-scale questions. The open-ended questions were designed to collect responses that were related to the general behavior of the Web site and the trip planned. Table 1 of [Appendix M](#) enumerates these questions.

There were three sets of Likert-scale questions. The first set included ten system usability questions. The second set consisted of seven questions related to trip planning while the third set of questions was related to a feature that the user believed was important for trip planning purposes. [Appendix M](#), Tables 2 through 4, enumerates these questions.

The first set of Likert-scale questions were based on the System Usability Scale (SUS), a simple, ten-item scale giving a global view of subjective assessments of usability [9]. Originally developed by the Digital Equipment Corporation, the SUS is a Likert scale, where a statement is made and the respondent then indicates the degree of agreement or disagreement with the statement on a five-point scale. The selected statements cover a variety of aspects of system usability, such as the need for support, training, and complexity, and thus have a high level of validity for measuring the usability of a system. Table 2 of [Appendix M](#) enumerates these questions.

The SUS is used after the respondent has had an opportunity to use the system being evaluated but before any debriefing or discussion takes place. Respondents are asked to record their immediate response to each item, rather than think about items for a long time. The SUS provides a single number, which is a composite measure of the overall system usability being studied. SUS scores range from 0 to 100 and are calculated as follows: For questions 1, 3, 5, 7, and 9, the score contribution is the scale position minus 1; for questions 2, 4, 6, 8, and 10, the contribution is 5 minus the scale position; multiply the sum of these scores by 2.5 to obtain the overall value of system usability.

The SUS has proven to be a valuable evaluation tool, being robust and reliable, correlating well with other subjective measures of usability (e.g., the general usability subscale of the software usability measurement inventory (SUMI)) [9]. SUS is freely available for use in usability assessment and has been used for a variety of research projects and industrial evaluations [10].

The second set of Likert-scale questions related to trip planning was adopted from Transitweb [11]. Transitweb prescribes principles and guidelines for which Web site developers can implement an effective artifact for trip planning. Seven trip-planning questions related to user

interface attributes were asked of the users regarding their trip planning from origin to destination. Table 3 of [Appendix M](#) enumerates these questions.

The third set of Likert-scale questions, presented in Table 4 of [Appendix M](#), feature-based questions, asked users to select a feature from a list, which they thought was important for trip planning purposes. This list also was compiled from guidelines developed by Transitweb [11].

These features included:

- Content Organization—Indicates how a Web site has been organized, distributed, and linked to various contents throughout the site.
- Navigation—Includes features such as design of the menu and related components for navigating among various options in the Web site.
- Home Page—This feature involves the site’s home page design.
- Maps—Indicates how system and route maps are designed.
- Itinerary Maker—Involves design of an interactive itinerary maker.
- Schedules—Includes design of pages for accessing and displaying route schedules.
- Place Directories—Includes design of directories of streets, points of interest, towns, or other geographic features intended to provide users with means to select an acceptable route when planning a trip.
- Page Form and Performance—Indicates design and performance of pages.
- Content—Involves form, format, and appearance of site content.
- Links—Includes presence, position, and appearance of html links.

In addition to quantitative questions with fixed scales, open-ended qualitative questions were collected from the respondents. There were three sets of qualitative questions in the survey. The first set of qualitative questions was presented after the respondents had planned their trip and before presentation of Likert-scale quantitative questions. These are presented in Table 1 of [Appendix M](#). Another set of qualitative questions was presented to Claremont respondents after they had selected the features that they thought were important for trip planning purposes. These questions were accompanied with the third set of quantitative questions previously described. The last set of qualitative questions was designed to collect the responses for the overall survey. This was done just before the survey ended.

Effort Level: Scenario Tasks

This section describes the specific task participants were asked to perform as part of the Formal Use, Effort Level dimension. One group of respondents was asked to evaluate the Los Angeles Metropolitan Transportation Authority Web site (<http://www.mta.net>). The specified (origin and destination pre-determined) trip scenario in this case was a trip from the City of Claremont to Pasadena City College for an art exhibition (see Figures 8.4 to 8.6). The unspecified (origin and destination not pre-determined) trip scenario was a trip in which the users themselves would decide the origin and destination. One group of respondents was asked to evaluate the Chicago Regional Transportation Authority Web site (<http://www.rtachicago.com>). The specified trip scenario in this case was a trip from O'Hare Airport to the Navy Pier in downtown Chicago.

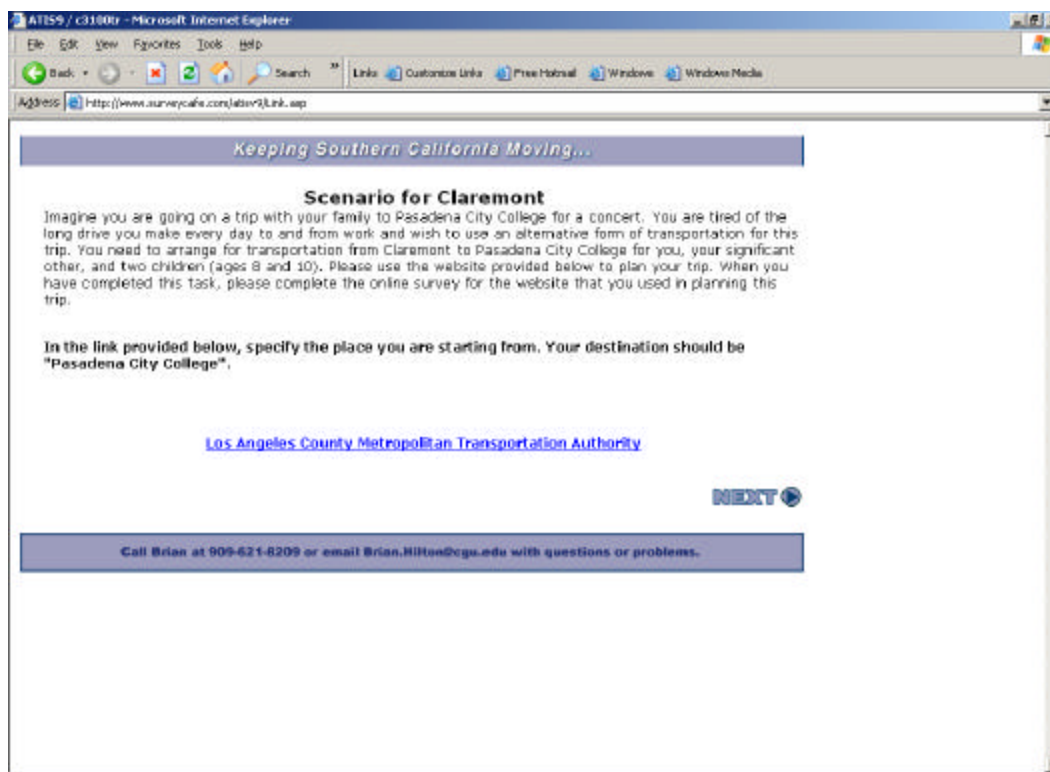


Figure 8.4 Scenario Screenshot

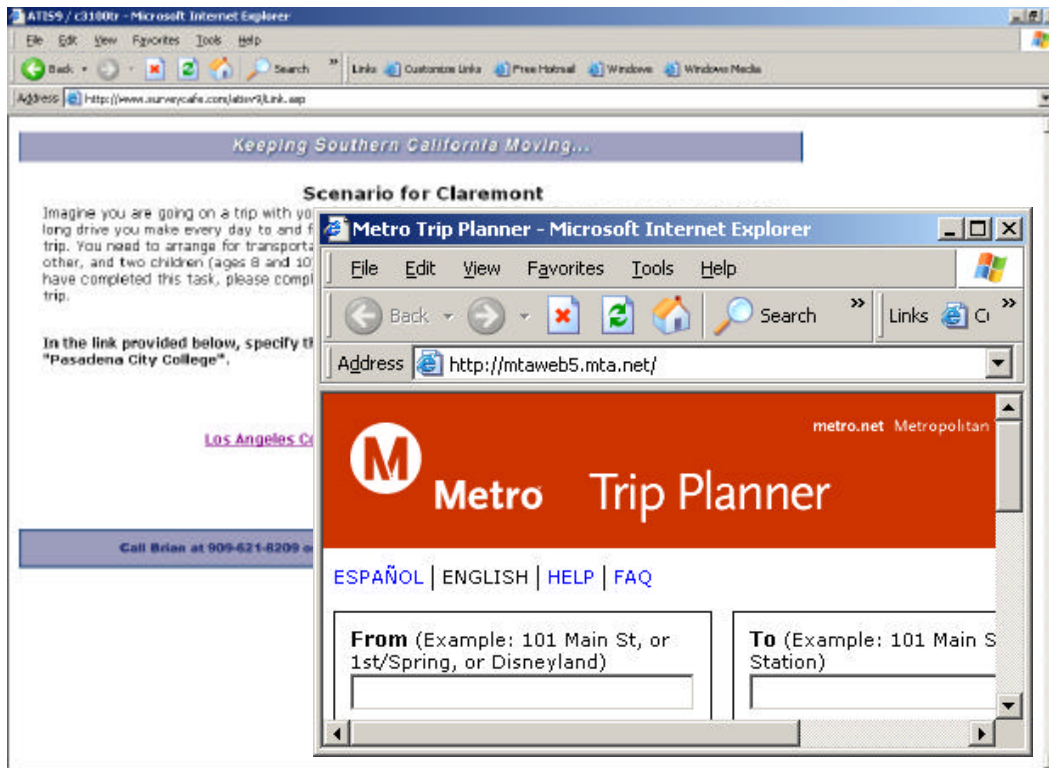


Figure 8.5 Route Planning Screenshot

ATI59 / C11800 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search

Links Custom Links Free Manual Windows Windows Media

Address http://www.surveycake.com/ati59?UseFreq.asp

Keeping Southern California Moving...

Pick an answer from each row.

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
1. I think that I would like to use this system frequently.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2. I found the system unnecessarily complex.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I thought the system was easy to use.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I think that I would need the support of a technical person to be able to use the system.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I found the various functions in this system were well integrated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
6. I thought there was too much inconsistency in the system.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I could imagine that most people would learn to use this system very quickly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
8. I found the system very cumbersome to use.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I felt very confident using the system.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I needed to learn a lot of things before I could get going with this system.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

NEXT ➔

Call Brian at 909-621-8209 or email Brian.Hilton@cgs.edu with questions or problems.

Figure 8.6 Usability Questions Screenshot

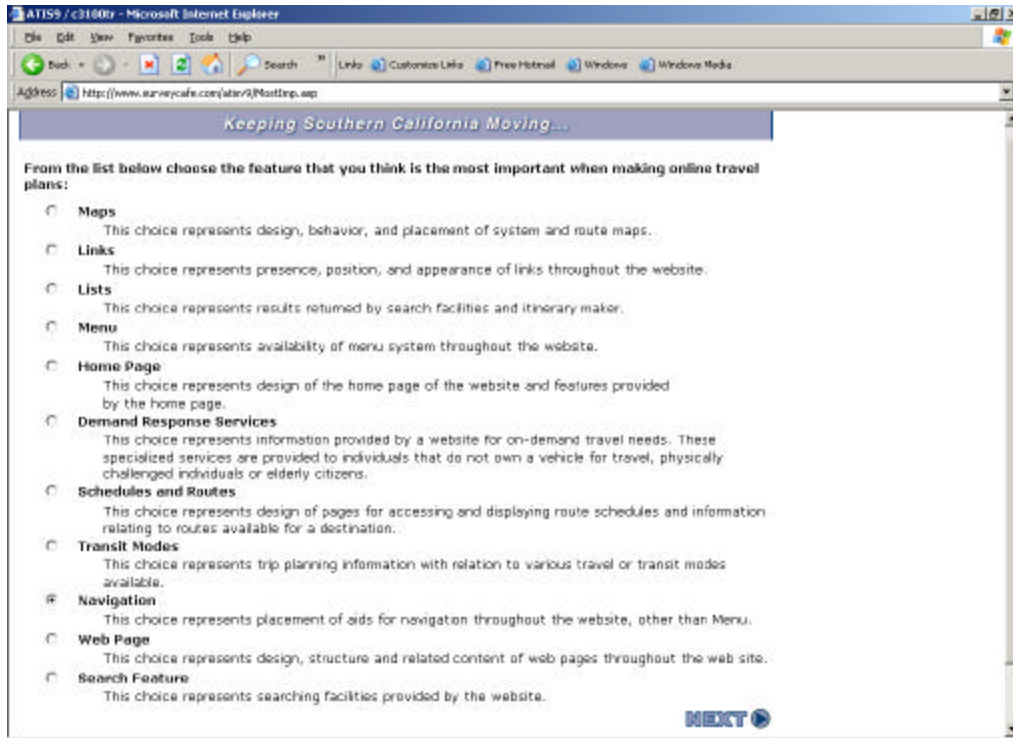


Figure 8.7 Feature Selection Screenshot

Prototype Survey Findings

This section describes the participants and data analysis of the two Internet-based ATIS services examined in this pilot study.

Participants

The respondents consisted of two groups, 125 graduate student volunteers from five graduate-level courses at Claremont Graduate University (CGU) and 200 senior citizen volunteers from Minneapolis, Minnesota (MN). From this sample, 71 complete responses were obtained: 48 valid responses from CGU and 23 from MN.

Survey Results

Descriptive Statistics—SUS Score

Analyses of the responses of the two participant groups are presented in Table 8.1 as well as in Figures 8.8 to 8.10.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
CGU Group 1: Planned Origin/Destination	23				70.3	16.12
CGU Group 2: Unplanned Origin/Destination	25				57.1	18.08
MN Group: Planned Origin/Destination	23				72.6	22.92

Table 8.1 SUS Score: All Groups

As indicated in Table 8.1, the average SUS score for the Unplanned Origin/Destination group was markedly lower than that for either Planned Origin/Destination group. The differences in the means could be due to greater difficulty in planning an unspecified trip. Between the two Planned Origin/Destination groups, CGU Group 1 and MN Group, the average MN score displayed more variation from the mean (larger standard deviation) than that of the CGU score. This variation may be due in part to a wide range of computer proficiency within the MN group, which consisted of senior citizen volunteers.

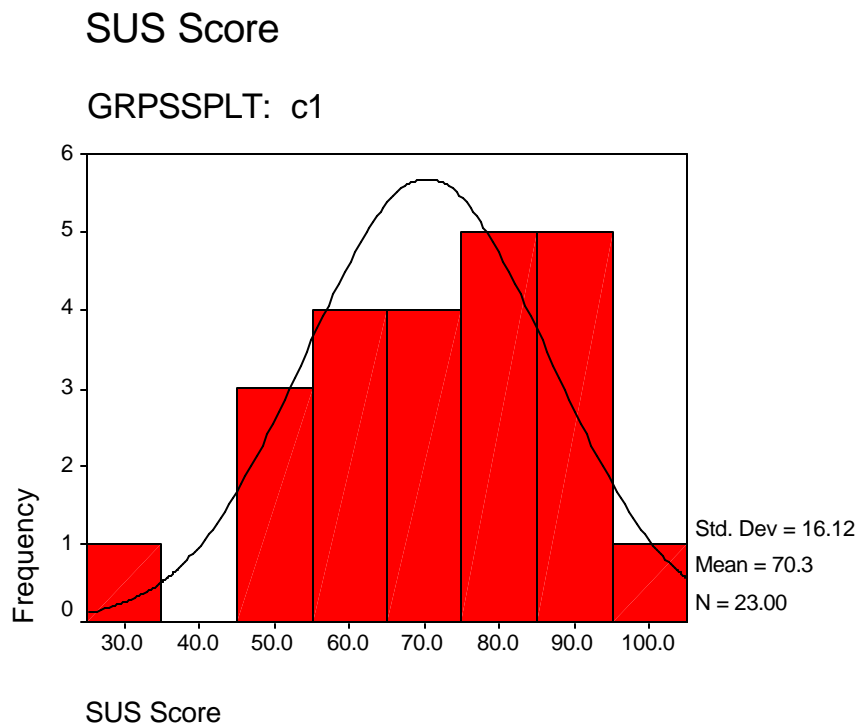


Figure 8.8 CGU Group 1: Planned Origin/Destination

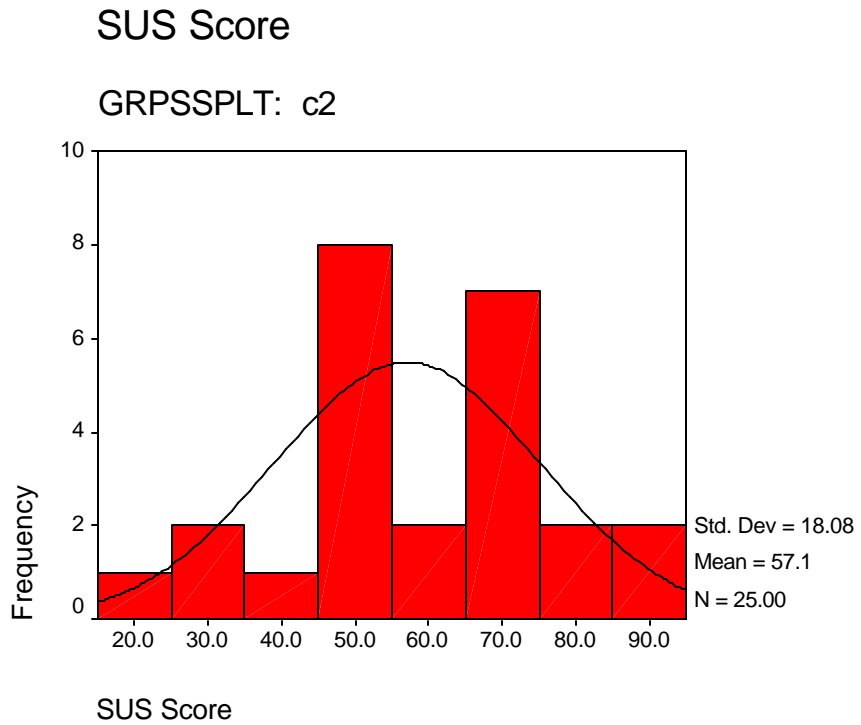


Figure 8.9 CGU Group 2: Unplanned Origin/Destination

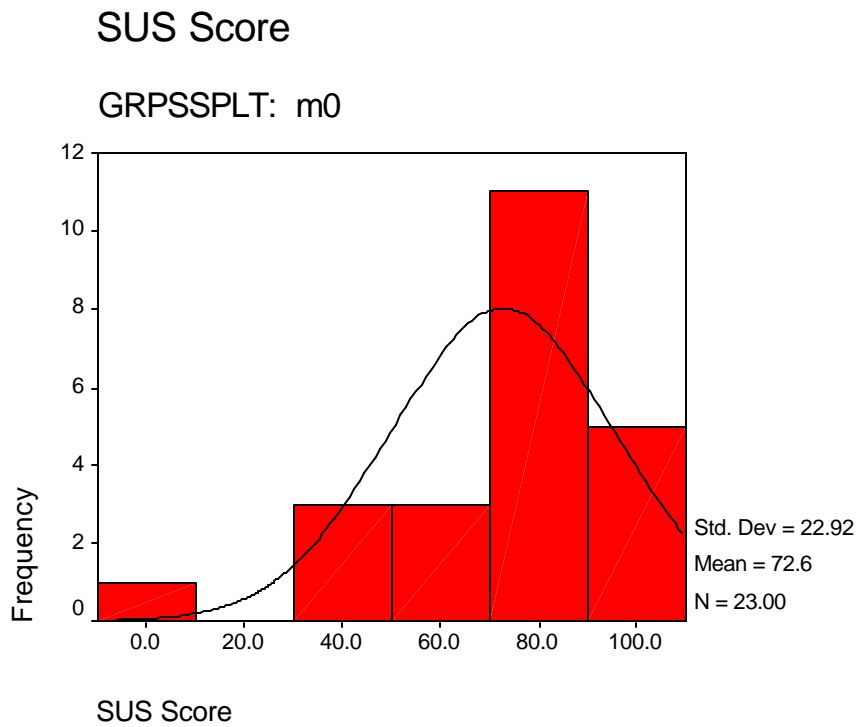


Figure 8.10 Minnesota Group: Planned Origin/Destination

Descriptive Statistics—Trip Planning

The seven Trip Planning questions were asked only of the two CGU groups. These questions were averaged for each respondent to produce a Mean Trip Plan score. As indicated in Table 8.2, the average Mean Trip Plan score for the Unplanned Origin/Destination group was lower than that for either Planned Origin/Destination group. The differences in the means could be due to greater difficulty in planning an unspecified trip.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
CGU Group 1: Planned Origin/Destination	23				3.59	.63
CGU Group 2: Unplanned Origin/Destination	25				3.28	.65

Table 8.2 Mean Trip Plan Score: CGU Groups

Descriptive Statistics—Feature-based

The feature-based questions were also asked only of the two CGU groups. Tables 8.4 to 8.6 present the frequency distributions for each group, as well as the group collectively. As indicated in Tables 8.4 to 8.6, the most important feature was Schedules and Routes in every distribution. However, CGU Group 1 (Planned Origin/Destination) had the highest response at 56.5 percent. While Schedules and Routes was the most important for CGU Group 2, there were other features (Maps, Transit Modes, and Navigation) that had a response rate. This finding is not surprising as unplanned origins/destinations would require additional features to plan a trip.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maps	4	17.4	17.4	17.4
	Lists	1	4.3	4.3	21.7
	Menu	1	4.3	4.3	26.1
	Schedules and Routes	13	56.5	56.5	82.6
	Transit Modes	2	8.7	8.7	91.3
	Navigation	1	4.3	4.3	95.7
	Search Features	1	4.3	4.3	100.0
	Total	23	100.0	100.0	

a. grpssplt = c1

Table 8.3 Most Important Feature: CGU 1

Mostimp

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maps	3	12.0	12.0	12.0
	Menu	2	8.0	8.0	20.0
	Home Page	1	4.0	4.0	24.0
	Demand Response Services	1	4.0	4.0	28.0
	Schedules and Routes	9	36.0	36.0	64.0
	Transit Modes	3	12.0	12.0	76.0
	Navigation	3	12.0	12.0	88.0
	Web Page	2	8.0	8.0	96.0
	Search Features	1	4.0	4.0	100.0
	Total	25	100.0	100.0	

a. grpsplt = c2

Table 8.4 Most Important Feature: CGU 2

Mostimp

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maps	7	9.9	14.6	14.6
	Lists	1	1.4	2.1	16.7
	Menu	3	4.2	6.3	22.9
	Home Page	1	1.4	2.1	25.0
	Demand Response Services	1	1.4	2.1	27.1
	Schedules and Routes	22	31.0	45.8	72.9
	Transit Modes	5	7.0	10.4	83.3
	Navigation	4	5.6	8.3	91.7
	Web Page	2	2.8	4.2	95.8
	Search Features	2	2.8	4.2	100.0
	Total	48	67.6	100.0	
Missing	System	23	32.4		
Total		71	100.0		

Table 8.5 Most Important Feature: CGU Groups

Descriptive Statistics—Duration

Table 8.6 indicates that the average duration time for the Unplanned Origin/Destination group was markedly higher than that for either Planned Origin/Destination group. The differences in the means could be due to greater difficulty in planning an unspecified trip. This average duration time also displayed more variation from the mean (larger standard deviation) than that for either Planned Origin/Destination group. This variation may be due in part to a wide range of origin and destination choices.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
CGU Group 1: Planned Origin/Destination	23				16.1	18.13
CGU Group 2: Unplanned Origin/Destination	25				29.2	30.14
MN Group: Planned Origin/Destination	23				13.3	6.95

Table 8.6 Duration Time in Minutes: All Groups

It is interesting to note that the major difference was between the planned and unplanned groups; that is, the senior/recreation trip group planned even more quickly than the student-recreation trip. (Assuming an equal amount of time was spent on the questions—as the time captured the total time online conducting the scenario and answering the few questions).

T-Tests—SUS Score

A t-test was performed to determine if differences between group means were significant. Results indicate that no significant difference between the means of the two Planned Origin/Destination (CGU Group 1 and MN Group) groups exists. The significance value for the Levene test was greater than 0.05 (0.465) indicating that equal variance for both groups could be assumed. The significance value (two-tailed) for the t-test also was greater than 0.05 (0.698) and the 95 percent confidence interval for the mean difference contained zero (lower = -14.06, upper = 9.49) both indicating that there was no significant difference between the two group means (here, the confidence interval contains zero, indicating that no significant difference exists). The result was expected since both groups were given specified origins/destinations.

However, as also would be expected, results indicate that significant differences between the means of the Planned Origin/Destination groups (CGU Group 1 or MN Group) and Unplanned Origin/Destination (CGU Group 2) groups exist. The significance values for the Levene test were greater than 0.05 (CGU Group 1/CGU Group 2 = 0.433 and MN Group/CGU Group 2 = 0.843) indicating that once again equal variance for these groups could be assumed. The significance values (two-tailed) for the t-test were not greater than 0.05 (CGU Group 1/CGU Group 2 = 0.011 and MN Group/CGU Group 2 = 0.012) and the 95 percent confidence interval for the mean difference did not contain zero (CGU Group 1/CGU Group 2 lower = 3.24, upper = 23.21 and MN Group/CGU Group 2 lower = -27.45, upper = -3.56) both indicating that there were significant differences between the these group means (here, the confidence interval does not contain zero, indicating that a significant difference exists).

T-Tests—Mean Trip Plan Score

A second t-test was performed to determine if differences between group means were significant for the Mean Trip Plan Score. Results indicate that no significant difference between the means of the two CGU Groups exists. The significance value for the Levene test was greater than 0.05 (0.977) once more indicating that equal variance for both groups could be assumed. The significance value (two-tailed) for the t-test also was greater than 0.05 (0.103) and the 95 percent confidence interval for the mean difference contained zero (lower = -0.06, upper = 0.68) both indicating that there was no significant difference between the two group means. The result was unexpected since one group was given a specified origin/destination trip while the other was not. Though the mean difference did contain zero, it did so barely. A larger sample size may reveal more clearly whether or not the differences in the means could be due to greater difficulty in planning an unspecified trip as illustrated in Table 8.2, Mean Trip Plan Score.

Qualitative Data and Analysis

Qualitative data was collected so that the responses from them reiterate the analysis performed on quantitative data and support the conclusion to be drawn. Among the various forms that qualitative data can take, open-ended questions, in this research, contained responses in the form of short texts. Responses for the open-ended questions, which are illustrated in Table 1 of [Appendix M](#), are provided in [Appendix N](#), [Appendix O](#), and [Appendix P](#). The responses are divided based on different groups and scenarios that have been described before. Further, qualitative responses for the feature-based questions, which were presented to Claremont respondents, are provided in [Appendix Q](#). These responses are based on the features that were adopted from Transitweb guidelines. They are presented in column titled “Further Comment” for every feature.

Task Completion

The responses for this question have been enumerated in Table 1 through Table 3 in [Appendix N](#). The responses are summarized in Table 1 of [Appendix R](#). This table presents count of various responses that were received for this question based on various categories. Further, it includes features that were referred to by the respondents. These features could have been among the ones laid by Transitweb or suggested by the respondents. These features are illustrated in Figures 1 to 3 of [Appendix S](#) for the Los Angeles Metropolitan Transportation Authority and Figures 1 to 5 of [Appendix T](#) for the Regional Transportation Authority of Chicago.

Most of the Claremont respondents, who were assigned a specified trip, were able to plan their trip successfully. Some of the respondents went beyond trip planning by tracing for specific features like schedules and routes (No. 13 and 18 in Table 1 of [Appendix N](#), illustrated as “Other Trip Specifications” and “Fare Type” in Figure 1 of [Appendix S](#) and “Trip Plan or Itinerary” and “Cost of Trip/Fare” in Figure 2 of [Appendix S](#)). Note that schedules and routes is a provision for the process of trip planning. This feature includes providing parameters for trip characteristics; cost of trip, number of passengers, day and time of travel, itinerary, and transfer information.

The Web site was able to offer and “express” route for the trip (No. 13 in Table 1 of [Appendix N](#), illustrated as “Fare Type” in Figure 1 of [Appendix S](#)) but failed to provide a route for the

return trip (No. 18 in Table 1 of [Appendix N](#), illustrated as “Trip Preferences” in Figure 1 of [Appendix S](#)). There was one respondent (No. 7 in Table 1 of [Appendix N](#)) who experimented with a different language setting on the Web site and was successful to some extent (illustrated as “Language Settings” in Figure 1 of [Appendix S](#)). The Web site seemed to provide various transit modes for trip planning, for example in the form of a bus (No. 22 in Table 1 of [Appendix N](#)). However, one of the respondents was not able to plan the trip indicating use difficulty or overall complexity as a reason. Another respondent was not sure about the trip planning because he or she had to alter the preferences for the route. Overall, most of the respondents in this scenario were able to successfully plan their trip and were able to find certain features that they were looking for.

However, this was not the case with Claremont respondents who were requested to plan a trip for a route decided by them. There were eight respondents who were not able to successfully plan their trip. Of these eight respondents, three indicated failure in the schedules and routes feature (No. 2, 3, and 15 in Table 2 of [Appendix N](#)). While presenting routes, the Web site could not provide itineraries for the destination (No. 2) or near the destination (No. 15) or could not provide enough options for trip planning (No. 3). There were respondents who were tracing for return routes and could not find them (No. 6 and 21 in Table 2 of [Appendix N](#), illustrated as “Return Trip Route” in Figure 3 of [Appendix S](#)). There were four responses that indicated failure of registering a starting point or destination (No. 9, 10, 13, and 17 in Table 2 of [Appendix N](#)). Further, one of the respondents was not able to access the results of the trip that he or she was trying to make (No. 25 in Table 2 of [Appendix N](#)). In conclusion, major reasons of failure for trip planning in this case was need for a better route planning or improved facility in stating starting or destination places.

Among Minnesota respondents, there were three respondents who were not able to successfully plan their trip or were unsure. Of these, one respondent was not able to get the kind of transit mode (No. 4 in Table 3 of [Appendix N](#)). This is evident in Figures 1 through 5 in [Appendix T](#), where options for specific transit mode were not found. Two of them could not access the site (No. 7 in Table 3 of [Appendix N](#)) or were not able to browse the Web site beyond a particular point (No. 6 in Table 3 of [Appendix N](#)). Further, there were two respondents who felt a need for maps of the routes that they were assigned to plan (No. 2 and 17 in Table 3 of [Appendix N](#)). As is evident from Figures 1 through 5 in [Appendix T](#), no maps are presented for the route. Overall, the respondents seemed satisfied with the performance of the Web site and were nearly satisfied with specific features that they were tracing for.

Desirable System Features

In general, the online trip planning services were viewed as easy to use. (The responses for this question are provided in [Appendix O](#) in Tables 1 through 3. The responses are summarized in Table 2 of [Appendix R](#). Similar to Table 1 of [Appendix R](#), this table presents count of various responses that were received for this question based on various categories. Similar to previous description, the features for both the sites are presented in [Appendix S](#) and [Appendix T](#).)

Referring to Table 1 in [Appendix O](#), there were responses referring to the system being “easy to use.” Considering other responses, “easy to use” could encompass further reactions such as “easy to follow” (No. 6 in Table 1 of [Appendix O](#)), “easy to understand” (No. 10 in Table 1 of

[Appendix O](#)), “easy to understand fields” (No. 15 in Table 1 of [Appendix O](#)), “not very complicated” (No. 10 in Table 1 of [Appendix O](#)), and “easy enough” (No. 18 in Table 1 of [Appendix O](#)). Three responses referred to map orientation and presentation (No. 5 in Table 1 of [Appendix O](#)), colors in the maps (No. 13 in Table 1 of [Appendix O](#)), and response time of maps (No. 18 in Table 1 of [Appendix O](#)) (illustrated as “Maps” in Figure 2 of [Appendix S](#)). Further, in one of the responses (No. 5 in Table 1 of [Appendix O](#)) benefits of travel times and cost of trip is referred to (illustrated as “Trip Plan or Itinerary” and “Cost of Trip/Fare” in Figure 2 of [Appendix S](#)).

There were several responses (No. 6, 20, 21, 23 in Table 1 of [Appendix O](#)) that referred to the ease of provision of starting place and destination. Provision of starting place and destination, on the Los Angeles Metropolitan Transportation Authority Web site, is in the form of **drop-down lists** for landmark sites or direct entry of street address and city (labeled as “Direct Entry of Address” and “Drop Down [Based on Landmarks]” in Figure 1 of [Appendix S](#)). For some (No. 6, 20 and 23 in Table 1 of [Appendix O](#)), drop-down lists and landmark sites were helpful, but for some (No. 21 in Table 1 of [Appendix O](#)) the respondents preferred to enter zip codes, that is, direct entry of addresses.

Many responses referred to **schedules and routes features** (No. 3, 4, 5, 7, 9, 11, and 18 in Table 1 of [Appendix O](#)). Respondents were pleased with the details of fares, time duration, timings of transit modes, and directions provided by the Web site (labeled as “Trip Plan or Itinerary” in Figure 2 of [Appendix S](#)). There were mentions of the quick response time of the Web site (No. 2, 3 and 18 in Table 1 of [Appendix O](#)). However, one of the responses did mention slowness in response of the map (No.18 in Table 1 of [Appendix O](#)). Further, in some of the responses, site design and organization was referred to (No. 18 and 23 in Table 1 of [Appendix O](#)). There was just a single mention of a transit mode (No. 12 in Table 1 of [Appendix O](#)). In one of the responses (No. 14 in Table 1 of [Appendix O](#)), the system was compared with MapQuestTM, a commercial outfit to provide mapping services to Web users. In sum, provision of starting and destination place through landmarks and drop-down lists did assist respondents in trip planning, the system was found easy to use, and maps assisted the respondents while making their decisions in planning a trip.

Among Claremont unspecified trip scenario respondents, there were lot of references to the facility of selecting a starting point or destination using drop-down lists based on landmarks (No. 4, 5, 9, 10, 11, 13, 15, 18, 19, and 22 in Table 2 of [Appendix O](#)), illustrated as “Drop Down Lists” in Figure 1 of [Appendix S](#). There were some of the responses that referred to the user interface provided on the Web site (No. 5, 12, and 21 in Table 2 of [Appendix O](#)). Some of the respondents seemed comfortable with the maps feature (No. 17, 19, and 24 in Table 2 of [Appendix O](#)), illustrated as “Maps” in Figure 2 of [Appendix S](#). As in the above scenario, there were mentions of ease of use and response time (No. 16 and 20 in Table 2 of [Appendix O](#)). Although the schedules and routes feature was referred to, it did not seem as dominant as in the specified trip scenario (No. 6, 7, 17 and 24 in Table 2 of [Appendix O](#)). A couple of respondents attempted a return route for their trip and seemed successful (No. 13 and 17 in Table 2 of [Appendix O](#), illustrated as “Return Trip Route” in Figure 3 of [Appendix S](#)). Similar to the previous scenario, there was a comparison drawn with MapQuestTM. There was just a single mention for search results (No. 3 in Table 2 of [Appendix O](#)) and transit modes (No. 25 in Table 2 of [Appendix O](#)). In conclusion, drop-down lists for specifying starting point and destination

seemed helpful in trip planning and respondents were satisfied with certain add-on features such as route for return trip.

Minnesota respondents referred to the various transit modes, including walking (illustrated as “Specification for Walking” in Figure 2 of [Appendix T](#)), that were provided for trip planning in the Web site (No. 1, 12, 21 and 23 in Table 3 of [Appendix O](#)). However, as in the previous scenarios, drop-down lists for starting point and destination dominated the responses (No. 4, 5, 11, 15 and 21 in Table 3 of [Appendix O](#)), illustrated as “Drop Down (Based on Landmarks)” in Figure 1 of [Appendix T](#). The feature of schedules and routes was referred to for trip planning in various responses (No. 2, 8, 18 and 23 in Table 3 of [Appendix O](#)), illustrated as “Trip Plan / Itinerary”, “Indication for Transfer” and “Fare Structure” in Figure 3 of [Appendix T](#), “Multiple Itineraries” and “Indication of Walking” in Figure 4 of [Appendix T](#), and “Multiple Itineraries” in Figure 5 of [Appendix T](#). Ease of use (No. 3, 10 and 18 in Table 3 of [Appendix O](#)) and response time (No. 14 and 18 in Table 3 of [Appendix O](#)) did assist respondents in trip planning. The navigation feature was earmarked in few of the responses (No. 20 and 22 in Table 3 of [Appendix O](#)). Lastly, one of the respondents was not able to access the Web site (No. 7 in Table 3 of [Appendix O](#)).

Perceived Shortcomings

These responses are enumerated in Table 1 through Table 3 in [Appendix P](#). The responses are summarized in Table 3 of [Appendix R](#). Similar to Table 1 and 2, this table presents a count of various responses that were received for this question based on various categories. Further, similar to previous descriptions, the features for both the sites are illustrated in [Appendix S](#) and [Appendix T](#).

Referring to Table 1 of [Appendix P](#), which refers to responses of Claremont respondents with specified trip, most of the responses seemed to indicate need for improved features for schedules and routes (No. 14, 17 and 21). Among these responses, deficiency was found in “Trip Specifications,” “Absence of Transfer Information,” and “Cost of the Trip.” Maps were found to be slow to respond (No. 23). The site was found difficult in using links and browsing through various options (No. 19). Fonts on the site were found to be too small by the respondents (No. 13). There was lack of provision for multiple transit modes (No. 23) and increasing complexity in stating starting place and destination (No. 5 and 7). This is apparent from Figures 1 through 3 in [Appendix S](#), as no provisions were found for different transit modes.

In responses from Claremont respondents with unspecified trip (Table 2 in [Appendix P](#)), the most dominant feature in the responses was lack of better information in dropdown lists for starting point and destination (No. 3, 4, 5, 10, 15, and 25). Some of the responses indicated that the drop-down lists did not seem to be providing what was expected of them (No. 5, 15, and 25). However, one of the responses indicated the way that these lists assisted in performing trip planning activities (No. 10). Further, some of the respondents expected to trace the address of a destination that was not served by the authorities (No. 3 and 4). Although respondents did like the drop-down list feature, it seemed that information provided by them was not sufficient enough for better trip planning. The next dominant feature was schedules and routes (No. 9, 13 and 21). Among these, one of the respondents could not fully plan the trip (No. 9), one of the respondents could not specify the time of travel (No. 13), and one that could not find fare

information for children on the Web site. Further, one of the responses referred to various transit modes not being available (No. 19) and the other indicating the need for learning in using the site for “non-tech savvy” (No. 23).

Among the Minnesota respondents (Table 3 in [Appendix P](#)), maps was the dominant feature that was absent for trip planning purposes (No. 1, 11, 18 and 23). There was a single mention for need of navigational tips (No. 1), one for schedules and routes (No. 3), and two for need of various transit modes available (No. 21 and 22). There were a couple of responses indicating that they did not like the Web site in general (No. 6 and 13). There was one response that indicated need for better facility for start and destination places and one that indicated need for an advanced feature such as the ability to download the route to handheld device (No. 12). The Web site assigned to Minnesota respondents seemed to be lacking in decent graphics and map facility although it did provide certain provisions in trip planning that the other Web site, which was assigned to Claremont respondents, did not.

Feature-based Questions

The responses for feature-based questions are provided in [Appendix Q](#) (Tables 1 through 16).

Schedules and Routes

There were 22 responses that selected “Schedules and Routes” as their preferable feature; 13 from the Claremont (Specified trip) group and 9 from the Claremont (Unspecified trip) group.

Among the Claremont (Specified trip) group, there were five comments that did not provide any detailed information (No. 4, 6, 7, 8, and 9 in Table 8 of [Appendix Q](#)). There were three responses that referred to the quantitative question for the feature (No. 3, 11 and 12 in Table 8 of [Appendix Q](#)). All of these responses indicated no special links for fare information. It seems the Web site presented fare information with the route it presented for the trip. There were two responses that indicated few refinements to maps that were presented to them (No. 2 and 10 in Table 8 of [Appendix Q](#)). One of them alluded to a need for displaying transfer information on the maps while the other indicated the importance of displaying landmarks on the maps around the route presented. There were two responses (No. 5 and 13 in Table 8 of [Appendix Q](#)) that pertained to the overall survey. Of those, one of the responses (No. 13) mentioned the need for a railway line, which was under construction between Claremont and Pasadena at the time of the survey. Lastly, one of the responses (No. 1 in Table 8 of [Appendix Q](#)) indicated that the respondent experienced faster response times when selecting a local trip versus an express one.

Among the Claremont (Unspecified trip) group, there were four responses that did not contribute to a detailed understanding (No. 1, 3, 5 and 6 in Table 9 of [Appendix Q](#)). One of the responses (No. 2 in Table 9 of [Appendix Q](#)) referred to the quantitative question that asked for the feature. Similar to the previous group, the fare information was presented on the route rather than be presented with a link to the information. One of the responses (No. 8 in Table 9 of [Appendix Q](#)) indicated a need for appropriate return route facility. Another indicated need for rate information for seniors or children (No. 9 in Table 9 of [Appendix Q](#)). There were two responses (No. 4 and 7 in Table 9 of [Appendix Q](#)) that pertained to the overall survey. One of the responses (No. 4 in Table 9 of [Appendix Q](#)) indicated failure of registering the address for starting point or

destination while the other (No. 7 in Table 9 of [Appendix Q](#)) indicated the overall experience of trip planning.

Maps

While the need for maps was frequently noted by the MN group, no detailed comments were provided by Claremont respondents for the maps feature except for one, enumerated in Table 8.1. This comment mentioned that the maps be made more readable. These features are labeled as “Maps” in Figure 2 of [Appendix S](#) for the Los Angeles Metropolitan Transportation Authority (<http://mta.net>).

Menu

Although some of the respondents did select this feature (Table 4 and Table 5 in [Appendix Q](#)), there was a single contribution to the open-ended question (No.1 in Table 5 of Appendix Q on Page 69). This contribution referred to more choice being offered to users by way of providing options for multiple destinations while planning for a trip.

Home Page

One of the respondents who selected “Home Page” as preferable feature had mentioned that it would have been better if he/she would have seen a list of questions first so that he/she could look for certain features while planning a trip (See Table 6 in [Appendix Q](#)). This comment was more related to the overall survey process rather than a single feature.

Transit Modes

There were two contributions from respondents regarding the feature “Transit Modes.” One of the responses (No. 2 in Table 10 of [Appendix Q](#)) referred to the need for comparison of transit modes available for the trip while the other indicated a need for detailed information about transit mode options (No. 2 in Table 11 of [Appendix Q](#)).

Navigation

There was a response that indicated need for specific navigation controls on the Web site (No. 1 in Table 12 of [Appendix Q](#)). There were no further contributions for this feature.

Search Features

There were two responses for this feature (No. 1 in Table 15 and No.1 in Table 16 of [Appendix Q](#)). Of these responses, one (No.1 in Table 15) referred to the overall survey indicating that the survey was too wordy at the start and that it should be simplified. Further, the response indicated the need for better transit mode options. Another response (No.1 in Table 16 of [Appendix Q](#)) indicated that this feature is not sufficient.

Findings and Implications

Usability is about to become the quality measure of today's interactive software including Web sites and mobile appliances [12]. Accordingly, usability evaluation will be an increasingly important part of the design process, and adding automation to usability evaluation will have many potential benefits, including reducing the costs of non-automated methods, aiding in comparisons between alternative designs, and improving consistency in usability evaluation [7].

For this study, usability data was collected using an automated method to demonstrate how data of this type could be employed for the design and implementation of an Internet-based service such as ATIS. Survey results indicate that the participants who were asked to complete an unspecified trip had greater difficulty in completing their task as measured by their satisfaction with the trip-planning exercise as well as the time it took to complete the exercise. Moreover, in terms of features, drop-down menus, maps to assist in planning, and detailed schedules and routes were all viewed as important features. These finding suggests that—when considering diverse trips—unplanned origins/destinations require additional features to plan a trip that these Web sites lacked.

On a more general note, such findings suggest that the online design can be important in the experience of the user, as some predefinitions can greatly assist in making online travel a more efficient and satisfying experience. In order to do this, ATIS sites need to: provide mass customization for individual users, respond to dynamically changing events (e.g., seasons, concerts...), allow for dynamic routing and scheduling requests, and 4) provide travel tips and suggestions based on previous trip planning requests.

To create a user-friendly system capable of handling diverse trips, several additional research steps are warranted. These include a better understanding of ATIS priority and design consideration as seen by the online services providers. Such a task would involve interviewing national leaders in ATIS, telemetric, and e-government to determine the current status, trends, and directions for providing high-quality diverse trip information via the Internet or through other advanced sources. The interviews would focus on three types of users: inner-city transit-dependent users, interregional recreational traveler users, and emergency healthcare trip uses. A second need is to implement the evaluation with a larger sample of online users. Based on preliminary 'quality of service' data obtained during this survey, this task would involve a larger sample size (between 200 and 300) and possibly include user focus groups. A related activity will be to compare online software approaches to providing diverse trip information along a number of "best practices" suggested by the e-government and ITS literature.

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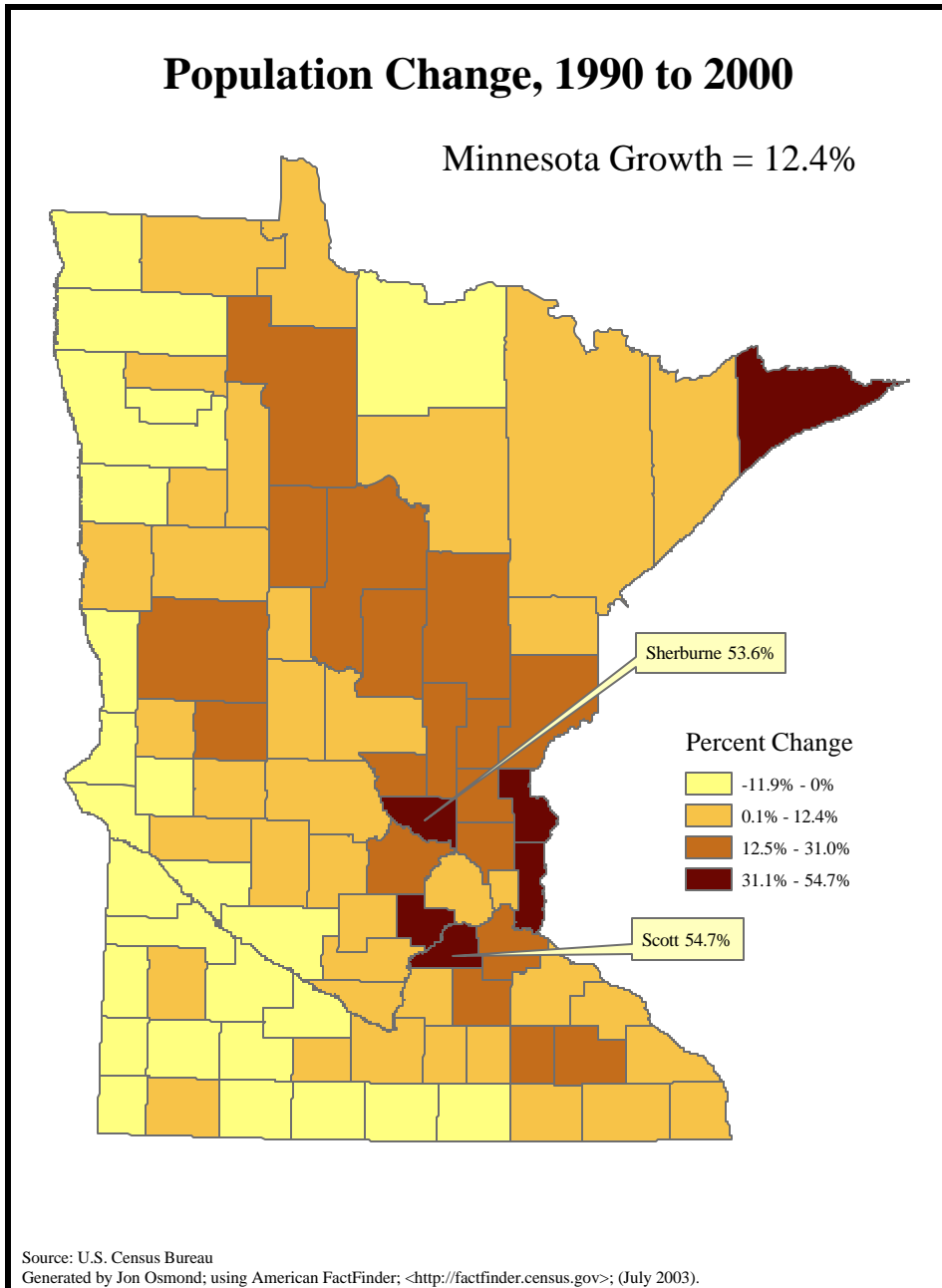
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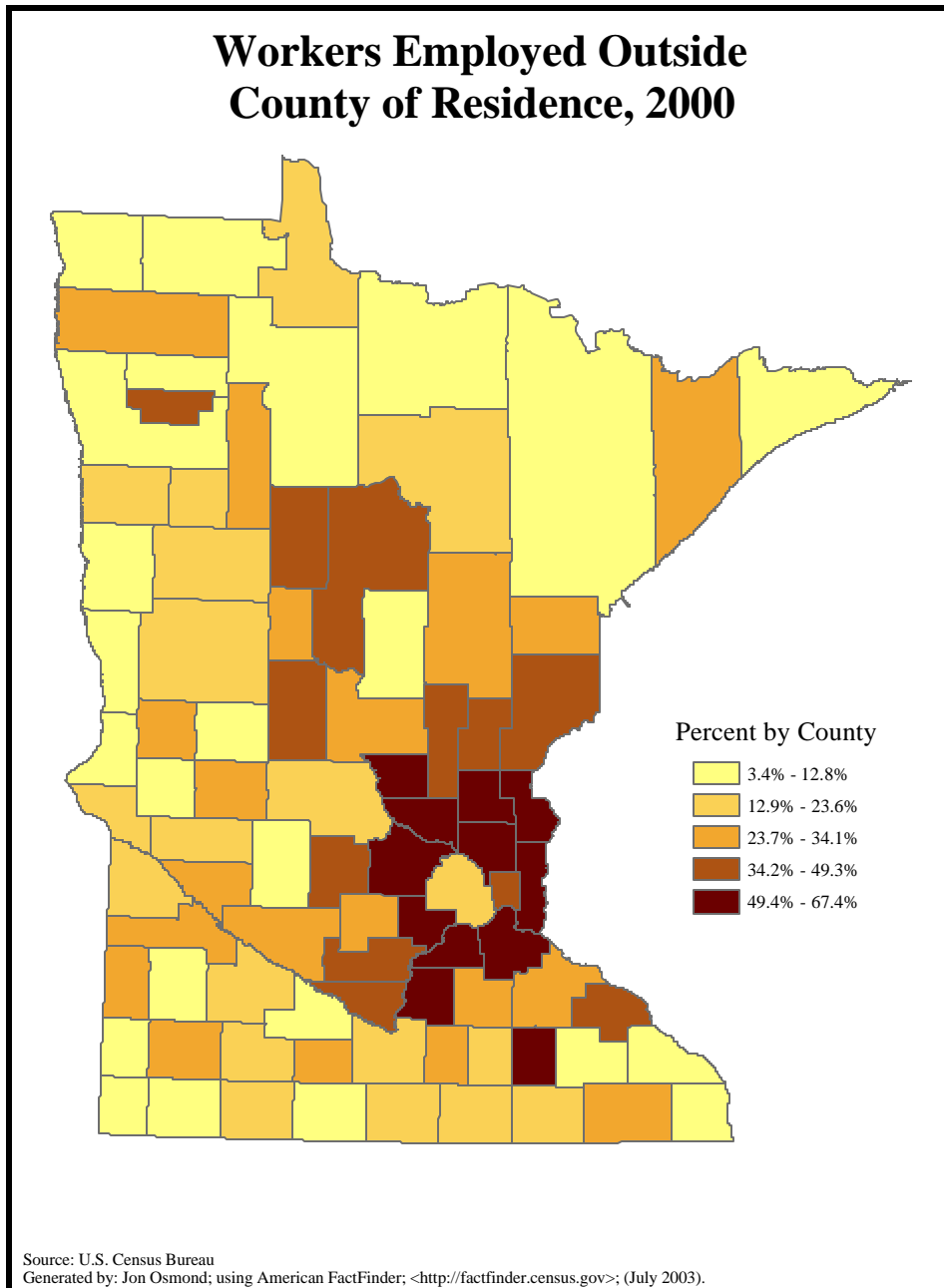
Appendix A

Chapter 1 Maps

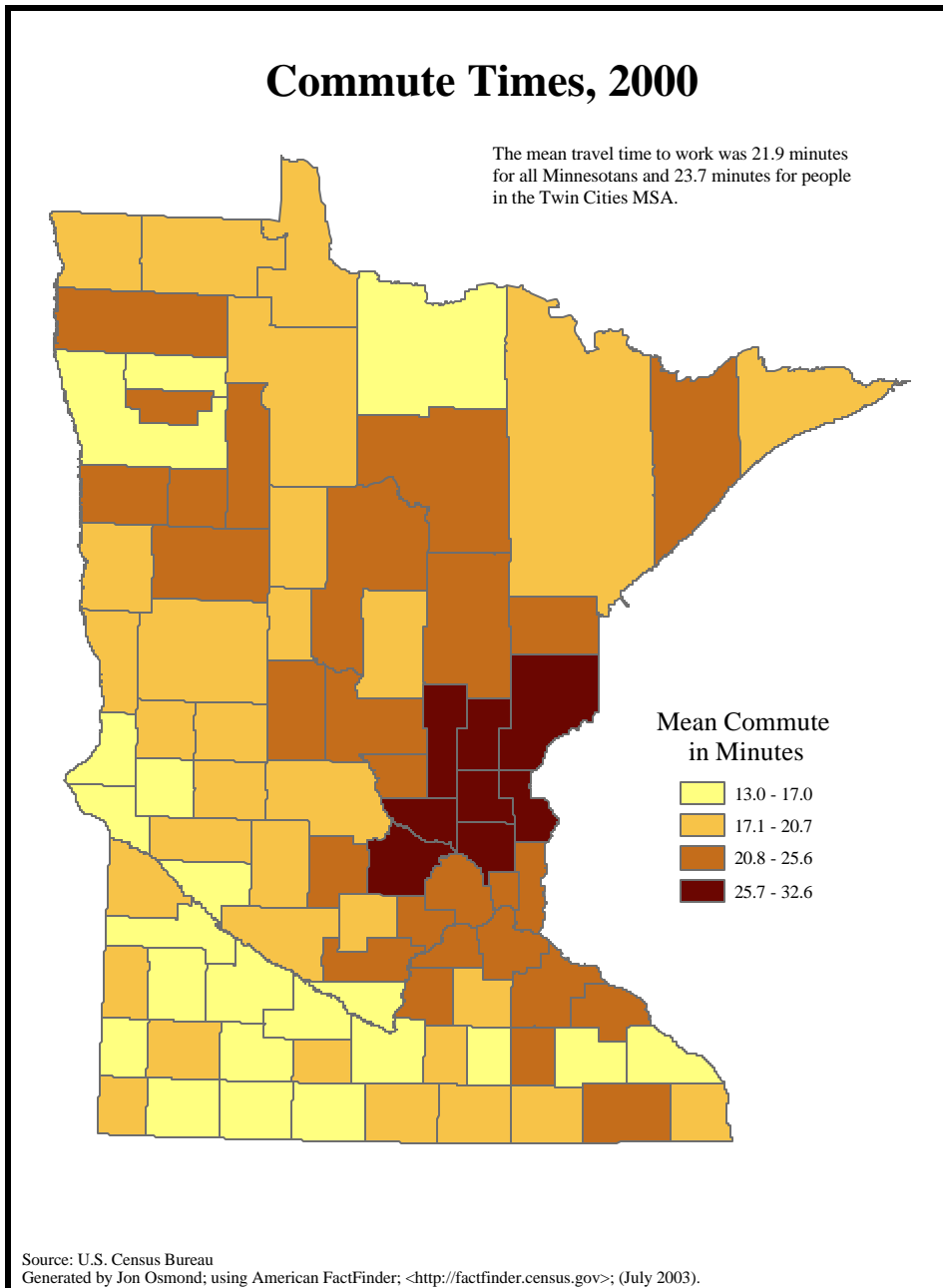
Map 1.



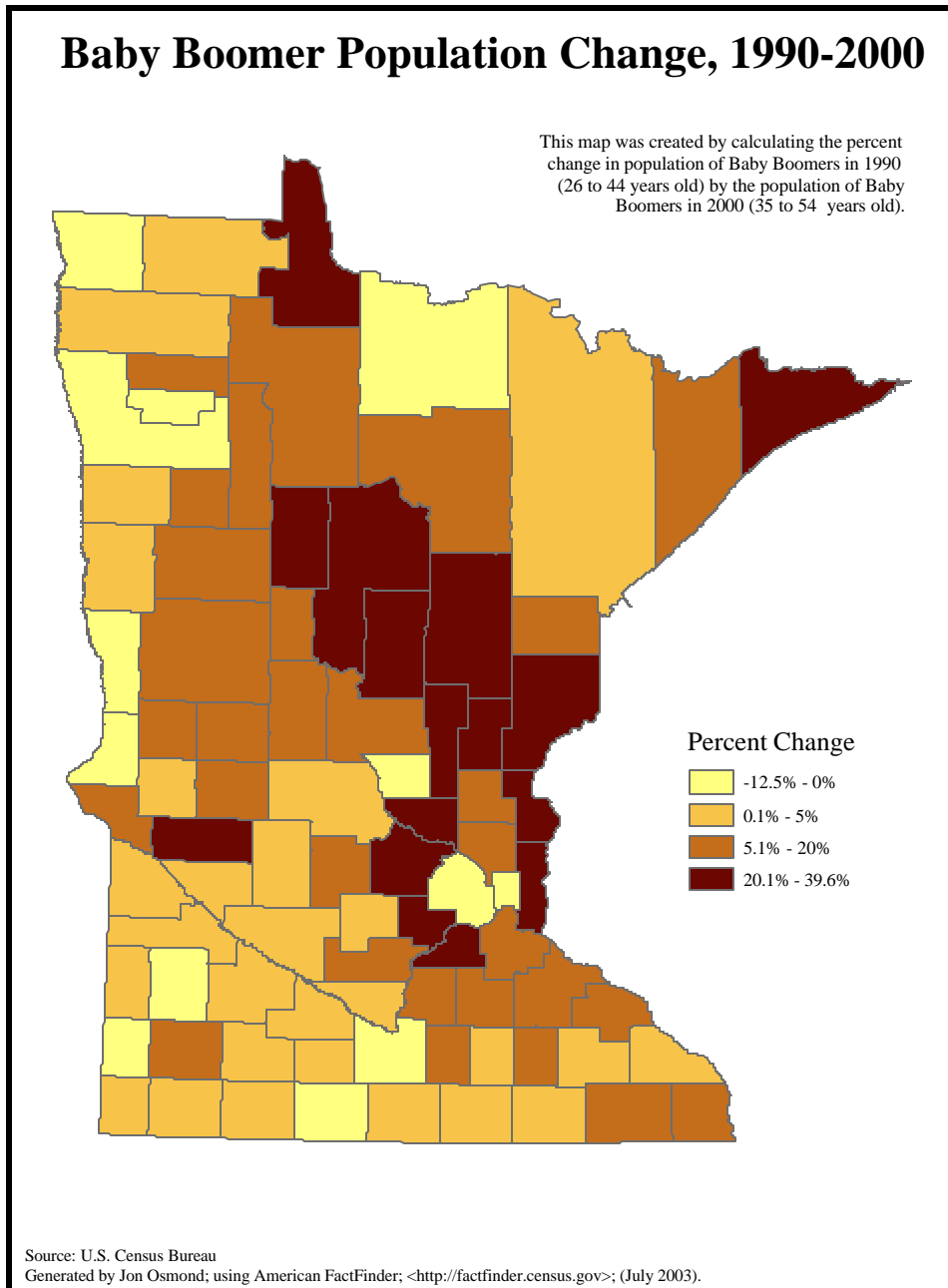
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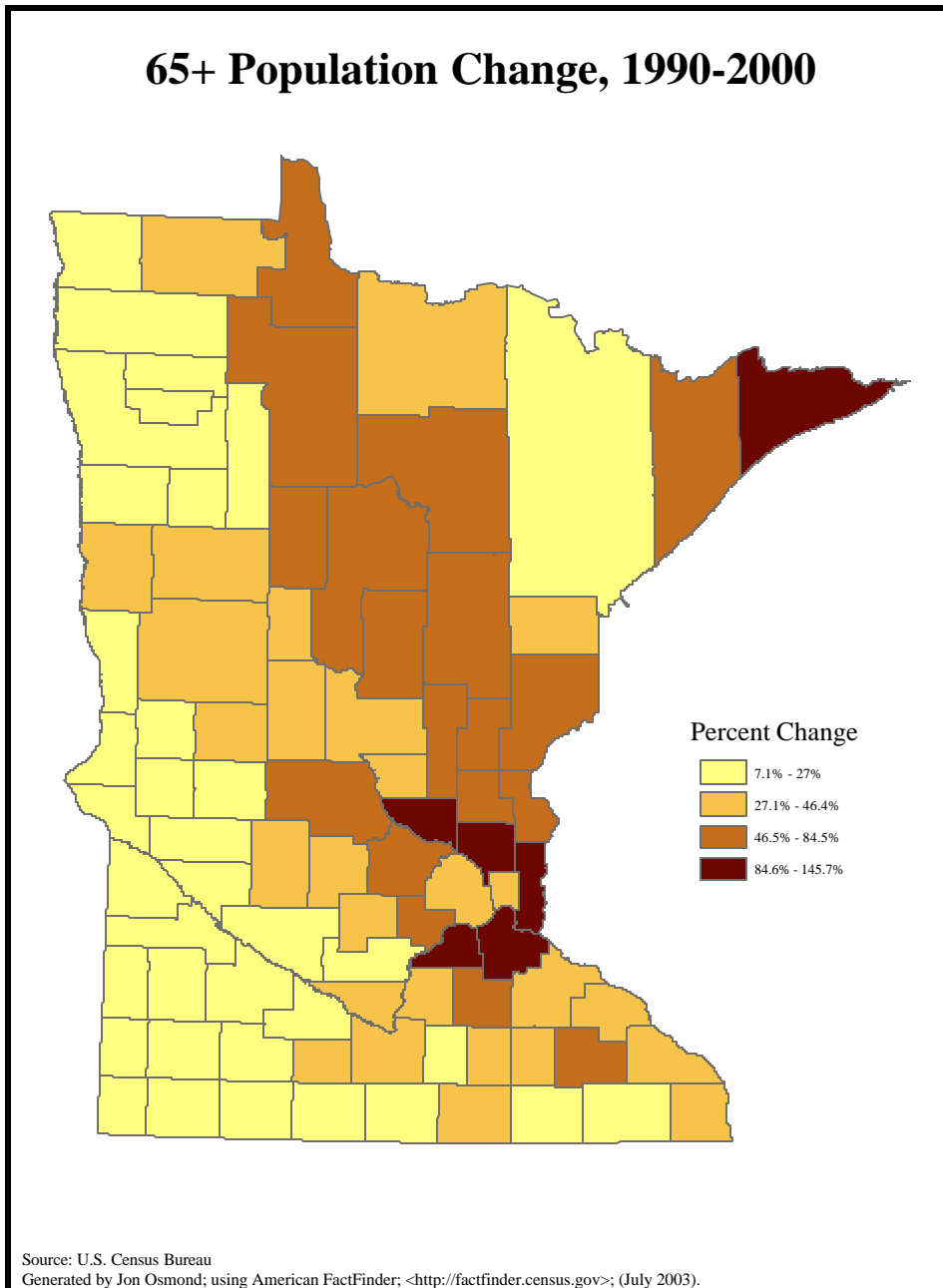
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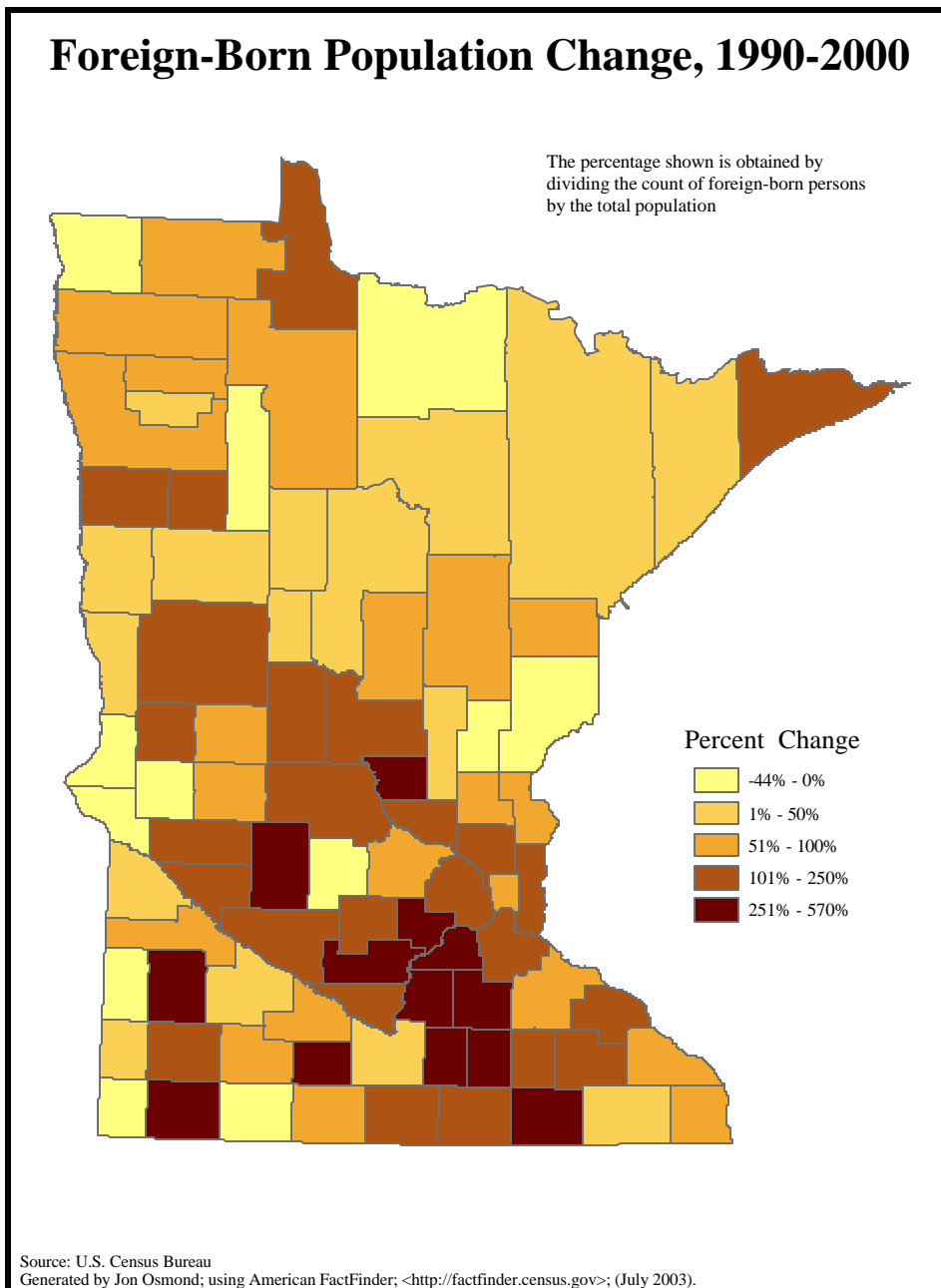
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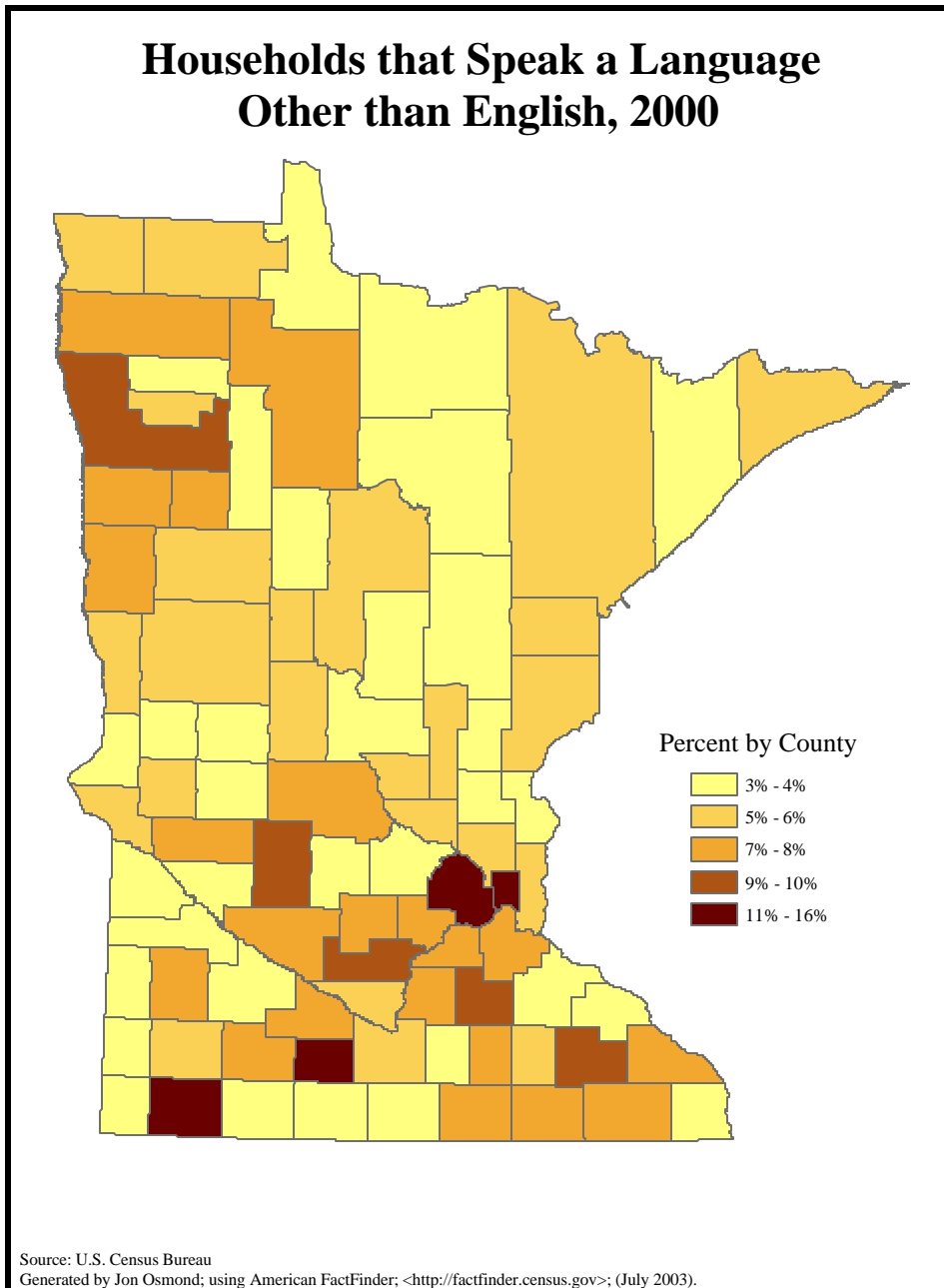
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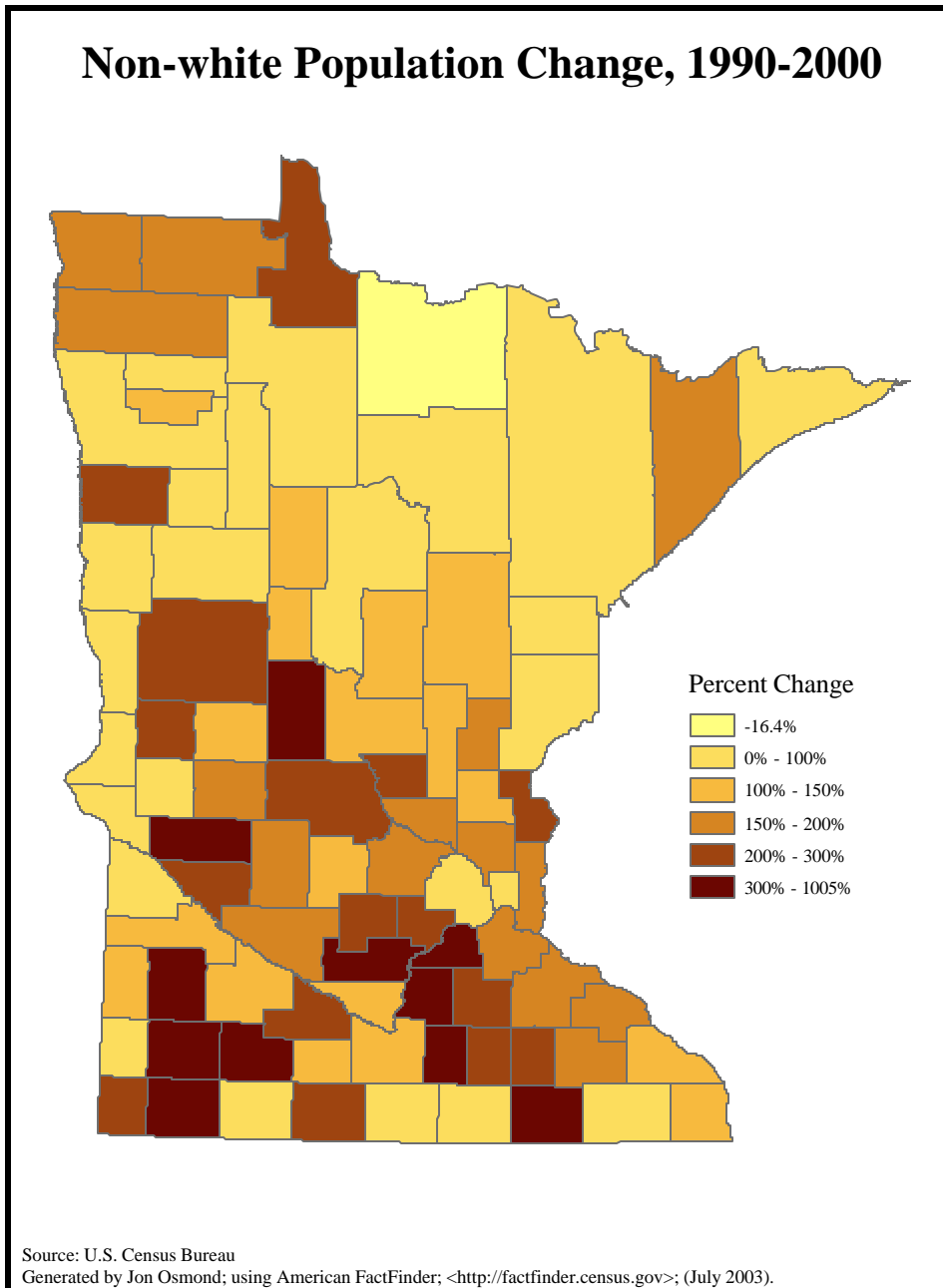
Map 6.



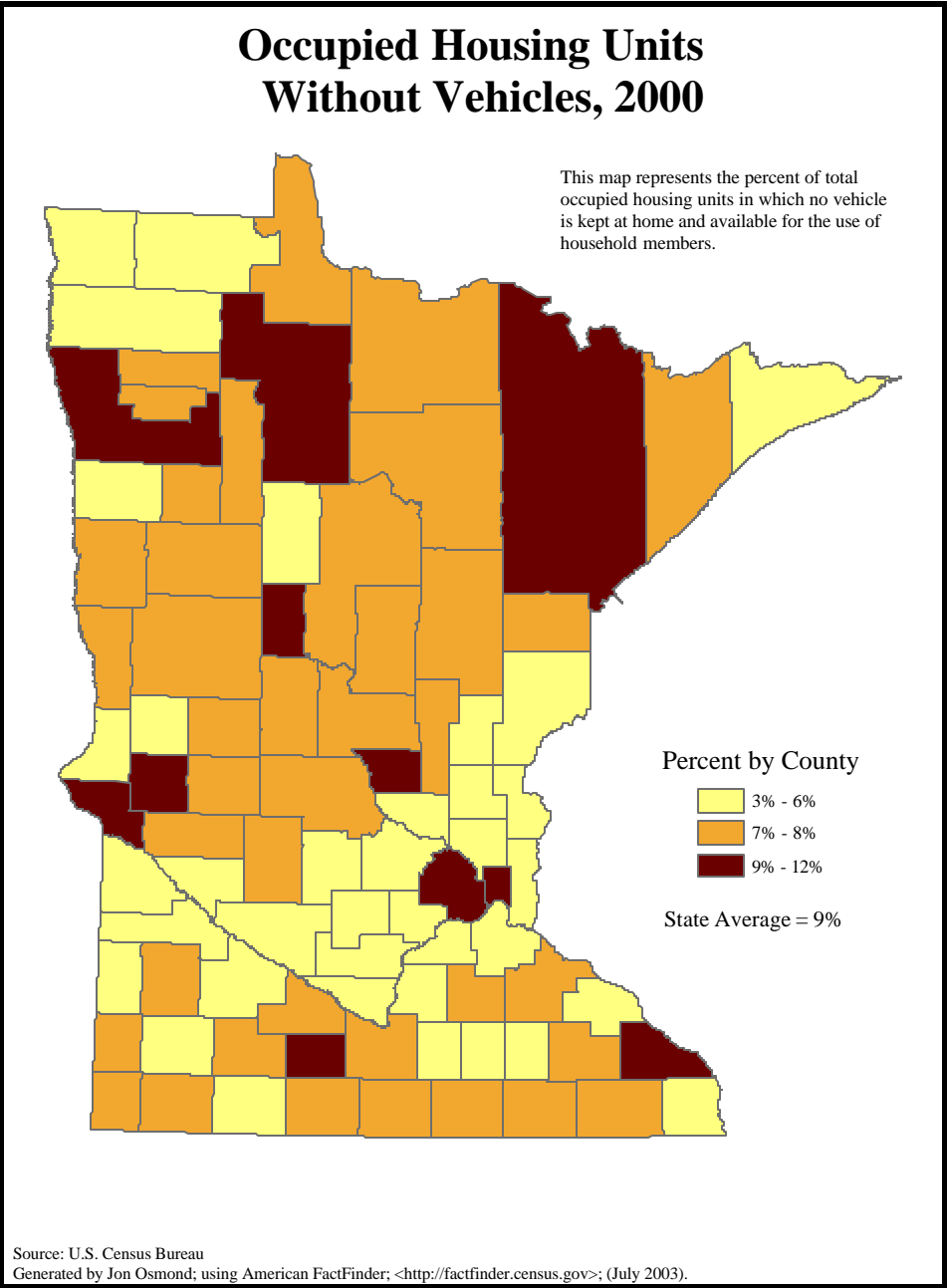
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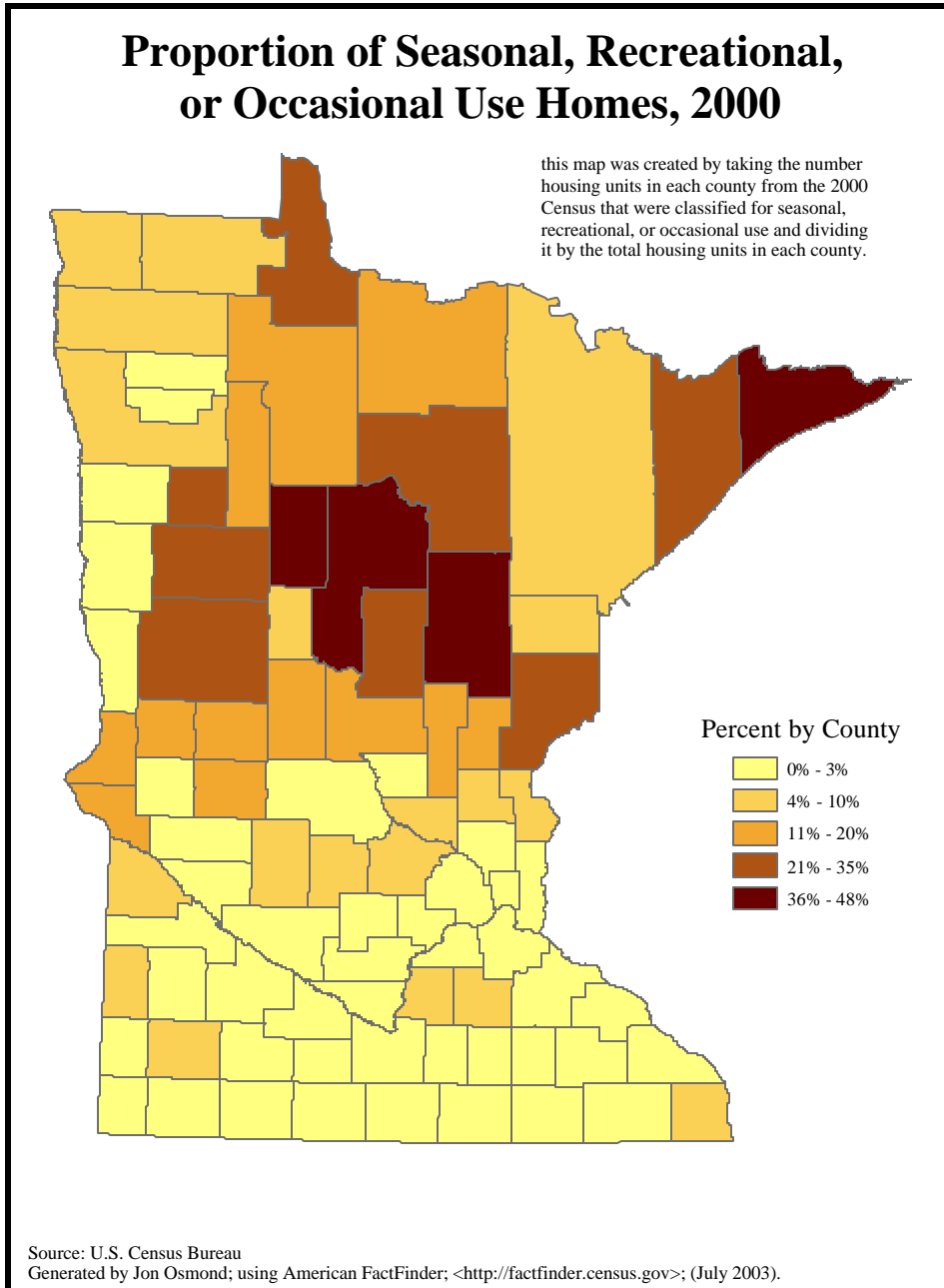
Map 8.



Map 9.



Map 10.



Appendix B

Elderly Survey

Please answer the following questions to the best of your knowledge. Feel free to leave any question blank if you do not understand the question or for any reason choose not to respond a question. Check the answer that best suits your situation.

(1) Which of the following best describes your living situation (please check one)?

- Live alone
- Live with spouse or other person(s) near my age
- Live with children or other extended family
- Live in retirement community

(2) How long have you lived in your current residence (please check one)?

- Less than 1 year
- 2-5 Years
- 5-10 Years
- 10-15 Years
- Over 15 Years

(3) What year were you born (Check whichever Corresponds)?

- 1943-1947
- 1938-1942
- 1933-1937
- 1928-1932
- 1923-1927
- 1918-1922
- Before 1918

(4) Please indicate how many times in the last week you participated in the following activities (please indicate number of times for each activity):

- Go to work
- Visit friends away from your home
- Go to see the doctor or other medical professional
- Go somewhere to participate in a recreational activity
- Go somewhere to participate in a social activity

(5) On a scale of 1 to 4, with **1 being most important** and **4 being least important**, how important are the following activities to you (for each activity, **please circle the number which best matches the strength of your preference**)?

Go to work

- (1) (2) (3) (4)

Continued on next page

Visit friends away from your home

(1) (2) (3) (4)

Go to see the doctor or other medical professional

(1) (2) (3) (4)

Go somewhere to participate in a recreational activity

(1) (2) (3) (4)

Go somewhere to participate in a social activity

(1) (2) (3) (4)

(6) In the last week, how many times have you gone to participate in an activity (in the blank, please write the number of times):

_____ Within your neighborhood

_____ Somewhere in town, outside of your neighborhood

(7) In the last year, how many times have you traveled out of town? _____

(8) On a scale of 1 to 4, with **1 being least** important and **4 being most important**, please indicate the things that are most important to you when you need or want to go somewhere (for each option, **please circle the number that best matches your preference**):

It doesn't take me too long to get where I'm going

(1) (2) (3) (4)

I can get there safely without any chance of being in an accident

(1) (2) (3) (4)

The transportation I use takes me exactly to the door of where I want to go

(1) (2) (3) (4)

I won't have any problems getting to the transportation (or into and out of the vehicle)

(1) (2) (3) (4)

I can get transportation whenever I am ready to go, without having to wait or plan my trip in advance

(1) (2) (3) (4)

I won't have to worry about other people bothering me or hurting me as I'm trying to get somewhere

(1) (2) (3) (4)

Continued on next page

I can be in a physically comfortable environment as I travel (good temperature, comfortable seats, etc.)
(1) (2) (3) (4)

I can be in my own private environment as I travel
(1) (2) (3) (4)

I don't have to pay too much out of pocket for transportation
(1) (2) (3) (4)

(9) On a scale of 1 to 4, with **1 being the least comfortable** and **4 being the most comfortable**, how comfortable are you about using computers?

(1) (2) (3) (4)

(10) If you could choose any way of accessing your regular activities, on a scale of 1 to 4 with **1 being your least favorite** and **4 being your favorite**, how you feel about the following (**please circle the number for each choice that best matches your preference**):

Driving your own car somewhere
(1) (2) (3) (4)

Walking somewhere
(1) (2) (3) (4)

Riding the bus somewhere
(1) (2) (3) (4)

Doing something on the Internet at home instead of having to go somewhere
(1) (2) (3) (4)

Getting a ride somewhere with a friend or family member
(1) (2) (3) (4)

Riding a bike somewhere
(1) (2) (3) (4)

(11) Please check the response that best fits your situation.

Do you own a car?

Yes

No

Do you drive a car?

Yes

No

Continued on next page

If you do not drive a car, what is your reason for not driving (check all that apply)

Cannot Afford Car

Prefer other means of transportation

Physical or other disability prevents driving

Thank you for taking the time to complete this survey. Your thoughts will help in the development of better transportation alternatives that meet your needs. Please use the enclosed business reply envelope to return your survey to us.

Appendix C

Focus Group Discussion Guide

Introduction (5 Minutes):

We're here today to talk about the things we like to do, the things we need to do, and the ways we get to the places where we need to go. First we'll talk some about what kind of things we do every day or every week, then we'll talk about where we go to do those things, and finally, we'll talk about how we like to get there.

1. Discussion of Activities (Approximately 20 Minutes)

How do you spend most of your time on any given day?

*<If general discussion doesn't address, follow up with more specific questions>
How many people here go to work every day?*

Does anyone go to visit friends often?

Does anyone here go to the doctor very much?

Does anyone here go places to do social activities?

Of all of these things we've talked about, which is the most important to you?

<generate a list>

Why are these things important?

Which things do you do in your neighborhood, and for which do you go to other parts of town?

2. Discussion of Trips (Approximately 35 Minutes)

Do you prefer it when you can to stay here in this neighborhood, or to go to other parts of town?

<also talk about why people like to visit other parts of town if they do, or why they like staying in their own neighborhood>

When you go somewhere here in town, what kinds of problems do you have getting there?

<make sure discussion addresses the following:

How important is it to people to get where they're going quickly?

How concerned are people about getting in accidents?

How important is it for people to have transportation that takes them all the way to where they're going (they don't have to walk a long way, or use a secondary mode).

Do people feel like they have access to the types of transportation choices they really want and why/why not?

How important is it for people to have a type of transportation that is ready to go whenever and wherever they are (as opposed to having to wait, schedule in advance or depend on others)

How concerned are people about physical security as they travel?

How important is it that people have a comfortable physical environment when they travel (and what makes an environment comfortable?)

Do people here like to have a lot of privacy as they travel – why or why not?>

Now let's talk about going out of town. Has anyone here gone out of town in the last year or so?

<if so, follow up with>

Why did you go out of town?

What did you do – (discuss general answers like vacation, business, family etc.)?

How did you get there?

Was it a good trip? What made the trip good or bad?

BREAK (20 Minutes)

3. Computer Discussion (Approximately 10 Minutes)

Does anyone here have a computer?

How do you all feel about using computers?

Would anyone like it if you didn't have to go places as much because you could do things on the computer?

<follow up>

What kinds of things would you like to be able to do on the computer if it would save you a trip?

4. Discussion of Transportation Modes (Approximately 30 Minutes)

Does anyone here have their own car?

What do you think are the good and bad things about having your own car?

Do you all walk to places very much?

What do you think are the good and bad things about walking places?

Does anyone here ride the bus?

What do you think are the good and bad things about riding the bus?

If you don't have a car, do you very often ride places with someone else that has a car?
What do you think are the good and bad things about riding together?

Do you all ride bikes to places very much?
What do you think are the good and bad things about riding a bike?

5. Final Questions (Approximately 15 Minutes)

<if group is non-English speaking>

Are there ways in which the language barrier makes it harder for you to get around?

If so, what kinds of problems have you had?

Have you ever heard of new ideas that people have about ways to get places that you wish you could try?

Well, we're about out of time now. Thanks to everyone for taking the time to have this discussion. Your ideas have been really good and will help us develop transportation alternatives that meet your needs.

Appendix D

Focus Group Data

Rural Focus Group Results

The discussions with Spanish- and Somali-speaking residents in Faribault, Minnesota, and Hmong-speaking residents in Tracy, Minnesota, are summarized on the following pages.

Faribault Early Childhood Family Education (ECFE)—Spanish Speaking

1. Discussion of Activities

Focus group participants reported spending time on a variety of activities on any given day. The types of activities range from going to work, attending English classes, dropping off or picking up children at school or taking them to the school bus, running errands, doing household chores including cooking and cleaning, and spending time with family. The most important activities were to dedicate time to and going places with children and spouses. Participants also reported spending time on social activities such as going to the movies in Faribault and traveling to new communities outside Faribault, for example Mankato, Burnsville, Bloomington (the Mall of America specifically), White Bear Lake, Roseville (Rosedale Mall specifically), and other locations.

Participants consider Faribault a town, but not a neighborhood. They reported spending time in Faribault on specific activities such as taking children to the local indoor and outdoor pool and going to the Wal-Mart and a public park in Faribault. One participant lives near a gas station that sells groceries, but purchases food supplies at the Faribault Wal-Mart. Participants also stated going to St. Paul to dance at establishments or to attend concerts. One participant lives in Morristown, 15 to 20 minutes from Faribault, and travels to Faribault, Burnsville, and the Mall of America in Bloomington to shop for basic needs.

2. Discussion of Trips

Focus group participants prefer to stay in Faribault or their neighborhoods, but also go to other locations for activities. One participant stated it is convenient to go to stores in Faribault; however, in order to see other things and shop at larger stores they need to travel outside of Faribault. Another stated they travel to Burnsville or Mankato to shop out of necessity because many of the Faribault stores are too small and close at 5 p.m. One participant stated merchants sell many things at expensive prices in Faribault, while another stated that for home improvement items for example, they must travel to Northfield.

Participants stated having several types of problems traveling to places in their neighborhoods or to places in Faribault. Lacking a driver's license and therefore not being able to drive is cited as the biggest problem. Participants explained that it is expensive to have to rely on other transportation options and said that not having a car is not the problem, not having a driver's license is. One participant mentioned that those who do not have driver's licenses still manage to travel places. The biggest problems occur for people who cannot drive, as they have to walk, take an expensive cab that is not often reliable, or take the bus, which has only one route in Faribault, to get to work. Winter is more of a constraint, and one participant stated one can bike or walk anywhere in the summer but not in the winter. Another participant said "when my older children want to go to Wal-Mart, I tell them to take the bus because they are becoming too dependent on me, and I feel they need to start going places by themselves, like it is in Mexico. When you are in Mexico, your parents teach you to take the bus from an early age."

Participants noted also that it is important to be able to travel to places in Faribault and arrive quickly. The local bus system arrives at its scheduled stops only once every hour, and riders spend a great deal of time waiting for the bus after doctor appointments or at other places in the city, or looking for other, quicker ways to travel in order to make it to their appointments on time. Traffic congestion is not an issue in Faribault; however, winter-driving conditions and low speed limits prevent participants from traveling to places quickly. Participants voice the need for more bus routes in Faribault.

These participants also are worried about accidents when traveling out of state, especially in the winter. They are more concerned about and are cautious towards other drivers and young drivers when driving a car and when walking in their neighborhoods. Participants feel safe on the local bus, but only with specific bus drivers. One participant stated that he/she stays home when a specific bus driver is on duty. Another participant felt that cab drivers are also “not very careful” drivers, and this is a problem.

Through the discussions, it became clear that it is important for participants to have transportation, especially the bus, which takes them all the way to their destination. The local bus system travels a long route through the city to get to places, such as commercial areas, forcing participants to have to walk to places like the local school, after the bus drops them off.

Participants feel they do not have adequate bus service and suggest there be faster service and more routes such as those available in Mexico. It seems, through the discussions, that access to transportation choices really depends on every person. For example, if one’s car breaks down, perhaps a friend is able to provide a ride. If not, one could take the bus, although that system may not be quick enough and may not take the rider close enough to where he or she wants to go.

It is also very important for participants to have transportation that is ready to go whenever and wherever they are, especially in emergency situations when they cannot wait for the bus. Participants feel the bus service in Faribault eventually gets them to their destination, but requires them to have to schedule appointments around the bus schedule and spend a lot of time traveling on the bus to get to their destination. These participants also feel there should be more bus routes in the city that go to specific places like the mall or hospital and to downtown and various neighborhoods.

In general, participants feel safe traveling in and riding the bus in Faribault. Participants feel less safe traveling in other cities, such as Minneapolis, and traveling by bus out of state. However, participants do travel out of state. One participant stated that he/she travels to Texas twice a year by bus or by car. Last year, he/she drove and encountered significant amounts of traffic during the Thanksgiving holiday. Another participant stated that he/she drove to Indiana during the summer and the trip was quiet. One traveled to Piedras Negras in Mexico and Eagle Pass, Texas in July. He/she took the bus to Eagle Pass, and while on the bus, another rider “overdosed” and the bus had to stop. Another participant traveled to Seattle by car and stopped several times along the way. Another traveled to Piedras Negras three times last year and didn’t have any problems; he/she traveled during week days to avoid traffic.

3. Discussion of Computers

Four of the participants stated they own computers. They use the computers for a variety of reasons including to purchase plane tickets, to pay bills, and for entertainment. Their children use the computer for completing homework and for entertainment. Participants who do not own a computer stated they would like to own one.

Participants said they would like to use the computer to do things such as shopping and working from home. One participant believes it is an advantage for women to have internet access from home to replace taking trips to other places or to work from home in order to take care of children who are at home. Participants also stated that using the computer to order merchandise from Mexico and different parts of the United States would save them time and money. One participant stated he/she would rather go out shopping than to avoid making the trip and purchasing products via the Internet.

4. Discussion of Transportation Modes

Participants stated there are several advantages and disadvantages to owning a car. The advantages, they said, are having the ability to go anywhere, any time without having to walk or call a cab, which saves time and money. The disadvantages to owning a car include expenses, such as gas, oil, tires, license plates, and insurance, and spending time on maintenance in general. Another disadvantage to owning a car, they said, is paying to fix the car if it breaks down and, in the winter, spending time scraping snow and ice off the car and warming up the car.

Participants stated several advantages and disadvantages of walking to their destinations. The primary advantages of walking, they said, are getting exercise and getting to know the town better, plus not having to find a place to park. The disadvantage of walking is that it takes a long time to get to distant destinations.

Participants stated they do ride the bus and that there are several advantages and disadvantages of using this transportation mode. The advantages of taking the bus, they said, are that it takes riders directly to the mall or the grocery store and to other specific places, including doctor's appointments, and can be used during the winter. The disadvantage of taking the bus involves route changes that vary depending upon the time of day. For example, the bus picks up riders with disabilities at 8:30 a.m. and 4 p.m. and then serves its normal route in between those times. Other disadvantages include a limited schedule and the fact that riders face long wait times for the bus to return to their stop.

Participants who do not have a car said they usually ride with someone who does have a car to a variety of places. Participants said they ask for rides on the weekends to go to work or other places, or have their spouse take them. One participant said that she asks for rides when her husband cannot pick her up, while another does not like to ask for rides when her husband cannot pick her up. The problem with having to ask for a ride is that sometimes the driver can provide a ride, and other times he or she cannot. The disadvantage for the driver of giving a ride is that saying "no" may upset the person asking. Those participants who own a car see different

advantages and disadvantages to asking for rides than those who do not own a car. Those who have cars “feel bad” when they have to deny someone a ride perhaps because they are low on gasoline. They also said they sometimes feel pressure to give someone a ride, and when they are able to provide a ride, they don’t like having to wait for their rider to finish an errand or appointment. In addition, those with cars feel that people who ask for rides sometimes forget the driver already has plans and an agenda for the day. On the other hand, drivers are grateful when riders offer money to pay for gasoline.

Two participants stated they each own a bicycle. One said he/she use it to go to the gas station for food or to get to other nearby locations. Another participant stated that his/her daughter has a bicycle, and yet another said that he/she rides the bike trails in “Northtown” with his/her family. According to participants, the advantages to using a bike include not having to spend money on gas and the ability to get exercise. Biking also is faster than walking and can be entertaining to travel around town and to different nearby neighborhoods and towns. The disadvantage to traveling by bike is that it is not practical for traveling long distances.

5. Final Questions

Participants stated they have problems getting around because of a language barrier. They noted it is particularly difficult to call a cab; it is hard for the cab driver to understand them and they cannot communicate with the driver. Cab drivers and other cab company personnel often do not have the patience communicate with non-English-speaking riders. It is also hard for the bus drivers to understand non-English-speaking riders and is difficult for these riders to tell the driver where they want to go.

Participants stated that the cab company began operation in Faribault only within the past five years. These participants noted also that they thought the bus service in Faribault was only for citizens with disabilities, but later found out the service is available to all citizens.

Faribault Adult Learning Center—Somali Speaking

1. Discussion of Activities

Focus group participants stated they spend most of their time on any given day working, taking children to the bus stop, doing household chores, and attending school, and visiting friends and relatives on the weekends. One participant said that there is no interpreter at his/her doctor’s office, so he/she does not go to the doctor. With one exception, all participants work at the Turkey Store, and said that they do not exercise outside of work. Working, going to school, and visiting friends and relatives re the most important activities listed. Two participants stated that while school is important, but they do not have time to attend.

Participants in this group work and attend school in Faribault. They visit friends and relatives in various places including Faribault, Minneapolis, Owatonna, and Rochester. One participant stated that he/she stays in Faribault because he/she does not have a car. Another stated that he/she is unable to go anywhere, because he/she takes care of children. Another said he/she stays home to read and study.

2. Discussion of Trips

Participants said they prefer to stay in their own neighborhoods and prefer not to go out of town because they do not have a car, they have everything they need in Faribault, the city is easy to access, and they like working in Faribault. Another stated he/she prefers to work outside of Faribault, but works in Faribault as there are no jobs available outside of the city.

One participant stated he/she has problems getting to places in town because of traffic congestion. He/she plans to make it to work within an hour, yet the trip takes two hours. Another participant stated that he/she visited friends and relatives in Minneapolis, and the return trip took five hours when it usually takes three. Traffic congestion is a problem in Minneapolis, Faribault, and on the freeway in between. Another participant explained that there are no transportation options, such as bus service, in the area and he/she feels that is a problem. Conversely, another person said that he/she has no problems getting around town.

According to the discussions, it is important for participants to get to their destinations quickly, for example, they need to arrive to work on time. However, some say there is no guarantee that they will reach their destination on time, as it “depends on God.” Another person stated “I don’t waste time; take advantage of every hour you have and get there on time.”

Reliable trips are important for planning one’s day and keeping to a schedule, participants agreed. One person noted that there is pressure to get to work on time, while another added that if “you are one hour late to work, you lose one hour from your paycheck.”

Participants have mixed feelings about safety and getting into accidents when using different modes of transportation. Some stated they feel safer in a bus or taxi than when they are driving. Others stated they worry about accidents whether they drive, take the bus, or take a taxi. Others said they worry more when they are driving because “when you drive it is your responsibility,” but they “trust in God” to keep them safe. Another participant stated he/she prefers to ride on a train than drive, yet there is no train available in the area.

Participants also have mixed feelings about physical security when they travel. One stated that he/she feels secure in a bus or taxi when going from Minneapolis to Faribault. Another stated that he/she is worried he/she may get hurt at the bus stop. Another feels secure in when driving a car than riding on a bus or in a taxi. While another participant who traveled by bus to Minneapolis and was not hurt at the bus stop, was worried about the bus being on time. One person stated that he/she does not feel safe traveling in winter with the snow on the roads.

Participants stated they feel it is very important to have transportation that takes them all the way to their destination. A direct trip is safer, they say, especially when trying to get to work on time. One person said that he/she walked home from school in 2000 and was attacked, and therefore, it is important to have transportation that gets one all the way home. Another participant said that he/she has traveled to Minneapolis and purchased larger, heavy items, and also prefers transportation that takes him/her all the way home, which is much more convenient, especially in the winter. Another person stated that it is important to have transportation that is on time and takes them directly to his/her destination.

Participants also noted the importance of having transportation that is ready to go whenever and wherever they are. One person said that he/she wants to go anywhere they want, on time. Others stated they can get wherever they need to go only by driving their own car. The flexibility gained by owning a car is very important these participants.

The group also stated a preference to travel by car with people they know, as they are afraid to travel with strangers. Other participants said they were fine riding on a bus with strangers. One person expressed that they prefer to travel with family, friends, and relatives only.

This group feels they do not have access to the types of transportation choices they really want, indicating that transportation in Faribault is a problem, as there are taxis, with unreliable service, and only one bus for the entire city. "I can call a taxi at night for an emergency situation, but if they come late or never come, I have to call over and over."

3. Discussion of Computers

These participants said they do not own a computer, but have access to computers at school. The group feels that computers are a useful tool and said they use computers to send and receive e-mail and to complete homework assignments. Others noted they use computers "for education and improving English."

Participants have mixed feelings about using the computer in lieu of making trips. One person stated that he/she would rather make purchases using a computer than have to go out to purchase goods. However, another person said he/she doesn't like the idea of shopping via computer, because a language barrier prevents him/her from knowing exactly what it is he/she is buying. Another person added that he/she has no knowledge of how to make purchases using a computer. While another participant felt that although the Internet itself is easy to use, a language barrier makes e-commerce difficult.

4. Discussion of Transportation Modes

Three participants own a car, although one person stated he/she may buy a bicycle due to high gas prices. Another person said he/she mostly rides the bus.

According to the discussions, participants felt that the advantages of owning a bicycle are that one can ride it anywhere and that it offers health benefits. They said also that the advantages to walking include the exercise aspect and the ease of getting to places close to where one resides. However, the disadvantage to the bus service is it takes a long time to get to selected destinations; the disadvantage to a taxi service is the belief that it is not safe; and the disadvantage to owning a bicycle is that riders get wet in the rain and cannot ride the bicycle in the snow. The advantage car ownership is the ability to use it whenever needed. These participants feel that the best transportation option is "to own a car."

5. Final Questions

Participants agreed that the language barrier makes it harder for them to get around. They all said that it is difficult to make doctor appointments and to order or buy things via telephone, including cable TV. One participant noted the language difficulty when looking for a job including filling out the application and interviewing, particularly because he/she does not

understand the questions asked on the application or in an interview. Another participant stated that the language barrier causes rent issues and problems buying a car. According to another participant, “English is the international language, and if you do not speak it or have time to learn it, you cannot buy food or earn rent money.” The language barrier is also a problem in school when teachers do not understand students, participants explained.

Tracy English as a Second Language (ESL)—Hmong Speaking

1. Discussion of Activities

Focus group participants stated they spend most of their time during the day working either full time or part time during the school year. They spend the rest of their time with household chores and do not have extra time for other activities during the week or on the weekend. The town of Tracy does not have a mall, and participants said they spend little time shopping and spend most of their time farming at home. Participants stated that they want to visit friends and relatives, but do not own a vehicle, which is a problem since there is no bus or taxi service in Tracy. The participants do visit the doctor, but an interpreter picks them up at home and drops them off when the appointment is finished, because the working-age children use the family car to get to work. The participants said they do not spend their time on social activities, but do get together with friends and relatives for traditional Hmong ceremonies or gatherings. The most important activities for this group include going to the doctor, visiting relatives or gathering with family for other social activities, and working. However, visiting relatives is more important than work when the social event is a wedding or a funeral, rather than a small party, especially during the work week.

Participants stated that they remain in Tracy for work and doctor appointments. They travel to St. Paul to visit relatives or for other social events when they have access to a car. A few times a year, they travel to Marshall, Mankato, and St. Paul, Minnesota, or to Sioux Falls, South Dakota, to shop for daily supplies such as clothes. Participants travel to Marshall more often than to other cities, as the larger stores in that town usually have the needed supplies.

2. Discussion of Trips

Participants said they prefer to travel within the city of Tracy, because they do not want to travel far and prefer not to travel in the winter. They prefer to work and would like access to other necessities, such as dental clinics and grocery and daily supplies in Tracy. However, there is no dental clinic in Tracy, and residents have to travel to Mankato to visit a dentist. There is a health clinic in Tracy, but it does not provide dental service. There also is no interpreter at the Tracy health clinic and Hmong residents must bring in an interpreter from St. Paul or Minneapolis.

Participants stated that getting to various destinations quickly depends upon the actual destination and the reason for traveling. For example, participants say they want to arrive quickly to a funeral and to pick up a sick child from school or for other times when they are at work and need to leave immediately. Participants explained that it is an hour drive from Tracy to purchase bus tickets, and added that plane tickets are expensive. Because there is no taxi or bus service in Tracy, these participants rely on family members to take them to the bus station or airport.

The group is concerned about getting into accidents when traveling, especially in the winter. Most of the participants’ jobs are located in Marshall, where snow piles up on the road in the

winter, and say they have had accidents or car problems in the past. Even after snow is plowed from roads, participants felt that the remaining layer of ice, which is not salted or sanded, causes accidents to occur. Some of the participants report that during bad winter driving conditions, their co-workers stay overnight in Marshall during the work week. Participants said they are not as concerned about accidents when walking or biking because Tracy is a small town; however, they are aware of safety issues with these two modes and carefully watch family members when biking or walking.

Participants were also concerned about physical security when traveling, especially when walking, and recognized that there are good and bad citizens who exist in every community.

Participants feel it is safer to travel with a friend or neighbor if they need a ride to work or another location, especially if they encounter a problem and need help. Participants feel more comfortable traveling with others they know, such as a friend or neighbor. Hmong men, however, will not travel by car with a Hmong woman who is married, even if it is to the store or to work. Hmong women do not invite other Hmong men to travel with them, but will travel with other Hmong women.

Participants felt it is important to have a type of transportation that is ready to go when they are, rather than coordinating schedules with others. They feel it is most important to have their own car and travel by themselves, which is easier than relying on other modes of transportation or rides from family and friends.

Participants felt it is important to be able to travel straight to their desired destination and to have transportation that takes them all the way to their destination. They talked also about having to transfer to another type of transportation when their vehicle breaks down and how someone then has to pick them up and take them to their destination.

The participants had mixed feelings about having access to the types of transportation choices they want. Some participants said they get sick when riding the bus, and noted that bus service is too slow, has too many stops, and does not travel where they want to go. They mentioned that there now is a bus service to Marshall, which is a one hour trip from Tracy, rather than a 30-minute car trip. The bus takes longer because it makes many stops to pick up individual riders. Others felt traveling by bus is a good thing. These people want access to bus transportation where they can sit and relax rather than drive themselves and want bus service available when their car is not available.

Participants stated that they do travel out of state from time to time. Last year, for instance, one participant stated that he/she drove to Sioux Falls, South Dakota, and then caught a flight elsewhere. The group reported that if there is no bus service or if they do not have a car, then they have to find some other way to and from the airport or bus station. Incidentally, according to a majority of these participants, driving is the second choice to flying. However, one person stated that he/she prefer traveling by car because he/she gets sick on the bus and has ear trouble in airplanes. Another stated a preference to traveling by taxi or bus over long distances rather than using his/her own car. Another person reportedly traveled by car to Wisconsin; the trip took eight hours and “was tiring.”

3. Discussion of Computers

All of the participants reported that they have a computer or had a computer that recently broke. They stated they do not use the computer themselves, but that their children do.

The participants reported that they would use the computer to avoid making certain trips if they knew how to use the computer. One person said he/she would use the computer to buy airline tickets. Others also stated that their children use the computer to purchase items which therefore reduces the number of trips the parents have to make. Participants reported also that they can ask their children to purchase supplies using a computer, noting that if the children cannot find the product on the Internet, they are able to call to purchase the product if a number is available and the price is reasonable.

4. Discussion of Transportation Modes

Participants reported that they either have a car or someone in their family has a car. Some said that they have a car, but it is currently in a repair shop. Participants also stated that a family should have at least two or three cars in their household. The group members reported that they are able to get rides from others, such as co-workers, when their car is not available. The disadvantage to not owning a car is that it is harder to visit friends or go to the store and is harder to travel in general. If there is a car in the family and it is not available, one still cannot travel to purchase needed supplies or products, participants said.

Walking and biking in Tracy is common among the participants. They reported that if they do not own a bike, they walk. The advantage of biking, according to this group, is that it is faster than walking; while the advantage of walking is that walkers get more exercise and achieve greater health benefits.

5. Final Questions

In general, participants felt they have difficulty communicating in English. They speak limited English at work or just enough for their position or to learn instructions for their job, but they are not able to hold conversations or communicate like “an educated person.” One group member felt that she did not have time to attend school to get an education. Others said they believe that their lack of English skills prevents them from reading the bus signs and learning how to ride the bus.

Participants had a variety of transportation ideas. One participant, who has been in the United States for 10 years, reported that he/she has not traveled on a train, in a taxi, or on a bus or an airplane. Others stated that they or their children used the bus when they previously lived in California.

Urban Focus Group Results

The discussions with Spanish- and Somali-speaking residents in Minneapolis, Minnesota, and Hmong-speaking residents in St. Paul, Minnesota, are summarized as follows.

Centro—Spanish Speaking

1. Discussion of Activities

According to discussions, these focus group participants spend most of their time on any given day working, taking care of children at home, going to school, making sure their children are going to school and receiving an education, attending art classes, or spending time on social activities. The most important of these activities are working and going to school.

Participants stated they attend most activities outside of their neighborhood. One person reported that he/she travels to Bloomington or other cities for his/her temporary employment agency job, to run errands, and to take his/her children to school since his/her own neighborhood does not meet all of these needs. One person stated that he/she takes two buses to travel to school. Another person said that he/she travels within Minneapolis for art supplies, to St. Paul to the supermarket, and to other cities to shop and see things.

2. Discussion of Trips

Participants reported various preferences regarding whether they stay in their neighborhoods or go to other parts of town for activities. One participant, for example, indicated that he/she enjoyed visiting other parts of town to see “new and different things.” He/she mentioned also the need to go outside of the neighborhood for basic needs. Another person said that traveling outside of the neighborhood depended on the things one does and needs. He/she travels to other cities because he/she has the time and can take advantage of that opportunity. There are places, however, he/she cannot travel to because he/she does not have a car and relies instead on bus service, which does not travel to every desired location. Others people noted that the weather conditions determine whether or not they travel outside their neighborhoods. These participants indicated that they do not want to go out in cold weather to get to the bus or have to walk any distance to a bus stop if one is not close to their home.

Regarding bus service, participants reported having trouble with limited bus schedules, long wait times, missed transfers, and racism from bus drivers when traveling in the Twin Cities. If they miss a bus, they wait a long time for another bus to arrive. If the bus is late, they miss their transfer and have to pay the bus fare again. These participants felt also that some drivers are racist and leave them stranded if they are running towards the bus, treat them rude, or say “move” in a rough and offensive way. One participant also commented that “we Hispanics always say good morning and good afternoon, and we are always smiling. They [bus drivers] never say hi, all they say is ‘put your money in and go to the back.’ When you see their faces, you can see they do not like you. So, this is a little problem we have here. Other drivers are nice and wait for you if you are running towards the bus.”

Participants reported that it is very important to be able to get to their chosen destination quickly. They agreed that traveling by bus negatively affects their ability to arrive to work, school, or other appointments on time. For example, one person said that he/she was fired from a job because he/she had to take two buses to get to the place of employment in Maplewood. This person missed the second bus, had to walk, consequently was late, and lost his/her job. Another participant added that one must make a new doctor’s appointment if the original appointment is missed because the bus was late. Another person reported missing a school test because of a late bus, even after leaving home early. All participants said that they have to leave an hour early to

get to places on time when taking the bus. One participant said that taking the bus wastes time, because it takes less time to travel by car.

These participants felt it is very important to have transportation that takes them all the way to their destination. In this scenario, riders would have to take fewer buses and walk less to catch another bus or to get to their final destination.

These participants also were concerned about physical security when they travel. They indicated concern about people who sell or use drugs and were also concerned about others fighting on the bus. In addition, participants said that they worried about drug solicitation on the way to the bus stop, especially around Franklin and Chicago in Minneapolis. One participant was mistaken by a police officer for a drug dealer when waiting at a bus stop, as apparently, drug dealers often pretend they are waiting for a bus at the bus stop. One participant is concerned about the lack of seat belts on city and school buses and what might happen in an accident. "It is important for bus drivers wait for passengers and for children to be seated before leaving the stop," a participant reported. Another person indicated that owning a car provides more security and control and enables one to be on time. Another person added that having a driver's license offers more security when taking your children places, such as to school, relieving some of the worry parents may have about the school bus driver's driving skills.

Participants reported they would like a comfortable physical environment when traveling by bus and in general. They said this would make them feel more secure and less worried. They also would like to see friendlier bus drivers who smile and say "hi." These participants also noted that they felt better dealing with Spanish-speaking bus drivers. Some people indicated they feel taken advantage of by bus drivers who overcharge them for transfers, while other bus drivers have let them on the bus when they didn't have enough money for the fare or transfer.

One participant stated that he/she does not have a driver's license but does own a car. Though this is "risky," this participant feels the risk is worth it on order to have transportation that is ready to use when he/she needs it.

Generally, participants have mixed feelings about the importance of privacy when traveling. Some people said that they prefer privacy. Others stated that they enjoy talking to others on the bus, but do not like loud conversations. Additionally, participants said they like it when people smile or say hi to them, especially bus drivers, because they, themselves, are "very open people." "We like to see smiles, that way we feel human, and we feel we are not pushed away by society."

None of these participants traveled out of the Twin Cities in the past year.

3. Discussion of Computers

One participant reported having a computer and using the Internet but feels the Internet "disconnects us from the real world." Participants generally felt that it is important to know how to use computers in "this day and age," but interestingly, they feel computers are a "waste of their time." One participant indicated that he/she does not know where computer classes are offered. Another person said he/she has taken a computer class but found the course difficult.

The majority of participants reported that they prefer not to replace going out to participate in activities even if they could stay home and accomplish the same task using a computer. These people indicated that they would rather venture outside of their homes and felt it is better to physically go to the store. One participant felt that computers can “simplify your life and allows you to pay bills.” Another person felt that many tasks can be done via the phone without needing a computer.

4. Discussion of Transportation Modes

Only one of the participants owns a vehicle and felt that the advantages to owning a car is that it provides quick transportation without having to make several stops. On the other hand, participants felt that the bus makes too many stops and noted that riders may miss their bus and must then wait a significant amount of time for the next bus. Additionally, it can be difficult for bus riders to carry multiple packages such as grocery and laundry bags and therefore must shop and do smaller loads of laundry more often. One participant felt that owning a car makes life easier and noted that a two-hour bus trip takes only one hour by car. “A car is not a luxury anymore, it is a necessity.” However, participants did see the disadvantages to owning an automobile, which include having expenses as gas, oil, tire changes, and insurance and license plates.

Group members reported that they do walk to various locations and activities. The advantages to walking, they said, include getting exercise and increasing blood circulation. Over all, walking “is good to your health.” One participant felt that there is nothing “bad” about walking. Others, however, reported the disadvantages to walking include having to be aware of one’s surroundings and being selective regarding where and at what time one walks. The group reported that “people often offer drugs on the street, and the police may think you are a drug dealer.” Additionally, they felt that women are at risk, especially when walking in “dangerous neighborhoods.” One participant said that his/her groceries were stolen as he/she was walking home. Another problem occurs in winter, they said, and if the sidewalks are icy, “you could fall.”

These participants stated they typically go places with someone who has a car. The advantage of ridesharing, they said, is that they get to places on time and have a comfortable ride when it is “cold outside.” However, the disadvantage is that as the rider, you have to accommodate to the car owner’s schedule.

One participant stated that he/she used to ride his/her bike, especially during the summer, but now has a car. Participants see exercise as the main advantage to biking, but see the fact that other drivers do not respect bikers as the main disadvantage. While participants acknowledged the availability of bike lanes, they indicated that these lanes are not available everywhere. In areas without bike lanes, they said, if street traffic is heavy and a biker rides on the sidewalk for safety, police officers may ticket the biker. Participants also reported falling of the bike as another disadvantage to biking.

5. Final Questions

Participants have heard of the new Metro Transit route that goes to the Mall of America (MOA) in Bloomington, and indicated that to get to the MOA from their residence or work, they must

take two buses. One participant mentioned that he/she would like to train service to Detroit or other states.

Brian Coyle Community Center—Somali Speaking

1. Discussion of Activities

These participants spend their time on any given day grocery shopping, going to school, volunteering at the Brian Coyle Community Center, going to the doctor, doing household chores, and working. One participant said that he/she takes the bus to grocery shop; another takes the bus to the doctor. Cooking and going to the doctor and to school are the most important activities to this group. Participants reported that during the Metro Transit bus strike when bus service was halted, they were unable to go grocery shopping or do other activities except attend school.

These participants indicated that they live, shop, and visit their doctor in the Cedar-Riverside area. Generally, they do not leave the neighborhood, because they are unfamiliar with other areas or they need help shopping, cooking, and traveling to the doctor. One participant who lives in the Cedar-Riverside area indicated that he/she does travel to visit relatives or sick friends and travels to Minnehaha (Minneapolis, St. Paul?) to visit grandchildren either by taking a bus, walking, or getting a ride from someone else. Another person said he/she travels out of the Cedar-Riverside area to the post office.

2. Discussion of Trips

Participants indicated that they would like to go to other parts of town if they had a ride. Others said they have no interest in going to other parts of town because of, for example, their age. While others said they needed to go to other parts of town to visit relatives, but during the bus strike they were unable to do so.

Participants indicated that they did not have any problems getting around before the Metro Transit bus strike and noted that they travel primarily by bus. One participant said that the bus is important to his/her family as the family does not own a car. Another participant reported walking to school in his/her neighborhood.

Participants said that if they need to get places quickly, they call a taxi or ask for a ride. They reported also that if the trip takes too long, they miss appointments. One person said that he/she has to get ready in plenty of time to get to the bus stop at least ten minutes before the bus arrives.

Participants indicated that they “rely on God” regarding accidents, stating “God knows what is going to happen.” These participants said that they find bus drivers to be very reliable, but are afraid of the “small-car drivers.” This group said they are more concerned about accidents when walking and believe that drivers “purposely direct the cars at us.” Additionally, this group said that when walking, they are afraid of intoxicated people or youth gangs. “Safety is not always [a sure thing]. Whether you are in the car or on the bus, only God knows what is going to happen.” This group prefers to ride the bus rather than walk.

These participants indicated that they have good transportation options and are able to get all the way to their selected destinations. They reported feeling that the bus goes most places and gets them to where they want to go.

Although these participants stated that they like driving, they didn't feel a car is a necessity. Most felt owning a car is not possible due to unemployment and/or a lack of money. One person commented "cars are very expensive and are not important since you can ride the bus." One participant indicated having a driver's license, but others stated they can get a license only if they have a car. One of the participants requested elderly bus service in her community.

These participants indicated they want transportation that is ready to go when they are and do not want to miss the bus and have to wait for the next one. They also said that taking the bus is better than having no transportation options.

Physical security is an issue when riding the bus, according to this group, and reported that discrimination is a problem and that they often do not feel safe on the bus, especially at night. Some participants reported having been followed after getting off the bus. The group felt a having comfortable physical environment is important when traveling.

Two of these participants traveled out of town last year. One traveled to Willmar by bus and another traveled to Ohio.

Time constraints did not allow SLPP to further discuss computer, transportation modes, and the final questions.

3. Discussion of Computers—NA
4. Discussion of Transportation Modes—NA
5. Final Questions—NA

Hmong American Partnership—Hmong Speaking

1. Discussion of Activities

Note: This group wanted their statements recorded and to have SLPP send the information to Metro Transit.

These participants reported spending most of their time on any given day at home, working, going to school at the Hmong American Partnership, attending U.S. citizen classes or other classes, shopping, visiting their children, visiting relatives if they have someone to take them, cooking and doing household chores, and taking care of children at home. Some of these participants do not know how to drive and reported they stay at home doing household chores, taking care of children, and attend evening classes.

Participants indicated that they travel outside their neighborhoods to the market, to visit friends and relatives, and to take classes. They said also that they either get rides from their children or friends or take the bus to get to their activities. During the bus strike, participants said they walk to destinations. Other participants, who live on the eastside of St. Paul, said they travel by car or bus or get rides from their children. Many walk, take the bus, or get rides from children to travel out of their neighborhood. Walking is a part of their tradition in Laos, as vehicle ownership is rare, and this is something the participants said they are comfortable with even here in the U.S.

2. Discussion of Trips

Participants said that they rely on their children to provide transportation; if the children are working or cannot give them a ride, then they do not have access to transportation and become frustrated. One participant said that he/she is new to this country and does not know how to ride the bus. Another participant said he/she has ridden the entire bus route in order to figure out how to use the bus system and find his/her destination. Another person said that if he/she knew how to drive, the bus strike wouldn't have such a stressful impact on his/her life. All participants stated that not being able to drive prevents them from getting around.

Participants did acknowledge that they fear getting into accidents when they travel. They also are worried, when driving or riding in a car, about getting lost, hurt, or attacked. These issues are compounded for those who cannot read or speak English. Some participants reported being "so scared" they avoid the bus and instead, rely on their children or others for rides. Some of the participants who do not read English and/or are very new to the United States, are worried about getting lost; they cannot read street signs and they do not know where their home is located or what their address is. One person said that if his/her children did not take him/her places, he/she simply does not go. Another person was worried about other drivers and has had three accidents with other drivers who were using cellular phones. Other participants were worried about getting hurt or lost when walking.

These participants said that they prefer transportation options that take them all the way and directly to their final destination. They indicated that they will take the bus or stay home—which is a satisfactory option—when they are unable to get a ride from their children. One participant commented that a vehicle that provides transportation, waits for riders, and then takes them home is less complicated, does not conflict with work schedules, and is less difficult than trying to arrange rides from friends and family. These participants are more concerned about the safety of the person giving them a ride than their own safety, and are negatively effected should something happen to the driver or the driver's car when they are getting a ride. They said they tend to worry when riding in a car and stop worrying upon arriving home. "In the Hmong culture, when we do something, we call upon the spirits to protect our family. We tie a ribbon around our wrist or onto our cars and call upon the spirits to protect [the vehicle] wherever it goes." One participant noted that he/she feels less concerned when riding on a bus than when riding in a taxi. Other participants reported feeling that the car is very important, makes it easy to travel from place to place, and has value. They appreciate the use of a vehicle, because in Laos they usually walked and had to carry things "on their backs."

Several participants indicated that they traveled out of town last year. A few said they did not travel out of town and stayed in St. Paul; one person reported going to the Maplewood Mall in White Bear Lake and the Mall of America in Bloomington. One person reported flying to Laos to visit their sister and brother-in-law and commented "the chance to see my homeland was wonderful." Another participant drove to visit relatives in Appleton, Wisconsin, and recently visited Appleton again for a grandfather's funeral. On that trip, the participant reported having a car accident in which the car and its occupants ended up in a ditch. Another person indicated he/she drove to Green Bay and Milwaukee, Wisconsin, for two funerals. Another participant said he/she flew to Fresno, California, for an uncle's funeral. One participant drove to North Carolina

to celebrate the Hmong New Year, while another participant's daughter and son-in-law drove him/her to Milwaukee. One participant, said he/she vacationed with his/her brother-in-law, who drove, at Yellowstone National Park in Wyoming.

These participants indicated that they do not like traveling in cars, buses, taxis, or even in carpools with people they do not know. They prefer to ride with relatives or people they know. One person commented "if you want to travel with a person who is not related to you, [he/she] probably will not allow you to go with [him/her]." Two participants mentioned they feel safer traveling out of state by bus rather than by car.

3. Discussion of Computers

Two participants indicated that they have a computer or their children do. They indicated that they find it difficult to use the computer and feel the equipment is complicated. One person said his/her age is a factor in his/her not knowing how to use computers. One of the computer owner's sons knows how to use the computer. Another participant reported being afraid to use the computer as "it might burn." (Perhaps start on fire?)

These participants indicated that they do not want to replace trips with computer use. Primarily, they would worry that products purchase online will not be the products actually received by mail. One participant mentioned that it is hard to return products that do not work properly, citing a personal example of cookware purchased online.

4. Discussion of Transportation Modes

Participants stated that their children and grandchildren have bicycles. One person said that he/she would like to purchase a bicycle, but cannot afford to at this time. Another participant said that his/her son and daughter-in-law are do not want their children riding bicycles for fear the children will get into an accident.

5. Final Questions

These participants have not heard of any new transportation ideas and feel the car, bus, and airplane are the most important transportation modes. One person said that he/she most often uses the bus to get around, and if buses aren't running he/she does not travel. Another person said that he/she admires two things in this country: the telephone and the car, which easily take people from place to place without them having to walk.

Roselle Apartments—Somali Speaking

1. Discussion of Activities

Participants stated that they spend most of their time on any given day going to work, looking for work, going to the doctor or dentist, shopping, playing soccer, or visiting friends in the afternoon. Some participants work two jobs and take the bus to work. One participant reported recently being on board a bus that had an accident. Another person indicated he/she is new to the city and takes the bus to look for employment. To these participants, with the exception of the person currently looking for employment, the most important activity is working.

Participants said that most of their activities take place outside of their neighborhoods. One person said he/she plays soccer in a variety of Minneapolis city parks or at 54th and Portland. One participant reported traveling to St. Paul, Anoka County, and most recently, Burnsville for work. This person lost his/her job in Burnsville after a bus delay at the Mall of America made him/her late for work. According to this participant, it is difficult to work in the suburbs because the bus system is unreliable and takes a long time to get out to the suburbs and/or it is hard to find direct connections jobs in the suburbs. These participants indicated that they also visit friends in Minneapolis and go to the Somali Malls in Minneapolis and St. Paul, but do not enjoy the long waits for their bus. One person has visited their dentist and doctor at “Southdale.” (Southdale Mall?) Another participant commented that it is hard for him/her to find a parking space at the doctor’s office, so he/she takes the bus.

2. Discussion of Trips

Participants indicated they would prefer to live near where they work. One person commented, however that it would be too expensive to live in the area where they currently work. Participants said also that it can be difficult to communicate with rental agents and to provide the necessary information, such as rental history, in order to rent an apartment. Another person said that generally, it is better find and apartment in and move to an area or neighborhood in which there are others who speak the same language.

Participants commented that it is important that they be able to get to their destinations quickly and is most important to be on time for work. One participant explained that he/she must take a taxi in order to get to work on time and said that this is a very expensive way to keep his/her job. Participants said also that a large portion of their salary is spent on emergencies. Traffic congestion and unreliable bus service prevent participants from getting to work or other destinations on time.

These participants indicated that they are afraid of getting into accidents when traveling. One person said he/she is afraid of traveling on the freeway because the cars “go too fast.” Another person stated that traffic slowdowns cause problems, such as road rage, and may cause accidents. These participants explained their belief that when they ride on the bus, they give their lives to the bus driver, which is a concern to these people. The participant who was recently in a bus accidents said it is a “problem when people rely on transportation and when buses or bus drivers are not reliable and may cause injury.” Taxis are also of concern to these participants who feel that taxis are prone to accidents in the rain or snow.

Personal safety and security when traveling are important to these participants. One person noted specifically that safety is a concern on Chicago Avenue in Minneapolis. He reported instances of gang violence occurring at a bus stop. Another person said that the bus stop location determines the level safety at the stop, and commented that it is “risky” if the bus stops at a location with poor or no lighting. Another participant explained that crimes can occur early in the morning when commuters are on their way to work. One participant felt uncomfortable walking in Minneapolis, on Lake Street in particular, without a friend or several people with him/her, and felt that walking alone is not safe; his/her friend was attacked when walking alone.

This group indicated that privacy when traveling is not a concern. One person said he/she likes to travel with others on longer trips, for example, to Rochester, Minnesota and feels there is “safety in numbers.” Participants said they also travel with others or friends in Minneapolis, Rochester, and Faribault. One participant stated simply that traveling on the bus is not safe. “If you travel with friends, no one will bother you or will ask for money.” Another person said he/she believes it is good to carpool to work in the morning, but added that he/she likes privacy when traveling for private things.

Participants in this group indicated that they prefer transportation options that take them all the way to their selected destination, with one person adding this shortens the length of time from home to work. Another participant commented that a direct bus connection saves the cost of driving and paying for auto-related expenses such as gas. One person felt that a direct bus connection saves the environment in that fewer cars are on the road. Participants agreed that they all prefer direct connections when taking the bus, so they can take advantage of the time saved “to do other things, like read.”

Participants also said they prefer transportation options that are ready to go when they are. One person commented this “is nice because I can [get to the] places I want very efficiently.” Another participant felt the best option is to call a cab, noting also that “it is hard to rely on transportation that breaks down, offers no service, or has delays.”

These participants had mixed feelings toward having access to the types of transportation choices they really want, indicating that having or not having transportation options “depends on the situation” in how it affects their lives. One person said that the main problem, even if he/she drives his/her own vehicle, is that it’s hard to predict travel time and when traffic slowdowns may occur. No matter what time he/she plans [to arrive at a destination], unless he/she plans more time than expected, he/she is late. Another person suggested that the city and state streamline traffic flow on freeways and main roads to make sure other routes are not congested. Another person said that city and suburban buses are unreliable and service is limited, adding that “more buses are needed, and wait times need to be shortened.”

Several participants reported going out of town last year. One traveled to Faribault and Rochester to look for work and apply for jobs and got a ride with friends who live in Faribault. Another person drove his/her car to Milwaukee, Wisconsin, to visit his/her brothers. One participant took a Greyhound bus to Detroit to visit relatives, while another person said he/she traveled several times to Mankato and also flew to Denver, Colorado, for business.

3. Discussion of Computers

Several participants reported owning computers (4 out of 5 at this point) and are computer literate. One person indicated he/she repairs computers or has a computer training/service job. Another participant said he/she uses the computer to send and receive e-mail messages, to search for jobs, to look for other information including fashion-related topics, and to read newspapers. Those participants who do not own a computer, use computers at internet cafés and at public libraries to fill out job applications, to send résumés, to access entertainment, to play games, to engage in “chat” sessions, to search for books, products, and services, and purchase items on

eBay. Participants feel that using a computer is “an opportunity to network and not have to leave your home for employment.”

These participants indicated that they like to substitute using the computer for taking trips of the house. One person said that the computer offers a more convenient way to pay bills and reduce time spent traveling. Another participant commented that “there is a generation gap” and the younger generation relies more on computers for everyday tasks. Participants felt computers are easier to use the more education one has. However, one participant felt that the downside to computer use is that it reduces people’s interactions with each other, adding “there is no first-name interaction, and interaction in general disappears.”

Participants agreed that they can reduce the number of trips they take by using the computer to pay bills instead of traveling to the post office and to do research from home rather than go to the library. One person said that the Internet is a good way to obtain travel information such as directions, travel time, and mileage. Another person reported that the Internet is good useful for ordering groceries or scheduling other delivery or pick-up service.

4. Discussion of Transportation Modes

Two out of five participants reported owning a car. The advantages to car ownership, they said, is it takes them where they want to go, is reliable, and offers privacy. The disadvantage to owning a car is the expense.

Participants reported that the advantage of bus service is that it is good for the environment and helps reduce pollution [by reducing the number of vehicles on the road]. Biking also reduces pollution, they said, and is good exercise, saves money, and is best used in good weather conditions.

Those participants who do not own a car reported that they receive rides to work and other places from friends, work carpools, buses, or taxis. One person said that in an emergency, he/she relies on friends who own a car, but otherwise takes the bus. Participants generally agreed that a car is the best way to get around.

5. Final Questions

These participants reported that language barriers present problems when traveling. One said that this is especially an issue for people new to an area and who do not know the area well or how to get around. Another person reported that most language-related problems occur for those who do not speak English and are unable to communicate with bus or taxi drivers, adding that “if a driver doesn’t understand you and you have to repeat yourself, this creates tension.” Participants noted that slang words and expressions are especially difficult to understand and said also that cultural barriers, including what is considered acceptable personal space and modes of talking, present challenges. “Somali people are lively and like to sit near each other,” one person reported. “People here have a different concept of space and do not like to share seats.”

Appendix E
Telework Case Studies:
Persons with Disabilities

Case studies provided by Midwest Institute for Telecommuting Education (MITE), 1900 Chicago Avenue, Minneapolis, Minnesota 55404

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Dataserv, Inc.—Dispatchers

Dataserv, Inc., now merged with WANG, is a technology maintenance provider for high tech companies. They are a 24-hour by 7-day operation. The call center typically had 64 full-time equivalent (FTE) dispatchers, a job which typically has a high employee turnover rate per year (more than 30 percent). One major reason for having a home-based workforce was to increase employee retention. Dataserv hired four full-time dispatchers with disabilities to work from home. The individuals dealt with Multiple Sclerosis (MS), back injury, complications of cancer, and hearing sensitivity to noise. These workers dispatched customer calls and requests to a large number of field engineers throughout the U.S.

The company duplicated all office equipment and telecommunications in each person's name and ensured that it was an ergonomic set up. These telecommuters initially were trained at the company for two to three weeks and regularly returned to the corporate site for staff meetings and training. Coworkers kept in touch on a regular basis. The company put the pictures of the four off-site workers on a wall in the call center. After working for Dataserv for three years, one of these dispatchers was named "Employee of the Year."

During a three-foot snowstorm at the corporate site in Minnesota, none of the in-house dispatchers were able to get to work, and the telecommuting employees took all customer calls for 30 hours straight. Using home-based workers ended up being a disaster recovery program for the company, in addition to increasing employee retention.

Precision Tune Auto Care—Customer Service

Precision Tune Auto Care hired three contractual workers to perform customer service follow-up calls for several of their locations in the Twin Cities. Persons worked out of their homes between 20 and 30 hours per week. The Minnesota Resource Center acted as the employer and hired individuals as temporary employees. As a small company, Precision Tune did not have occupancy space for the three employees; although, they wanted to implement a customer follow-up service and found an innovative way to accomplish it. After six months, Precision Tune permanently hired these contract employees because the company did not want to lose the skill base and customer knowledge these three people had gained as contract workers.

ChimneySweeps—Scheduler/Secretary

A sole proprietor who provided furnace and air conditioning maintenance services hired an individual with arthritis to schedule his appointments and handle customer phone calls. He would forward his office line to this employee's home after 9 a.m. each day until 5 p.m. The employee

also regularly handled some of the weekend calls and was able to relay emergency calls. This was the perfect solution for this employer, because he was not able to take calls while working on other projects. The employee provided full call coverage, which helped serve the needs of business customers.

Law Firm—Customer Service

A firm in Duluth, Minnesota, hired an individual to take calls from 5 to 10 p.m. Calls were forwarded from the law offices to the employee's home. At one time, the law firm ran television advertisements and received many calls at night. This employee extended the phone coverage to handle the needs of potential customers.

Northland Insurance Company—Transcriber

This firm employs two telecommuters who work 30 hours a week at home transcribing accident reports from audiotapes and sending them to the corporate site via modem. One of these individuals has been unable to work in a regular position for more than 10 years due to MS. The other person has chronic back pain that requires her to change position every 15 to 20 minutes. Working at home allows both employees to spread six hours of work over an entire day, and accommodate needed breaks. The State initially purchased the equipment for the employees. The employer provided software and courier services.

RESOURCE, Inc.—Secretary

This large, nonprofit organization has a home-based secretary who splits her time between two programs. The employee copes with disability-related fatigue and pain, and telecommuting enables her to better manage and maintain her health. If this employee worked in-house, her daily commute time would be almost two hours. This employee is responsible for database management, mailings, and handling customer calls and orders. She attends regular staff meetings and maintains daily contact with coworkers via e-mail and voice mail. The company provides all equipment and pays for an additional phone line in her home and for voice mail.

United Way—Information Specialists

Nonprofit agencies such as the Minneapolis United Way have implemented a pilot program in which referral specialists receive calls and provide information and assistance. This is an excellent strategy to give 24-hour service to callers in need. Individuals with disabilities work from home and have calls from the corporate office forwarded to them at 4:30 p.m. each day; calls are then forwarded to the next employee at midnight. Seven individuals with severe disabilities have found long-term employment and work 20 to 30 hours per week. A coordinator, who also has a disability, supervises this staff. These employees want to work part-time so they can still retain their medical assistance. The company provides periodic training updates that employees are required to attend in-house.

SERVICE 800—Customer Service Representatives

This company has more than 100 customer service representatives who work from their homes. Telecommuters conduct customer satisfaction calls for contracts the company has with large technology service vendors. Many of these employees deal with chronic or changing disabilities. The employees conduct their work during business hours and bill the long distance calls back to the company. They are connected via modem to receive their customer follow-up lists and are assigned projects each week or month. These employees regularly send customer response feedback they receive to the company. The employees are currently contractors with SERVICE 800 and are asked to provide a computer with a Pentium processor. The company provides software and covers all related costs.

Staying on the Job Resource Manual: Managing Employees with Chronic and Changing Disabilities

The *Staying on the Job (SOJ)* resource manual examines issues and provides solutions for the challenges supervisors face as they hire and retain employees with chronic and changing disabilities. This manual provides examples of accommodations such as telecommuting and flex-hours that help the employee work while coping with fatigue, loss of concentration, chronic pain, temperature sensitivity, or mobility impairments.

For more information about SOJ or for an SOJ training manual, contact Ann Gilbert at: (612) 752-8118 or agilbert@ersource-mn.org.

Appendix F

Manager Interview Questions

Manager Interview Questions

I. Transportation Markets

1. What is the demographic profile of users of your carsharing service?
2. Has your organization tried to extend its service to users of differing demographic groups such as the elderly, low-income, non-white, or others you have identified?
3. What opportunities and challenges have you faced regarding attempting to serve these populations?
4. Can the demand for carsharing from these groups support your organization's business model?
5. What kinds of activities do your members typically use the service for?
 - a. Work
 - b. Recreation
 - c. Out of town
 - d. Healthcare
6. To what degree does this alternative provide transportation:
 - a. Within a neighborhood
 - b. Within a city
 - c. Among cities in a metropolitan area
 - d. Out of metropolitan area

II. Strengths and Weaknesses of Alternative

7. What advantages/constraints does your organization face, and what complaints/compliments from users does your organization as a provider receive regarding the following:
 - a. Safety of service
 - b. Offering reasonable travel time to a range of activities
 - c. Accessibility to users
 - d. Security for users
 - e. Ease and comfort of service
 - f. Privacy
 - g. Affordability (differing impacts for different income groups, fixed versus out of pocket)
 - h. Flexibility
 - i. Marketing to potential riders
 - j. Training
 - k. Member services

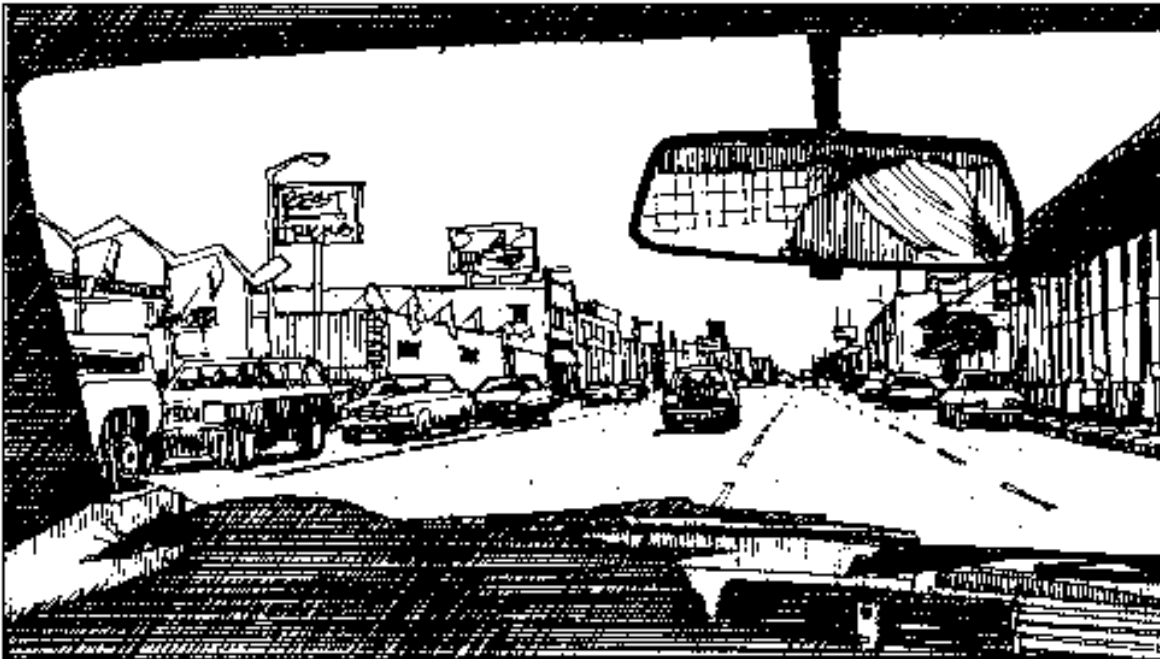
III. Implementation Issues

8. How is your business plan financed? Does your organization receive government funding? Grant funding?
9. Has your organization engaged in partnerships with other transportation services? If so, what is the nature of those partnerships?
10. What labor costs are involved in implementing the service?
11. What administrative overhead costs are involved in implementing this service?
12. How is technology used in the day-to-day operation of the organization? For instance, what is the process one typically uses for reserving a car?
13. What kinds of advantages and problems are you facing in using your technology, and are there new technologies being explored to meet some demand within your operation?
14. What would this provider recommend to anyone trying to implement this program in Minnesota in the future?

Appendix G

Survey Instrument

Intelligent Transportation Systems in Community-Based Transportation



A Survey prepared by

State and Local Policy Program
Hubert H. Humphrey Institute of Public Affairs
University of Minnesota
301-19th Ave. South
Minneapolis, Minnesota 55455

Survey: Intelligent Transportation Systems in Community-Based Transportation

This survey is part of the study entitled **“Using Intelligent Transportation Systems (ITS) to Better Serve Diverse Populations.”** Please read the consent form above before filling out the following survey questionnaire. The Community-Based Transportation (CBT) component in the research in this study has two stages. In the first stage, please fill out this short survey. At the end of this survey, the State and Local Policy Program (SLPP) will invite you to an second stage in-depth interview, if you are interested in ITS, and/or plan to deploy ITS in your organization.

Part I: Service Characteristics

1. Is your organization _____? (Please circle one)
 - 1) Public
 - 2) Non-profit
 - 3) Private for profit

2. What is the nature of your service? (Circle all that apply)
 - 1) Fixed route
 - 2) Flexible fixed route
 - 3) Dial-a-ride
 - 4) Other (Please specify)_____

3. How large is your total service area: _____square miles? (Please fill in the blank)

4. Your main service area is: (Circle all that apply)
 - 1) Urban
 - 2) Small Urban
 - 3) Suburban
 - 4) Rural

5. On average, how much time does a typical rider spends on your vehicle during a trip: _____minutes. (Please fill in the blank)

6. How many vehicles (Your fleet size) do you have? (FIRST, fill in the “Number of Vehicles” and SECOND, check “Yes” or “No” for wheelchair accessibility)

Type of Vehicles	Number of Vehicles	Wheelchair accessible	
		Yes	No
Bus (40-foot and above)			
Bus (smaller than 40-foot)			
Van			
Car			

Part II: Ridership Characteristics

7. How large is your total ridership per year? _____ Trips/year. (Please fill in the blank)
8. What is the percentage of each type of riders (Riders clientele mix)? (Please fill in the blanks)
- 1) Senior _____%
 - 2) Disabled _____%
| _____ Within which, Senior Disabled _____%
 - 3) Non-English Speaking _____%
- AND
- 4) General Public _____%
| _____ [People without car _____%
| People with car but ride _____%
9. What is the expected demographic trend in your ridership in 10 years? (Please choose “more” or “less” for each population)
- 1) Senior (65+) riders _____ more _____ less
 - 2) Disabled riders _____ more _____ less
 - 3) Non-English Speaking riders _____ more _____ less
 - 4) People without car _____ more _____ less
 - 5) People with car but choose to ride _____ more _____ less
 - 6) Other (Please specify) _____ more _____ less
10. Your clients/riders primarily use your service to go to: (Circle all that apply)
- 1) Non-emergency medical care'
 - 2) Social Services
 - 3) Job training/Employment assistance (“welfare-to-work”)
 - 4) General transit services (Americans with Disabilities Act requirements)
 - 5) Poverty relief
 - 6) Care for the elderly
 - 7) School and Headstart
 - 8) Other (Please specify) _____
 - 9)

Part III: Service Technologies

11. Currently, your service takes trip request that is _____ in advance. (Circle all that apply)
- 1) 7 days
 - 2) 4 days
 - 3) 1 day
 - 4) 5 hours
 - 5) 1 hour
 - 6) Half-an-hour
 - 7) Other (Please specify) _____
12. Do riders transfer from your service to other agencies' vehicle? (FIRST, circle one choice and SECOND, fill in the blank)
- 1) Yes, some of them _____% of them
 - 2) Yes, only a few _____% of them
 - 3) No
 - 4) Don't Know

13. What technologies do you use (FIRST, choose all that apply) and how do you perceive your riders feel about them (SECOND, rate them)?

(Circle all that apply)	ITS in CBT	<i>In your opinion, your riders think these technologies are: _____? (Circle one for each technology you use)</i>			
		Very helpful	Somewhat useful	Not very helpful	Not helpful at all
1)	Dispatcher-driver voice/text communication	4	3	2	1
2)	Computer-aided schedule/dispatch software	4	3	2	1
3)	Computer-aided accounting software	4	3	2	1
4)	Customized Spreadsheet and Databases	4	3	2	1
5)	Global Positioning System (GPS) & Automatic Vehicle Location (AVL)	4	3	2	1
6)	Mobile Data Terminal (MDT)	4	3	2	1
7)	Geographic Information Systems (GIS)	4	3	2	1
8)	Web site for customers to schedule a trip	4	3	2	1
9)	SmartCard technologies	4	3	2	1
10)	Electronic fare collection	4	3	2	1
11)	Maintenance Software	4	3	2	1
12)	Palmtop Computer/ Personal Data Assistants (PDAs)	4	3	2	1
13)	Other (please specify)	4	3	2	1

14. You like these technologies because they are: (FIRST, circle all that apply and SECOND, check reasons why they are helpful to you in the table)

	(Circle all that apply)	ITS in CBT	These technologies are helpful because they are...							
			More efficient to schedule reoccurring trips	More efficient to schedule on-demand trips	Easier to schedule transfer with other agencies	Easier to track down different payment types with subsidies	Saving staff time, personnel cost	Reducing errors	Providing real-time information of the system	Easier to coordinate with other agencies
1)	Dispatcher-driver voice/text communication									
2)	Computer-aided schedule/dispatch software									
3)	Computer-aided accounting software									
4)	Customized Spreadsheet and Databases									
5)	Global Positioning System (GPS) & Automatic Vehicle Location (AVL)									
6)	Mobile Data Terminal (MDT)									
7)	Geographic Information Systems (GIS)									
8)	Web site for customers to schedule a trip									
9)	SmartCard technologies									
10)	Electronic fare collection									
11)	Maintenance Software									
12)	Palmtop Computer/ Personal Data Assistants (PDAs)									
13)	Other (please specify) _____									

15. If budget allows, do you want to add the following technology to your system? (Please list in priority: 1=Highest,2=Second,3,4...etc.)

- 1) ___ Dispatcher-driver voice communication
- 2) ___ Computer-aided schedule/dispatch software
- 3) ___ Global Positioning System (GPS) & Automatic Vehicle Location (AVL)
- 4) ___ Computer-aided accounting software
- 5) ___ SmartCard
- 6) ___ Other (please specify)_____

16. Please describe riders' needs that are not adequately met currently. Do riders___? (Circle all that apply)

- 1) request more on-demand service
- 2) request more predictable pick-ups
- 3) want to know where the vehicle is
- 4) want easier fare-paying method
- 5) request non-English service
- 6) request better timed-transfer
- 7) other (please specify)_____
- 8) Don't Know on the part of transit service agency

17. What changes have you seen in the system since you adopted ITS Application (please specify the type of technology you use_____)? (circle all that apply)

- 1) Increased ridership
- 2) Fewer complaints
- 3) Happier employees
- 4) Lower operating costs
- 5) More service for the same, or less, cost

18. Any suggestion and comments on "how to use ITS to improve the service of CBT"?

19. I am interested in the final report of this study. ___Yes, ___No (Please check one)

Thank you for filling out the above survey!

PLEASE MAIL THE SURVEY FORM TO:

Yufeng Guo
Research Assistant
State and Local Policy Program
Hubert H. Humphrey Institute of Public Affairs
University of Minnesota
301-19th Ave. South
Minneapolis, MN 55455

Cover graphic courtesy of Florida Center for
Community Design +Research, School of
Architecture and Community Design, University
of South Florida

Appendix H

Interview Questions

Interview Questions

For the study of “Using ITS to Better Serve Diverse Population”
MnDOT GuideStar 2002 Research Project
State and Local Policy Program
Humphrey Institute of Public Affairs
University of Minnesota

Framing the context of dialogs:

1. Please describe your agencies needs not currently met: _____ (Choose all that apply)
 - 1) Repetitive scheduling
 - 2) Scheduling error
 - 3) Dispatching error
 - 4) Dispatching difficulties
 - 5) Linguistic translation difficulties (central translator/dispatcher with voice communication capacity)
 - 6) Subsidy account management (for different types of riders)
 - 7) Financial report management (to different agency)
 - 8) Coordination with other agencies
 - 9) Flexible management (with volunteer drivers)
 - 10) Other _____

Open-ended Question:

(If your agency has not yet used ITS, go to question 29)

Planning Experience

2. What ITS do you use right now?
3. How did you decide to employ ITS and what did you expect it to do for you?
4. Where did you get the most informative ITS information or advice?
5. What sort of planning process, if any, did you use?
6. What agencies or private firms were involved in the planning process?
7. Did you involve the stakeholders? Which ones?
8. How long did the planning and implementation process take?
9. Did the planning and implementation of ITS involve more or less of your time, staff time, driver time than you anticipated?

Implementation and Operational Experience

10. What were the greatest challenges in implementation?
11. What problems arose, and how did you overcome them?
12. What type of new training did the ITS application require? How did you provide the training? What was the cost to the system in dollars/time?
13. Were there any new safety issues that arose from the ITS implementation?
14. How do you reach your customers to keep them informed or to receive feedback?

Evaluation of ITS Application

15. What has made it a success? Can you identify one or two things?
16. Why have you stayed with the system?
17. Did you establish an evaluation procedure for the new processes, equipment, and outcomes? Who did the evaluation?
18. What changes were made to the system as a result of the evaluation?
19. Have the benefits you envisioned been realized? How so?

Lessons Learned

20. What is the one thing that made the system work for you?
21. What were your smartest moves? What is the best thing you can do that costs you little or nothing?
22. What do you wish you knew before you started?
23. If you had to do it again, what would you do differently?
24. Was the level of training you received adequate?
25. Was the funding adequate?
26. Are there lessons learned or things you could say are good approaches to implementing and using ITS? What advice would you give to anyone considering it or trying to implement ITS?
27. Your agency's future plan in ITS deployment?
28. What information in this study do you think can best help you?

If your agency is looking for new ITS deployment in your service...

Next Steps

29. What type of ITS you are looking for? What characteristics it should have?
30. Why do you think you need it? What do you expect it can do for your clients?
31. What changes it will bring to your services?
32. What needs to be changed in your agency in order to plan, implement, and evaluate the new ITS?
33. Why similar agencies like that of yours did or did not use ITS?
34. What information in this study do you think can best help you?
- 35.

Can I call you for some clarifications of your answers, if there is any?

Please send your answers to:
Yufeng Guo yguo@hhh.umn.edu

Graduate Research Assistant
State and Local Policy Program
Hubert H. Humphrey Institute of Public Affairs
University of Minnesota
301-19th Ave. South
Minneapolis, MN 55455

Appendix I
List of Transportation Agencies Contacted

A.B.L.E.

Ability Building Center

Accessible Space

Achievement Center

Adult Day Services of Bemidji

Ageless Care Options

Allina Hospitals & Clinics Medical Transportation

American Cancer Society

American Red Cross of St. Paul

Annandale Heartland Express

Anoka County Traveler

Anoka, City of

Arlington Good Samaritan Center

Arrowhead Transit

Atwater, City of

Becker County DAC

Becker County Transit

Benson Heartland Express

Bethany Adult Day Services

Bethany Home

Better Care Lines, Inc.

Bois Forte Reservation Tribal Council

Brainerd / Crow Wing County Transit

Brown County Heartland Express

CARE AND SHARE GROUP OF PLYMOUTH
SENIOR CITIZENS CLUB

Carver County Rural Transit (CART)

CEDAR RIVERSIDE PEOPLE'S CENTER

Cedar Valley Services - AlbertLea

Cedar Valley Services - Austin

Center of Human Environment

CentraCare Health Services of Long Prairie

CENTRO CULTURAL CHICANO

Chisago-Isanti County Heartland Express

Clay County Rural Transit

Clearwater DAC

Clearwater Heartland Express

Cloquet Community Education

Cloquet Dial-a-Ride

CLUES

Community Alliance East Home

Community Hospital – Cannon Falls

Community Options and Resources

Connections of Moorhead

LUTHERAN CHURCH OF THE GOOD
SHEPHERD

Lyngblomsten Foundation

Mahnomen County DAC

Mahnomen County Heartland Express

Main Street Industries

Mankato Heartland Express

Maple Grove Dial-a-Ride

Maple Grove Transit

Martin County Heartland Express

Martin Luther Manor

Meeker County Transit

Merrick Inc.

Metro Mobility

Metropolitan Health Plan

Midway Transportation

Mille Lacs Health System

MINNEAPOLIS AMERICAN INDIAN CENTER

Minneapolis Indian Services Center

Minnesota Valley Transit Authority

MN Masonic Home - Sr Outreach Services

MN Valley Action Council

Model Cities Health Center

Moorhead Area Transit - Paratransit

Morris Transit

MorrTrans

Mountevideo Heartland Express

Mounticello Heartland Express

Mower County Transit

MRCI

Murray County DAC

Murray County Heartland Express

Norman County DAC

North Suburban Senior Council

Northeast Contemporary Services

NORTHEAST SENIOR CITIZEN RESOURCE
CENTER

Northeast Suburban Transit

Northern Itasca Health Care Ctr

Northfield Transit

Northland Transportation

ODC Inc.

Options Inc.

Park People Mover

Paul Bunyan Transit

COOPERATIVE ADULT MINISTRY (CoAM)	Perham Hospital District
Cottonwood County DAC	PHASE
Cottonwood County Transit	Phoenix Alternatives, Inc.
DAC - Bemidji	Pillsbury United Communities
DARTS	PILLSBURY UNITED COMMUNITIES
Dawson Heartland Express	Pine County Citizens Commission on Aging
Deer River Health Care Center	Pine Haven Care Center Inc.
Delano Area Transportation	Pipestone Transit System
Duluth Transit Authority - Stride	Plymoth Metrolink
East Grand Forks City Bus-Dial-a-Ride	Polk County DAC
East Metro Transit Redesign	Prairie Five Rides
East Polk County DAC	Prairie Manor Nursing Home
EAST SIDE NEIGHBORHOOD SERVICE, INC.	Prairieland Transit System
East Side Neighborhood Srvs	Preston Good Samaritan
East Suburban Resources	PRISM
ECCO - Hope DAC	ProAct- Eagan
Edina Dial-a-Ride	Pro-Act-Redwing
Elders Home Inc.	Productive Alternatives
Emmanuel Nursing Home	Progress Inc.
Employment Enterprises	Rainbow Rider Transit
Enterprise North	Red Wing Ride
EPIC Enterprises Inc.	Redwood Falls SOS
FAIRVIEW SOUTHDALE HOSPITAL SENIOR	
TRANSPORTATION SERVICE	Regional Rehab Center -Duluth
Falls DAC Inc	Renville County Heartland Express
Far North Transit	Renville Cty Comm.Residence Inc.
Faribault County Prairie Express	RISE
Faribault Flyer	Riverrider Public Transit
Fergus Falls Senior Citizen's Program	Riverview Healthcare Association
FIVE CITIES SENIOR TRANSPORTATION	Rochester Zumbro Inedependent Passenger
PROGRAM	Service (ZIPS)
Floodwood Services and Training	Rock County DAC
Focus Corporation	Rock County Public Transit
Functional Industries	Roseville Area Circulator
Good Samaritan Nursing Home	Roseville Area Senior Program
Good Shepard Community	Rum River Transportation Collaborative
Graceville Health Care Center	Saint Peter Transit
Granite Falls Heartland Express	Scott County Transit
Grant County Alpha Transit	Semcac Transportation
Greenview Health Care Center	Senior Transportation Program
Greenwood Connections	Service Enterprises
Guardian Angels of Elk River	Sibley County DAC
H.S.I. Transportation	Sojourn Adult Day Services
Hallie Q. Brown Center	Southwest Metro Transit
Halstad Lutheran Memorial Home	Spring Valley Care Center
Harmony Community Hospital	St. Benedicts Senior Community
Harry Meyering Center	St. Cloud MTC Metro Bus plus Paratransit

Hastings TRAC
Healtheast Transportation
Heartland Homes Inc.
Hennepin County Medical Center
Heritage Living Center
Hibbing Area Transit
Hillcrest Nursing Home
Hopkins HOP-A-RIDE
Hubbard County DAC
Hubbard County Heartland Express
Human Development Center
Independence Center, Inc.
Indian Family Services
Industries Inc.
INTERAGENCY ELDERRIDE
Isanti County Comm. on Aging
Itasca DAC
Jackson County DAC
Jewish Comm. Ctr. of St. Paul
Jobs Plus, Inc.
Kanabec County Senior Citizens

Kandiyohi Area Transit

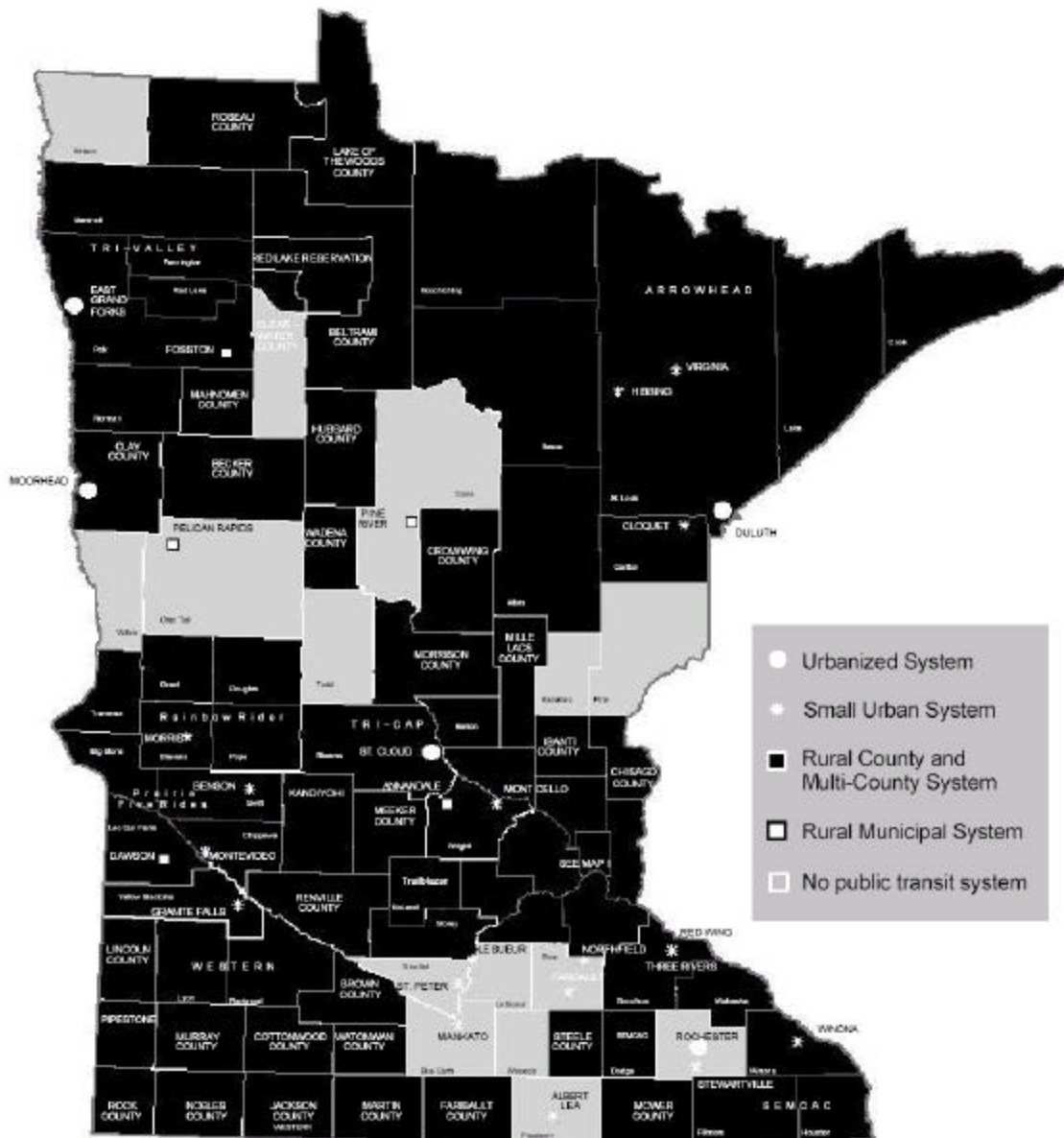
Key Transportation, Inc.
Kittson County DAC
Kittson Memorial Hospital
Laidlaw Transit Service

Lake Area Bus (LAB)
Lake Lines
Lakeshore Lutheran Home
Lakewood Health System
Le Sueur Heartland Express
LeSueur County DAC
Lifeworks Services Inc.
Lincoln Heartland Express
Linwood Senior Center
LITTLE BROTHERS, FRIENDS OF THE
ELDERLY
Littlefork Medical Center

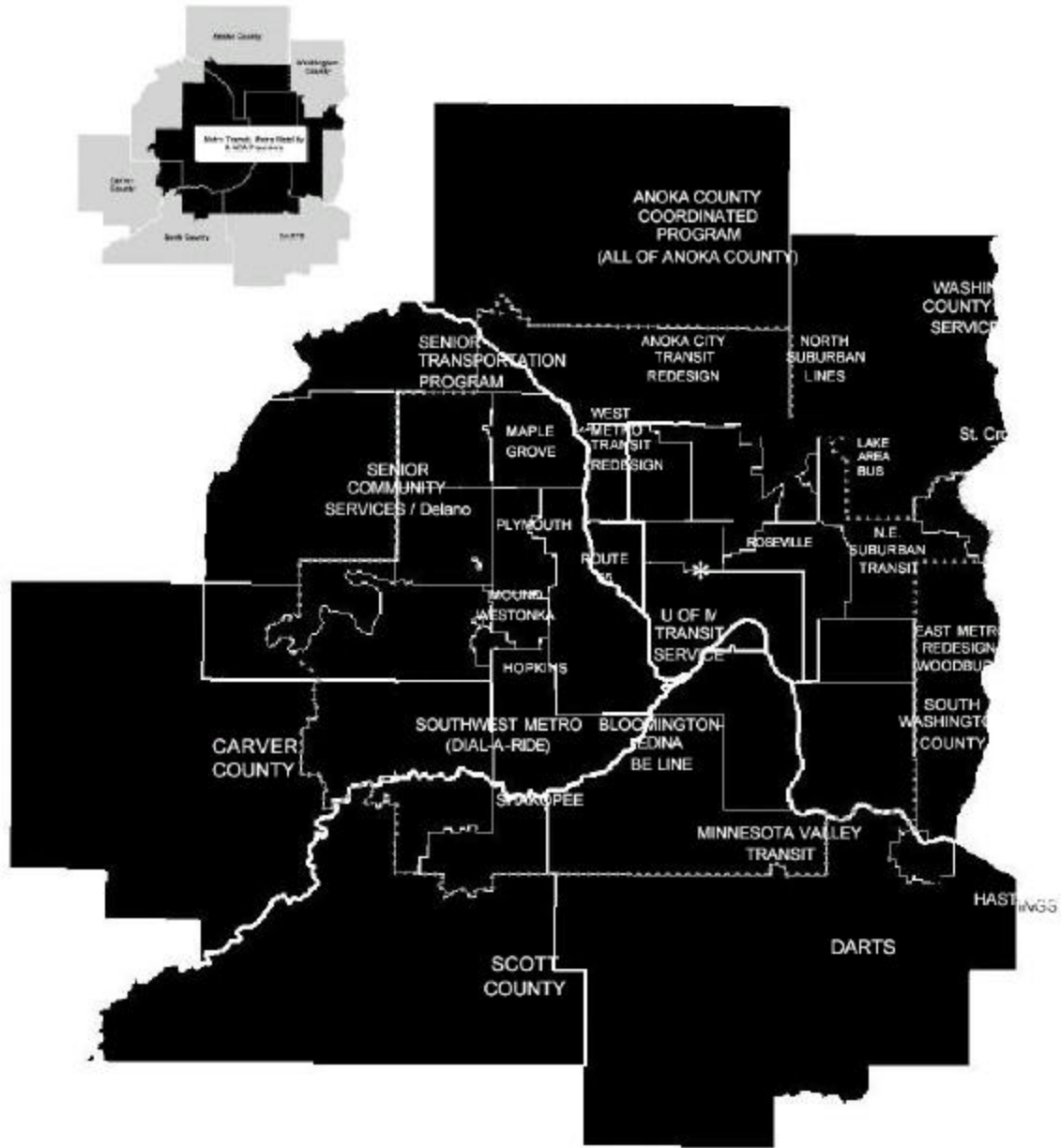
St. Croix Valley Transit
St. Elizabeth Hospital and Nursing Home
St. Francis Health Services
St. Johns Lutheran Home
St. Louis Park Public Schools
St. Olaf Residence
St. Otto's Care Center
Steele County Area Transit
STEP, Inc
Three Rivers Hiawathaland Transit
TLC Special Transportation
Trailblazer Transit
Tranby Healthride
Tri-Cap Transit Connection
Trimont Health Care Center
Tri-Valley Heartland Express
UDAC, Inc.
University Good Samaritan
Valley View Nursing Home
Villa St. Vincent
Virginia Dial-a-Ride
VOLUNTEERS ENLISTED TO ASSIST
PEOPLE (VEAP)
Volunteers of America – Senior Services
Division
Wadena County DAC
Wadenda County-Friendly Rider
Watsonwan Take Me There
Western Community Action Transportation
Program
Westonka Rides
White Bear Area Senior Program
White Knight Transportation
Winona County DAC
Winona ORC Industries
Winona Transit Service
Woodland Centers

Appendix J
CTB Service Map
from 2003 Minnesota Transit Report

Map I – 2003 Greater Minnesota Public Transportation Systems

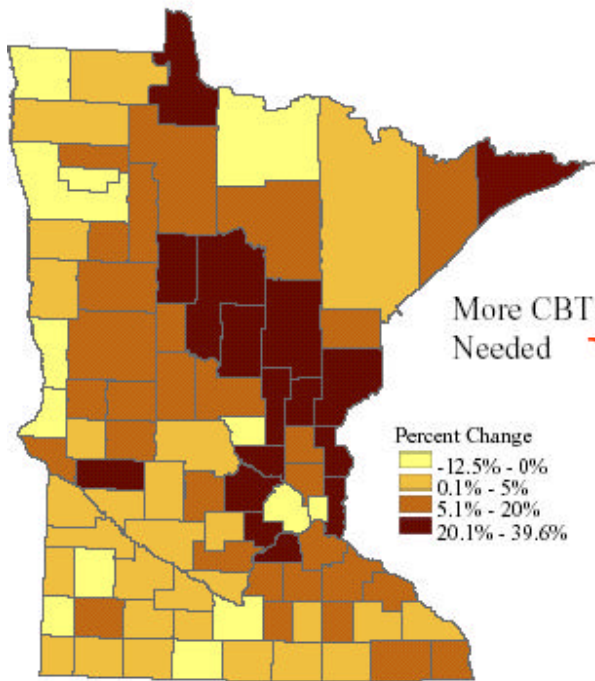


Map II – 2003 Twin Cities Metropolitan Area Public Transportation Systems



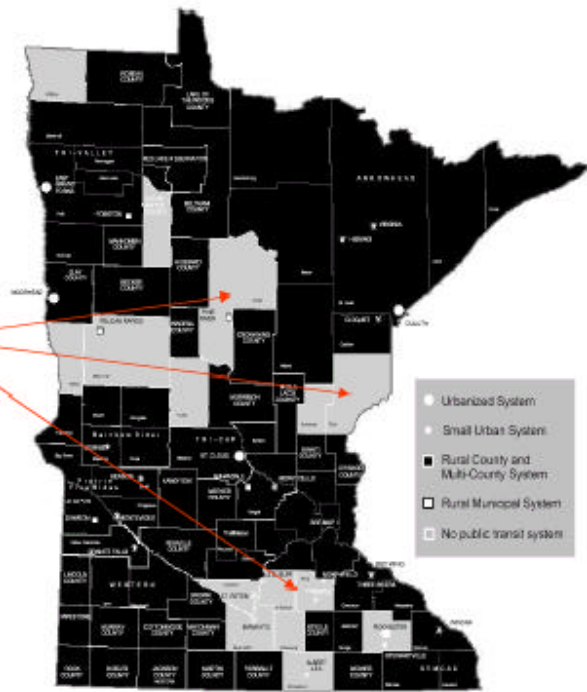
Appendix K
Potential CBT Improvement Area Suggestion

Baby Boomer Population Change, 1990-2000



This map was created by calculating the percent change in population of Baby Boomers in 1990 (26 to 44 years old) by the population of Baby Boomers in 2000 (35 to 54 years old).

2003 Greater Minnesota Public Transportation Systems



More CBT
Needed



Appendix L

Best Practices

ITS used in CBT agencies were explored not only in Minnesota. There are many successful stories in terms of using ITS to better serve diverse populations nationwide. The following three examples are intended only to provide a snapshot of how different ITS can be combined in different institutional environments to provide better customer services. In the case of Dakota Area Resource and Transportation for Seniors (DARTS), it uses a combination of Pass, MDT, and GPS/AVL, and is now considering Web-based scheduling and continues exploring the use of appropriate and markedly available technology to serve its clients. In the case of Client Referral, Ridership, and Financial Tracking (CRRAFT), developed by the Alliance for Transportation Research Institute at the University of New Mexico, it uses a Web-based software system with scheduling, dispatching, funding allocation, automatic report generating capacity, and SmartCard technology to perform its inter-agency coordination tasks. In the case of Independent Transportation Network (ITN), it uses GIS-assisted dispatching in carsharing, which may be a new direction for CBT to take.

DARTS

When: Started in 1975

Where: Dakota County, Minnesota

What: non-profit senior and disabled transit service

Who: seniors and people with disabilities

Technology: GPS system in conjunction with computer-assisted scheduling and dispatching

Smart DARTS is a field operational test applying advanced technologies in a suburban paratransit environment. Phase 3 calls for the addition of AVL/MDT technology only, building upon the computer-assisted dispatch concepts that were tested in earlier phases. (Mn/DOT: 1998. Smart DARTS Phase 3 RFP Announced. 2003.)

In July 2002, DARTS launched Phase 3 of the Smart DARTS project, which involves placing mobile data and global positioning units in five of the 35 DARTS buses. This technology allows drivers to receive their schedules electronically when they start in the morning and gives the dispatch office “real-time” status and location information throughout the day. By December 1, the remaining 30 buses will be similarly equipped. When fully-implemented, DARTS will share this technology and expand to 50 mobile units, allowing DARTS to offer same-day ride service for those riders who were unable to call in advance to schedule a ride. This is an experimental project with many partners. It will be a model for the metropolitan area and entire state as transit providers seek better ways to coordinate their services through technology. (DARTS: 2002. DARTS Journal, Fall 2002. 2003.)

On April 1, 2003, DARTS began full service using GPS. The Hennepin 2002 Research Project carried out by SLPP took a closer look at the Smart DARTS GPS program and concluded that GPS has brought lower denial rates for same-day ride requests, by comparing two sets of data from April to August 2002 and from April to August, 2003. After the GPS deployment, same-day request denials were reduced in terms of percentage of the total rides requested. Other things being equal, this analysis may well mean that the GPS technology has helped DARTS dispatchers with real-time ride accommodation, through the communication with drivers and the knowledge of where vehicles are located. The significance of the study means that GPS could help CBT providers with greater efficiency when dispatchers can schedule more trips in real-

time while vehicles are out on a pick-up or drop-off route. This increases efficiency in route scheduling, number of buses needed, and staff efforts and reduces ride denials, wait times, and rider anxiety while waiting for the bus.

CRRRAFT

When: Began in 2000

Where: New Mexico

What: Rural statewide Web-based coordination system

Who: Welfare-to-work recipient, rural population

Technology: Web-based software system with scheduling, dispatching, funding allocation, automatic report generating capacity, and Smart Card system

This project enables The Alliance for Transportation Research Institute (ATRI) to work with the New Mexico Highway and Transportation Department's Public Transportation Programs Bureau (PTPB) to implement intelligent transportation systems (ITS) architecture for transit systems. The Institute will develop and implement a Web-based software program called the Client Referral, Ridership, and Financial Tracking System (CRRRAFT) and procure a multipurpose electronic fare-card system. CRRRAFT is designed to integrate human services transportation referral processes with daily rural public transit operations. For human services agencies, CRRRAFT standardizes client transportation referral and works with the state's current electronic benefits transfer cards. For transit operators, CRRRAFT simplifies ridership reporting and invoicing. It will help the PTPB and rural transit systems accurately track passengers and bill trips. In New Mexico, human services agencies will refer clients for transportation through CRRRAFT. CRRRAFT's modular design supports easy modifications, including the addition of funding agencies such as the State Agency on Aging Programs, Indian and Public Health Services, and others. This project is funded under the National ITS Program, administered by the Department's ITS Joint Program Office. (TRB: 2003. New Mexico Client Referral, Ridership, and Financial Tracking Systems. 2003.)

In 2000, the ATRI at the University of New Mexico began to develop a Web-based software application to coordinate rural transportation funding. The CRRRAFT system is an interagency effort that includes the New Mexico Department of Labor, the New Mexico Human Services Department, the New Mexico State Highway and Transportation Department's Public Transportation Programs Bureau (PTPB), and rural transit service providers.

The project has three major components and a number of unique features. Part 1 involved developing a Web-based software program to certify and schedule trips, track riders, bill trips, and generate reports. After considering a variety of off-the-shelf products, ATRI and PTPB decided to build their own Web-based application. The project was designed to address the diversity and spatial distribution of transit systems by having a single application reside on a server, which is accessible to agency users over the Internet. ATRI believes that the Web-based design will save costs and time of installing, troubleshooting, and upgrading software. Part 2 of the project involves establishing the Internet connections between the CRRRAFT server and the rural agencies so these agencies' employees can access trip information, do billing, and produce reports without having the CRRRAFT system installed locally. At the time of the site visit, the beta testing phase has been completed, and ATRI has performed initial training at two rural transit systems. Once the system is implemented at all 26 of the transit systems, ATRI estimates

that approximately 150 vehicles will be tracked, and between 3,000 and 5,000 clients will be included in the system. Part 3 involves procurement of a multipurpose electronic fare-card system and in-vehicle card readers that will be integrated with the CRRAFT system. The farecard will use the state's current electronic benefits transfer (EBT) card to issue transportation privileges to human services clients. Infrequent general-public riders also will be able to buy disposable, magnetic stripe passes that can be used on the transit vehicles, while frequent general- public riders will have access to a card similar to the EBT card.

Monitoring of transportation providers by state agencies is often viewed as a difficult task in the transit community. Development of the CRRAFT system provides a model of how agencies can use technological solutions to help improve the coordination between funding agencies and their subgrantees. The application itself has sparked the interest of the Federal Transit Administration/Federal Highway Administration (FTA/FHWA) Joint Programs Office (JPO), which has provided funds for CRRAFT development and training efforts. The JPO hopes to use the system as a national showcase for this type of rural transit ITS application.(Conklin, J., C. Schweiger, et al. [2003]. Rural Transit ITS Best Practices, U.S. Department of Transportation, Intelligent Transportation Systems Joint Program Office, Multisystems, Inc.: 168.)

Independent Transportation Network

When: Started in 1995

Where: Started in Portland, Maine

What: non-profit carsharing program

Who: seniors and people with visual impairment

Tech: GIS-assisted dispatching in carsharing

Through a TRANSIT-IDEA grant, and with assistance from Environmental Systems Research Institute (ESRI) and GeoFields, Independent Transportation Network (ITN) is developing a geographic information system (GIS) component for its software that will permit computer-assisted human decisions so dispatchers can offer rideshare options to seniors when they schedule their rides. Consumers may ride alone, or ride with others in much the same way people generally use automobiles; sometimes they ride with others, sometimes, alone. Sometimes they plan in advance, sometimes they don't. The ITN offers all of these options and charges accordingly.(Freund, K. [1998]. Build it and They Will Come. Community Transportation. September to October 1998.)

Appendix M

Survey Questions

Survey Questions

Table 1: Open-ended Questions

No.	Question
1	Where did you start
2	Where did you end
3	Were you successful in planning trip? If 'no', why?
4	Aspects of the site you disliked
5	Aspects of the site you liked

Table 2: Likert-Scale—System Usability Scale (SUS)

No.	Question
1	I would like to use this system frequently
2	I found the system complex
3	I thought the system was easy to use
4	I would need technical support to use this system
5	I found the various functions were well integrated
6	I thought there was too much inconsistency
7	People would learn to use this system very quickly
8	I found the system cumbersome to use
9	I felt very confident using the system
10	I needed to learn a lot of things before I could get going with this system

Table 3: Likert-Scale—Trip Planning

No.	Question
1	The itinerary maker was easily accessible
2	The input controls were labeled appropriately
3	The results returned were displayed in sufficient detail
4	The results were annotated to indicate various options regarding my inputs.
5	When an error occurred (or no results were returned) I got the help I needed.
6	The maps and schedules were provided depending on the travel mode that I selected.
7	The lists generated by itinerary maker were arranged in chronological order.

Table 4: Likert-Scale—Feature-based Questions¹

No.	Features	Questions	Code for future reference
1	Maps	An interactive system or route map is displayed and divided into major hubs with separate detailed maps for each.	Maps1
		Orientation of maps is indicated appropriately and they represent places in the middle and along the sides of the map to indicate territory covered.	Maps2
		Route maps are grouped together and have significant landmarks, destinations, and crossing streets.	Maps3
		Clicking on an area on system or route map displays a detailed map of roads and places around that route.	Maps4
2	Links	Links are placed appropriately and easily distinguishable.	Links1
		Links to special services, administration and other Web sites relevant to trip planning are provided.	Links2
3	Lists	Lists generated by search options or itinerary maker are arranged in a chronological order	Lists1
4	Menu	Menu remains displayed all the time on the Web site irrespective of the navigation.	Menu1
5	Home Page	Home page carries maximum information about planning a trip and includes search feature for the site.	HomePage1
		Home page includes links to information that is frequently visited by a user like routes, schedules, news, etc.	HomePage2
6	Demand Response Services	I found that the Web site provided information relating to demand response services, and that they were placed differently than the schedules services.	DRS1
7	Schedules and Routes		

¹ Each set of Likert-scale questions, which were based on various features, were accompanied with a non-mandatory open-ended question. This open-ended question gathered any general comments that a respondent might have regarding the feature. The responses for the open-ended questions are provided in [Appendix R](#).

		There is a link on route map and schedule page that links to fare information applicable to the route.	S&R1
8	Transit Modes	Web site provides information for more than one transit modes.	TM1
		Route maps and schedule pages are provided depending on one or more transit mode or modes that the user has selected.	TM2
9	Navigation	Navigation for the Web site is facilitated without using options that are not part of the web site like the 'Back' button on the browser.	NAV1
10	Web Page	Web site has minimal background graphics	WPage1
		Throughout the Web site, horizontal or vertical scrolling is used sparingly while navigating.	WPage2
		The site provides directories for streets, routes, towns, and popular attractions.	WPage3
		Information on the site is understandable, timely and serves different types of users.	WPage4
		Information for fares is available within a click and grouped together in the site structure.	WPage5
11	Search Features	A search feature is provided for searching contents on the Web site.	SRCH1

Appendix N

Qualitative Responses

“Were you able to plan your trip successfully, If no, why?”

Table 1 – Claremont (Specified Trip)

No.	Claremont – Specified Trip
1	I was successful
2	yes
3	
4	Yes
5	yes
6	
7	Yes, I did. I planned my trip using the Spanish version of the system. Although seems very functional, It has some misspelling errors, word choice errors, and some grammar problems too.
8	
9	yes
10	More or less; I had to go back and change my preferences once because a planned trip didn't make sense (I had to do some back-tracking). I did find a good route that was cheap and didn't require a lot of transfers, which was nice.
11	yes
12	Yes
13	Yes, the way there, but there were no options for my return trip (to leave Pasadena at 9 pm)
14	YES
15	Yes. Had no troubles at all.
16	At first I tried to type in my actual home address, but it couldn't find my address. I then typed, “Claremont” and I was successful.
17	yes
18	Yes. The planner presented me with the “express” route I would need to take from point A to point B.
19	too complicated
20	Yes
21	Yes
22	yes - by bus
23	Yes, I was able to successfully plan a trip.

Table 2 – Claremont (Unspecified Trip)

No.	Claremont – Unspecified Trip
1	I couldn't do the trip due to flocks of seagulls
2	See previous questions...no itineraries available for the locations to which I would choose to go, even after changing options for mode of travel (which are not entirely clear).
3	Not completely. The system does not have enough options to really plan the trip perfectly. It seems to me very basic.
4	Yes
5	Yes. But this is my second try. At first, I have tried to go to Sea World but it was not successful. I couldn't locate the Sea World without knowing the full address.
6	Yes. The initial trip was planned well, however, the return trip did not produce any information. The system did not respond.
7	Yes.
8	yes
9	No, it gave me places like Burbank and Compton, but it couldn't find San Diego
10	no, the program could not register my address
11	
12	Yes
13	No. Kept telling me that it could not find my destination. Finally worked, but then same problems on return trip.
14	yes
15	No. There were no nearby stops.
16	Perfectly fine.
17	After a few false starts. The example indicated I could use an intersection (such as Los Angeles/Temple - but that didn't work. I had to settle for 100 N Los Angeles St. -Many people know a number, but not always North or South.
18	yes
19	
20	yes
21	NO!!! There was no return trip available. I change times, locations, and tried 4 bus option. YIKES!
22	Yes.
23	Yes.
24	
25	No, Web site none functional. There seemed to be an error in loading the trip planning Web page.

Table 3 – Minnesota (Specified Trip)

No.	Minnesota – Specified Trip
1	Yes, I was able to successfully plan my trip.
2	I got the information needed about the train I needed to catch and the bus transfer I would need to make. There were 3 options for the fastest way to make the trip. I could have gotten maps if desired.
3	Yes
4	Maybe. I was able to figure out how to get from point A to B but I would not be likely to choose that kind of transportation. It was cheap but not so convenient.
5	Yes
6	Can't get past the 2nd page. Once RTC gives you the 3 options from O'Hare to Navy Pier, there is no place to go from here. This deal is all screwed up, IMHO.
7	No- unable to open the Chicago RTA trip planner
8	YES
9	Didn't really have a specific point of interest and did not see any costs.
10	Yes
11	Yes
12	Yes.
13	
14	Yes! Easily!
15	Yes but I wasn't too sure that what I was doing was right other than getting a submit or clear option.
16	Yes
17	Yes, but maps of the airport terminal and the el's location would have been helpful.
18	Yes, it seems that way from the trip planner. However, being unfamiliar with Chicago, when transfers are needed, I had no idea how or where I needed to go from the blue line to the bus.
19	
20	Yes
21	definitely
22	Yes. Instructions were very complete and clear.
23	Yes, I was able to successfully plan my trip.

Appendix O

Qualitative Responses

“Were there any features you liked?”

Table 1 – Claremont (Specified Trip)

No.	Claremont (Specified Trip)
1	I liked the shape
2	it was fast and pretty easy to use
3	Yes, the display of directions, time duration, and fares for each part of the trip was very friendly and quickly to follow.
4	I liked the exact times to expect the bus to pick up and drop off for a particular bus stop and knowing the fees associated with riding the bus.
5	five possible times presented along with map and travel times and cost
6	Site was fairly easy to follow. Being able to enter starting and ending point by landmarks was nice.
7	They way how it displays the results of your planned trip (time, ticket price, etc.)
8	
9	easy to use, gives information for particular times of day so you can plan around departure times
10	Overall, the site was easy to understand and not very complicated.
11	how detailed the directions were
12	Rail
13	There weren't too many graphics, which was nice. The white and red looked good and the map helped me plan the trip.
14	It was ease to use Mimics the method used by MapQuest
15	easy to understand fields.
16	simplicity
17	no
18	The site design was good and it loaded quickly (except for the map). Planning a trip seemed easy enough.
19	nothing particular
20	Ability to have the site know how to find a particular location by name, rather than me having to know the street address.
21	Super easy but I could have used a way to enter zip code
22	not really I was a bit confused by what should happen when I hit sub mit or whether there was something to the question about wanting the same return route
23	The drop-downs were very helpful. The organization of the Web site was user-centric.

Table 2 – Claremont (Unspecified Trip)

No.	Claremont (Unspecified Trip)
1	I really like the shape of the parking lot
2	Not particularly.
3	The results of the search
4	The scroll down option for the departure and destination site. Especially for someone who is not completely familiar with the area, it was helpful to have familiar landmarks to choose from.
5	At lease it has some important landmarks, so that I don't have to remember the address. Also, if the address I types is not exactly the same of what the site has in its database, the site gives suggestion. User interface is quite nice too.
6	The combination of information about distance/routes and cost is helpful.
7	Once you click on "Plan Trip" the site does provide you with additional information (monthly pass prices, for example) which is helpful. Otherwise, I prefer or perhaps am more accustomed to sites like MapQuest and the way it is written and organized.
8	ability to specify how close to destination one wanted to arrive
9	I liked the fact that you had different ways to look up sites, such as using landmarks.
10	It was good it had landmarks as possibilities...I don't know the address of school so it was helpful
11	The pull-down menus were somewhat helpful in selecting landmarks, but they were incomplete -- only one high school is listed for LA County!
12	The very friendly user interface and very clear result showed.
13	List of landmarks useful - don't even allow direct entry of addresses.
14	round trip part
15	Drop downs are always convenient.
16	easy and fast to use.
17	It shows a map AFTER the route is selected. It allows you to keep same route on return, or pick something different.
18	drop downs but I am not familiar with the city
19	I liked how you could plug in your destinations and I liked the maps.
20	easy and quick to use
21	Easy to read.
22	They had the landmarks so it was easy in that respect.
23	It was simple for me, but as I stated before, others may have trouble with it...
24	It's pretty rigid and cold. However, the graphic of the map was clear and helpful. Also, the pricing info was helpful.
25	The various options for method of travel, eg rail.

Table 3 – Minnesota (Specified Trip)

No.	Minnesota (Specified Trip)
1	Yes, options for selecting what is my preference in selecting a trip type were provided.
2	I liked having a choice of routes. It seemed rather limited but adequate for the trip I needed to plan.
3	Very easy to use.
4	Liked being able to pull down the names of the places rather than having to type the addresses in.
5	Dropdown Boxes
6	None
7	unable to open the RTA site
8	PLANED OUT VERY WELL
9	Just the idea of getting away, would like to have it include the OPRAH SHOW>
10	Easy
11	Like the drop down boxes for the tourist sites etc..
12	Liked the number of different travel choices offered. Also, liked that pricing was shown and that variables, such as walking distance was included.
13	No
14	Very quick, very self-explanatory. Don't know if it would be this easy if I had only an address and not a landmark.
15	Drop down menus for selecting beginning starting point and destination.
16	All good
17	
18	Quick and easy. All info including fares available on the same page for the entire trip. Could easily be printed for carrying in the pocket.
19	Not really. It was pretty ho-hum.
20	Getting around was easy.
21	choices
22	Clarity, cleanness.
23	There were options for "walking" as well. There results had multiple itineraries.

Appendix P

Qualitative Responses

“Were there any features that you disliked?”

Table 1 – Claremont (Specified Trip)

No.	Claremont (Specified Trip)
1	I dislike the color
2	no
3	No, except for the missing fields of number of people and their ages
4	No
5	question as to whether the destination “Pasadena City College” corresponded to the address given by the site. I am unaware of the city streets in Pasadena so this was not clear.
6	
7	It was difficult to try to find the place where I was leaving from since I did not have the address. You have a lot categories, besides some of them are kind of confusing (e.g. University, University of California vs. Education).
8	
9	no
10	
11	the site was very efficient
12	No
13	The font was pretty small when I was asked to select which origin address (after I entered Olive Street, it offered a few other options, and those options were small, especially considering they were all very similar addresses)
14	It was useful in general However, I was a little confused on the time i.e. arrive at or depart- this was not very clear
15	Efficient, fast, worked well.
16	no, it was ok
17	transfers information doesn't include the city the card doesn't show the transfers no alternative times or routes
18	
19	difficult to navigate
20	
21	Could not easily determine the cost of more than 1 person
22	not really
23	The map did not show at the start, I had to click on any of the destination to get the image of the map. It did not provide me with the multiple ways of commuting.

Table 2 – Claremont (Unspecified Trip)

No.	Claremont (Unspecified Trip)
1	I disliked the breakfast
2	
3	The options are limited. I selected San Diego county thinking of going to places like Sea World, San Diego zoo, Gas Lam, etc. But the system does not provide other options than Metrolink Oceanside station
4	It was a bit unclear that the site would not help me plan long distance trips. I initially tried Los Angeles to San Diego (Oceanside), but the trip planner could not account for this destination.
5	It would be nice to have more landmark. Another thing is that I couldn't locate the Claremont Colleges at first by selecting "University" I have to select "education" instead. This is quite confusing.
6	NO.
7	
8	no
9	No, except the fact that I couldn't get to my destination
10	no, I thought it was actually really good if you are planning trips from major landmarks...it would be helpful for trips to the airport I think.
11	
12	This site is very nice. However, I would rather drive when planning a trip with family in LA.
13	The time component. There were four choices - they should appear above the time selection so that it reads "Leave by 8:00", not "8:00 Leave By"
14	too little choices
15	The selection of recreational areas. I would have planned to go to Yosemite or other place like that.
16	none.
17	
18	no
19	Not many options provided to the user as "alternatives."
20	no, it worked well
21	There wasn't any info regarding child fares. It would have been nice if they gave us the closest option available to our first request.
22	
23	For people who are not tech savvy, this might be difficult, and there are a number of people who are trying to learn how to use the Internet.
24	
25	Non-functional pull down menus, no exact destination options, no examples of proper destinations, etc.

Table 3 – Minnesota (Specified Trip)

No.	Minnesota (Specified Trip)
1	There were no maps and helpful navigational tips.
2	It seemed to give information I requested.
3	Did not offer schedules/options. Offered two basic routes. Was concerned with the statement that schedules could be changed without notice.
4	
5	No
6	All
7	unknown
8	NO
9	No
10	No
11	Would have liked to see an actual map of the area I was traveling in
12	Would have liked the ability to download the itineraries to a handheld device.
13	It is confusing.
14	No.
15	Only that I wasn't sure when I was done.
16	No, it was very good.
17	I felt it needed better graphics that you didn't need to fill in each field of where you were starting from or going to. The going to portion was easier once I figured that all the fields in the "starting out" field didn't need to be filled in.
18	Yes, no maps to show how or where to go when transferring.
19	None not noted above.
20	Nothing in particular.
21	No choices for a taxi cab or city bus for comparison
22	Only alternatives listed were for different times. In reality, I would probably take a taxicab to the destination.
23	There were no maps for the itinerary

Appendix Q

Responses for Feature-Based Questions

Table 1: Responses for feature – Maps – Claremont (Specified Trip)

No.	Maps1	Maps2	Maps3	Maps4	Comments for feature – Maps
1	3	4	3	3	No
2	4	4	4	4	-
3	4	2	2	2	better make it easy to read
4	4	4	4	4	-

Table 2: Responses for feature – Maps – Claremont (Unspecified Trip)

No.	Maps1	Maps2	Maps3	Maps4	Comments for feature – Maps
1	3	2	2	4	-
2	4	4	4	4	-
3	4	4	4	4	No

Table 3: Responses for feature – Lists – Claremont (Specified Trip)

No.	Lists1	Comments for feature – Lists
1	4	No

Table 4: Responses for feature – Menu – Claremont (Specified Trip)

No.	Menu1	Comments for feature - Menu
1	4	The menu should have more fish
2	2	-
3	3	No

Table 5: Responses for feature – Menu – Claremont (Unspecified Trip)

No.	Menu1	Comments for feature – Menu
1	2	The system needs to help the users to select choices easier. Also, having the ability of selecting more than one destination will help me to make better decisions regarding my trip.
2	3	-

Table 6: Responses for feature – Home Page – Claremont (Unspecified Trip)

No.	HomePage1	Comments for feature – Home Page
1	3	I wish I had seen the questions first so that I would remember how to properly answer them.

Table 7: Responses for feature – Demand Response Services – Claremont (Unspecified Trip)

No.	DRS1	Comments for feature – Demand Response Services
1	3	-

Table 8: Responses for feature – Schedules and Routes – Claremont (Specified Trip)

No.	S&R1	Comments for feature – Schedules and Routes
1	2	when i clicked local in the trip preferences, it was quicker than the express option
2	5	Presentation of detail map if destination/source is an “attraction” or site rather than an address
3	3	I saw the fare information as text but don’t recall a link.
4	3	-
5	3	There were a couple of questions pertaining to features that I did not notice on the Web site (answered “no opinion”)
6	4	-
7	3	-
8	4	-
9	2	No
10	4	map would be great if users could zoom in and if it would display transfers
11	4	I assume this means that we’re talking about the fare information shown in the actual page. I did not see any “link” on the map.
12	1	I couldn’t use the feature as I didn’t find the referenced link
13	3	I cannot imagine why anyone with a car would both using MetroLink or anything to do with metro until they get the Gold line from Pasadena to Claremont completed.

Table 9: Responses for feature – Schedules and Routes – Claremont (Unspecified Trip)

No.	S&R1	Comments for feature – Schedules and Routes
1	3	-
2	2	The last question asks about a link to fare information. Although there is no link, the fare information is presented in my route page.
3	4	-
4	3	The only thing I had trouble with was getting to the register my address...that was cumbersome... maybe being able to input city and zip would help
5	5	-
6	3	-
7	4	I used this system for two routes, though I reported the Claremont/Orange scenario. I mistakenly did an LA to Disneyland scenario. There were many options. Perhaps, the utility of this system depends on how many options are provided to the user.
8	3	The trip to Disneyland came up nicely. I never found a return trip within a few minutes. I wouldn't spend any more time than that on this site.
9	2	Didn't display different rates for seniors or children

Table 10: Responses for feature – Transit Modes – Claremont (Specified Trip)

No.	TM1	TM2	Comments for feature – Transit Modes
1	2	2	
2	4	4	It would have been nice to have a summary page with all transit mode information side-by-side for comparisons. As a planner, I could make time/money/route convenience decisions more efficiently and effectively with a comparison page.

Table 11: Responses for feature – Transit Modes – Claremont (Unspecified Trip)

No.	TM1	TM2	Comments for feature – Transit Modes
1	4	3	
2	1	1	I got no information about transit mode options.
3	3	3	

Table 12: Responses for feature – Navigation – Claremont (Specified Trip)

No.	NAV1	Comments for feature – Navigation
1	2	There need to be specific controls provided of how to navigate across the pages.

Table 13: Responses for feature – Navigation – Claremont (Unspecified Trip)

No.	NAV1	Comments for feature – Navigation
1	4	
2	1	No
3	4	

Table 14: Responses for feature – Web Page – Claremont (Unspecified Trip)

No.	WPage1	WPage2	WPage3	Comments for feature – Web Page
1	4	1	5	
2	2	2	4	

Table 15: Responses for feature – Search Features – Claremont (Specified Trip)

No.	SRCH1	Comments for feature – Search Features
1	4	The initial section of the survey was too wordy. Can be simplified. The system does not appear to offer different options i.e. bus vs. rail etc. at least it was not clear to me when i first did the search

Table 16: Responses for feature – Search Features – Claremont (Unspecified Trip)

No.	SRCH1	Comments for feature – Search Features
1	4	Although it provides this feature, I think it is not sufficient.

Appendix R

Summary of Qualitative Responses

Table 1 – Responses for “Were you able to successfully plan your trip, If no why?”

No.	Categories	Count	Transitweb Guidelines				Referred by Respondents				
			Maps	Schedules and Routes	Transit Modes	Web Page	Language	Start/Destination	Accessibility	Return Routes	Ease of Use
Claremont (Planned Trip)											
1	Invalid	3									1
2	No	1									
3	Not Sure	1		1				1			
4	Yes, with some difficulty	1									
5	Yes	13									
6	Yes, looking for more features but did not find them	1		1							
7	Yes, looking for more features but did find them to some extent	1					1				
8	Yes, looking for more features and found them	2		1	1						
	Total	23		3	1		1	1			1
Claremont (Unplanned Trip)											
1	Invalid	4									
2	No	8		3	1	1		4	1		
3	Not Sure										
4	Yes, with some difficulty	1						1			
5	Yes	10				1					
6	Yes, looking for more features but did not find them	2								2	
7	Yes, looking for more features but did find them to some extent										
8	Yes, looking for more features and found them										
	Total	25		3	1	1		5	1	2	

Minnesota Respondents										
1	Invalid	2								
2	No	2		1					1	
3	Not Sure	1			1					
4	Yes, with some difficulty	1								
5	Yes	13								
6	Yes, looking for more features but did not find them	2	2							
7	Yes, looking for more features but did find them to some extent									
8	Yes, looking for more features and found them	2		1						1
	Total	23	2	2	1				1	1

Table 2 – Responses for “Were there any features you liked?”

No.	Categories	Count	Transitweb Guidelines					Referred by Respondents						
			Maps	Schedules and Routes	Transit Modes	Naviga-tion	Web Page	Search Features	Fares	Response Time	Ease of Use	Simplicity	Printing	Start/ Destination
Claremont (Planned Trip) Respondents														
1	Invalid	3												
2	Yes	17	3	7	1	3	4		4	3	5			4
3	Maybe	1		1										
4	No	2												
	Total	23	3	8	1	3	4		4	3	5			4
Claremont (Unplanned Trip) Respondents														
1	Invalid	1												
2	Yes	23	3	4	1		3	1	2	2	3			10
3	Maybe													
4	No	1												
	Total	25	3	4	1		3	1	2	2	3			10
Minnesota Respondents														
1	Invalid	2												
2	Yes	18		4	4	2	2		2	2	3	1	1	5
3	Maybe													
4	No	3		1			1							
	Total	23		5	4	2	3		2	2	3	1	1	5

Table 3 – Responses for “Were there any features you disliked?”

No.	Categories	Count	Transitweb Guidelines						Referred by Respondents							
			Maps	Lists	Schedules and Routes	Transit Modes	Naviga-tion	Web Page	Fares	Transfer Information	Learning Lag	Traveler Characteristic	Download Routes	Start/ Destin-ation	Response Time	Fonts
Claremont (Planned Trip) Respondents																
1	Invalid	6														
2	No	7													2	
3	Maybe	1						1								
4	Yes	9	1		3	1	1	1	1	1		1		2		1
	Total	23	1		3	1	1	2	1	1		1		2	2	1
Claremont (Unplanned Trip) Respondents																
	Invalid	7			1											
	No	6			1											
	Maybe	1		1	4				1		1					
	Yes	11												5		
	Total	25		1	6				1		1			5		
Minnesota Respondents																
	Invalid	1														
	No	10														
	Maybe															
	Yes	12	4		1	2	1	1					1	1		3
	Total	23	4		1	2	1	1					1	1		3

Appendix S
Los Angeles Metropolitan Transportation
Authority
Web Site

Los Angeles MTA Web site: <http://mta.net>

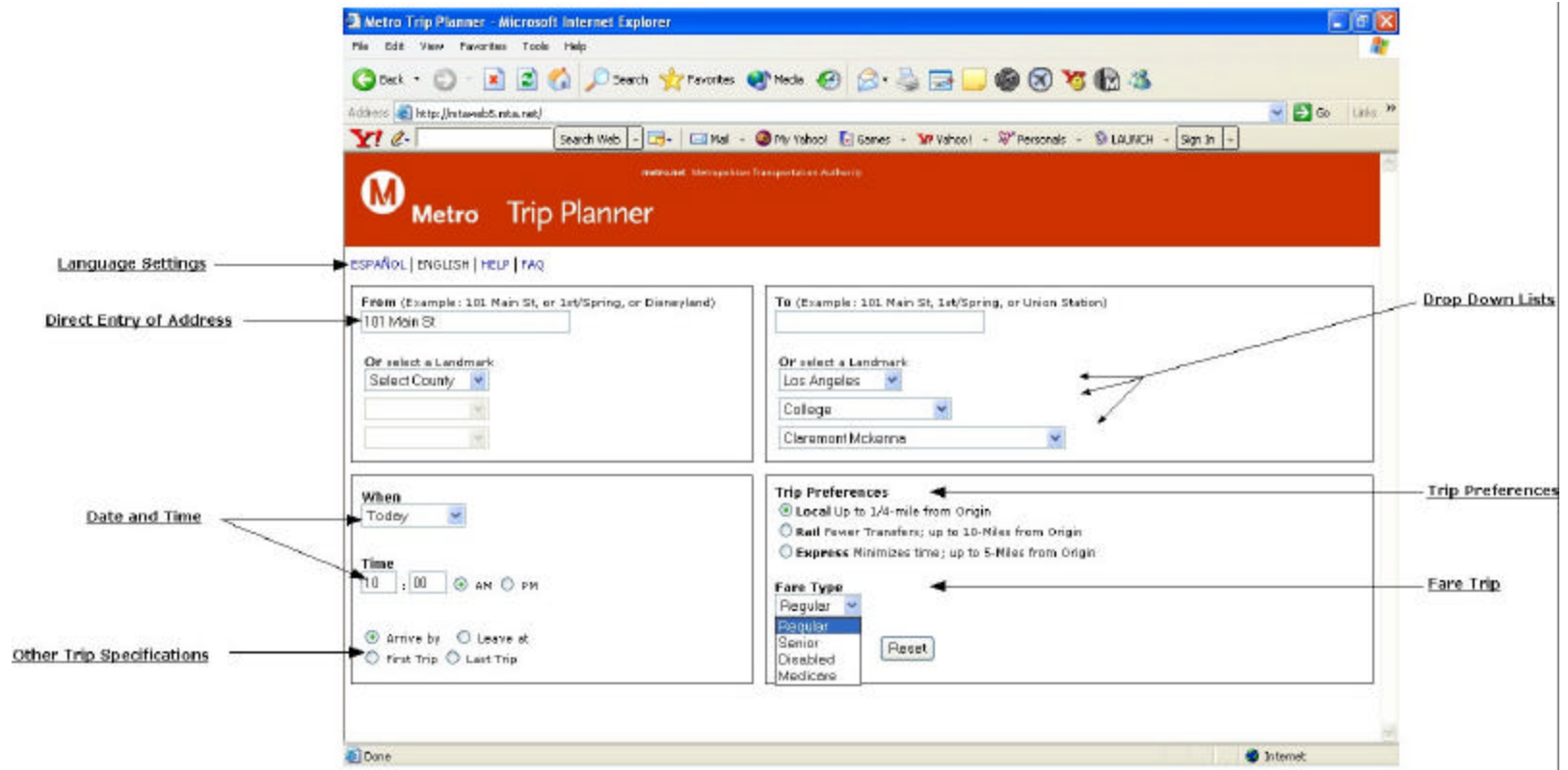


Figure 1: Entering Trip Characteristics

Metro Trip Planner - Itinerary Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://mtaweb5.mta.net/scripts/esrimap.dll?name=trip&Day0=WED&m0=A&Day1=&m1=&temp=&min0=00&hour0=10&timecrit0=AR&min1=&hour1=&timecrit1=8> Go Links >>

Search Web Mail My Yahoo! Games Yahoo! Personals LAUNCH Sign In

M Metro Trip Planner [HELP](#) | [FAQ](#) | [NEW TRIP PLAN](#) | [MTA HOME](#)

Starting at 101 Main St 90245

Go to SE corner of Grand / Richmond

- Take Metro Bus 439 East (DOWNTOWN LA UNION STA) at 6:13 a.m.
- Pay \$1.75 plus .25 transfer (Monthly Pass: \$67)
- Get off at Alameda St / Arcadia St at 7:42 a.m.

Go to SE corner of Busway Ent / Alameda

- Take Foothill Transit 492 East (MONTCLAIR TRANSIT CTR) at 7:50 a.m.
- Use transfer plus 1.65
- Get off at 1st St / Harvard Ave at 9:19 a.m.

Go to 1st St / Claremont Metrolink

- Take Foothill Transit 187 East (CLAREMONT TO PASADENA) at 9:30 a.m.
- Pay \$1.10 (Monthly Pass: \$45)
- Get off at Foothill Blvd / College Ave at 9:46 a.m.

Ending at Claremont Mckenna


Total Cost: \$4.75

Estimated Travel Time: 3 Hours 33 Minutes

[DISPLAY PRIOR TRIP](#) | [DISPLAY NEXT TRIP](#) | [CHANGE PREFERENCES](#)

Keep same route(s)

Maps



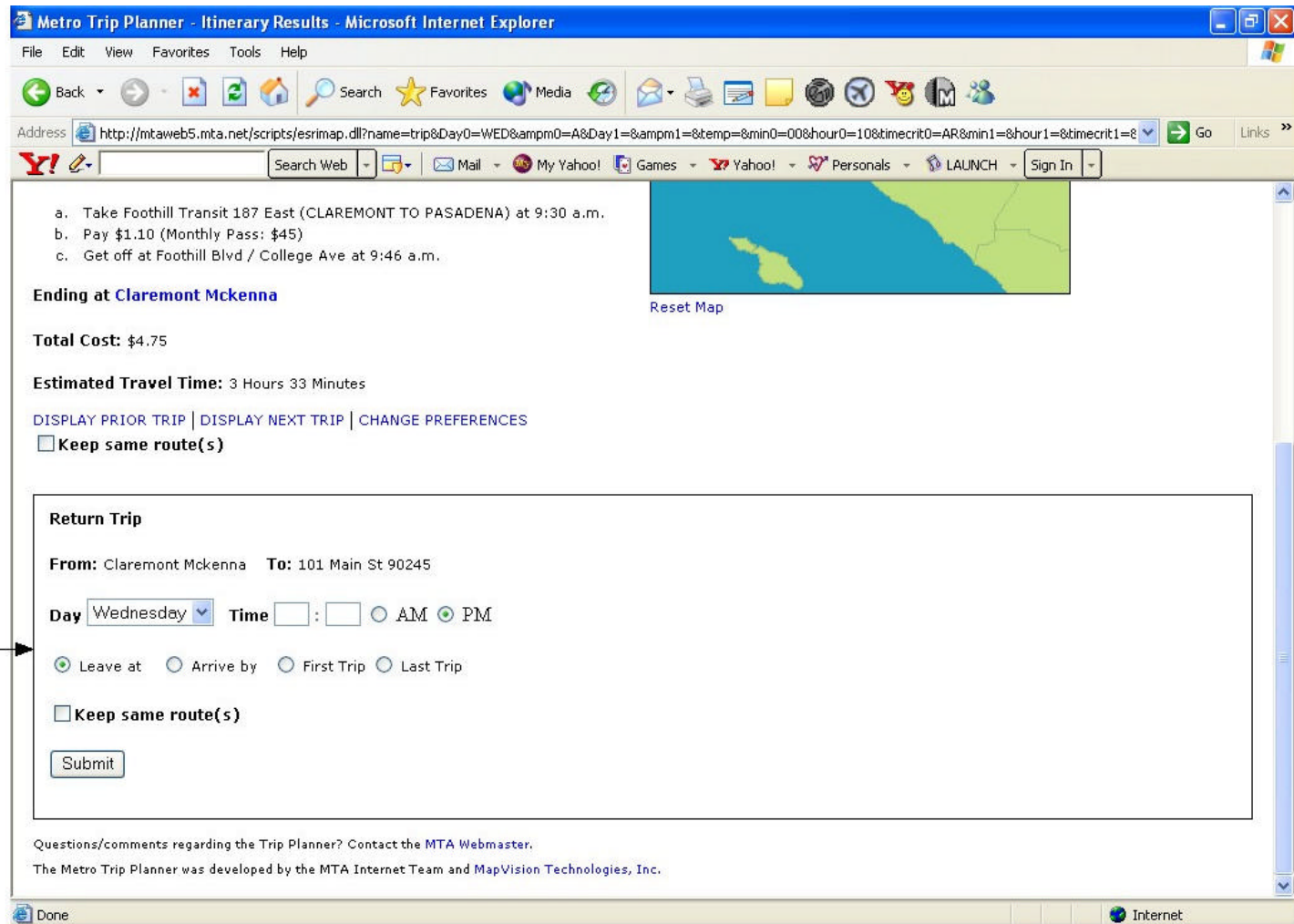
Reset Map

Done Internet

Trip Plan or Itinerary

Cost of Trip/Fare

Figure 2: Results of the Trip Planner (Continued on next figure)



Return Trip Route →

Figure 3: Results of the Trip Planner (Continued from previous figure)

Appendix T
Chicago Regional Transportation Authority
Web Site

Chicago RTA Web Site (http://rtachicago.com)

The screenshot shows the Chicago RTA Travel Information Center website in a Microsoft Internet Explorer browser window. The page title is "Plan Your Trip With the RTA! - Microsoft Internet Explorer". The address bar shows "http://rtasweb.rtachicago.com/". The website header includes the RTA logo and "Travel Information Center". The main content area is a trip planning form with four sections:

- 1 WHERE ARE YOU STARTING?**
Enter an address or intersection: (Eg. 123 N Main St) CHARE AIRPORT
Enter a City (optional)
Choose a starting point: O'Hare Airport (Drop Down)
- 2 WHERE ARE YOU GOING?**
Enter an address or intersection: (Eg. 123 N Main St) NAVY PIER
Enter a City (optional)
Choose a destination: Navy Pier (Drop Down)
- 3 WHEN ARE YOU TRAVELING?**
Date: Jan 30 2004
My starting time will be: 11:20 AM (Date and Time of the Trip)
- 4 OTHER TRIP OPTIONS...**
Do you require a lift, ramp, elevator or accessible station? No

Annotations with arrows point to specific elements:

- "Direct Entry of Addresses" points to the text input field for the starting address.
- "Drop Down (Based on Landmarks)" points to the dropdown menu for the starting point.
- "Date and Time of the Trip" points to the date and time selection fields.

Additional elements on the page include a "HELP" icon, logos for CTA, Metra, and Pace, and a disclaimer: "Itineraries are based on information supplied to the RTA by its transit operators: the CTA, Metra and Pace. You must provide date and time information to plan a trip. Schedule and route information is based on the latest timetables available and is subject to change without notice. If you have any questions about an itinerary, call the RTA Travel Information Center at 635-7000 in all."

Figure 1: Entering Trip Characteristics (Continued on next figure)

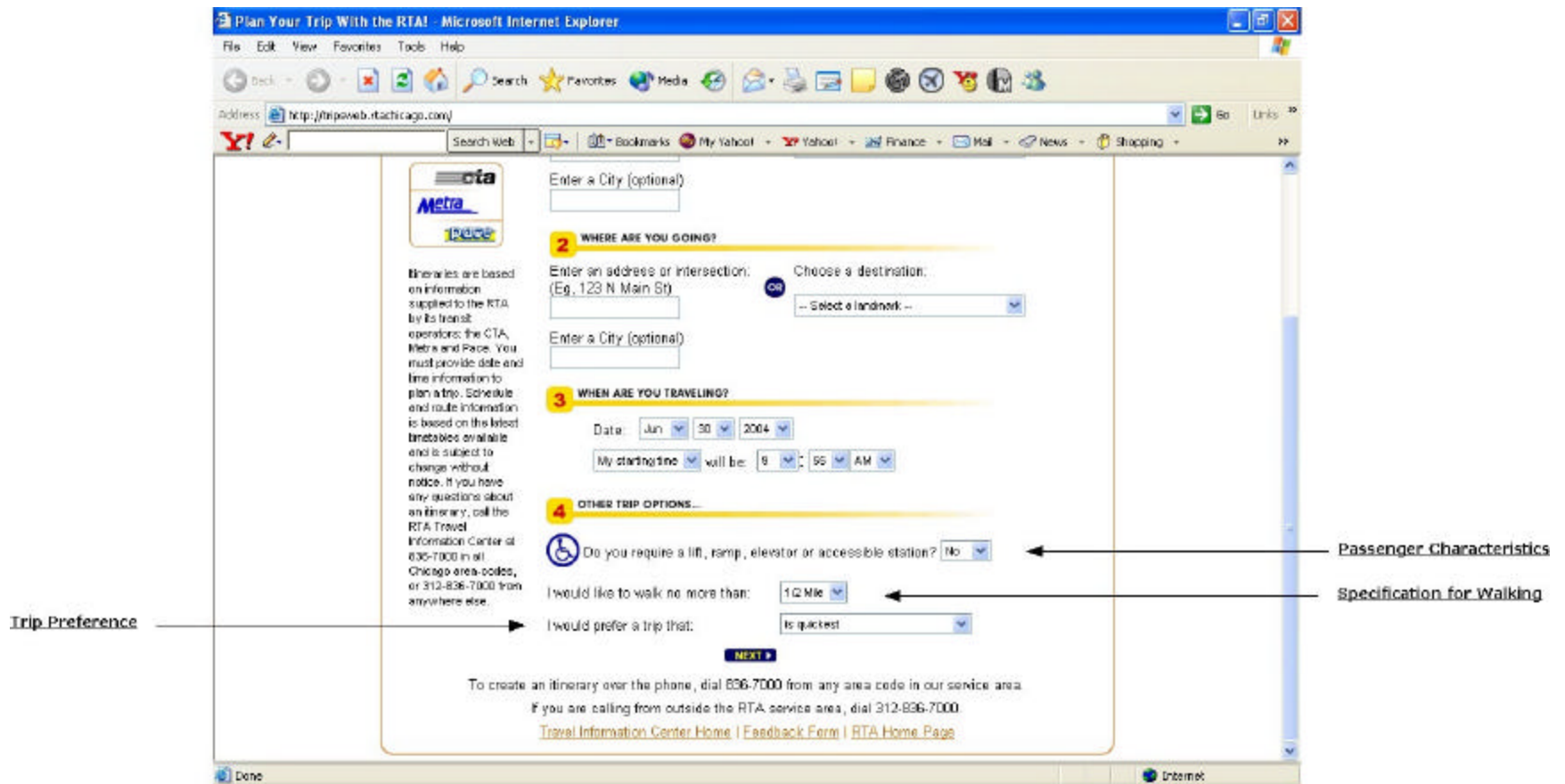


Figure 2: Entering Trip Characteristics (Continued from previous figure)

The screenshot shows the RTA Travel Information Center website in Microsoft Internet Explorer. The page displays a trip itinerary with the following details:

- YOUR ITINERARIES**
 - Walk 0.1 mile NE from O'HARE AIRPORT to O'HARE CTA (BLUE - O'HARE)
 - Take CTA BLUE LINE TRAIN (TO FOREST PARK)

Depart: O'HARE CTA	At 09:30 AM
Arrive: GRAND CTA	At 10:07 AM
 - TRANSFER**
 - Take CTA BUS #65 GRAND EASTBOUND

Depart: GRAND & HALSTED/MILWAUKEE	At 10:08 AM
Arrive: NAVY PIER BUS TERMINAL	At 10:21 AM
 - Walk 0.1 mile S to NAVY PIER
- Fare Structure**

Regular Fare:	Senior/Disabled Fare:
\$ 2.00	\$ 1.00
- NEXT ITINERARY**

Annotations on the page include:

- Trip Plan / Itinerary:** Points to the main itinerary section.
- Indication for Transfer:** Points to the transfer section.
- Fare Structure:** Points to the fare table.

Figure 3: Results of the Trip Planner (Continued on next figure)

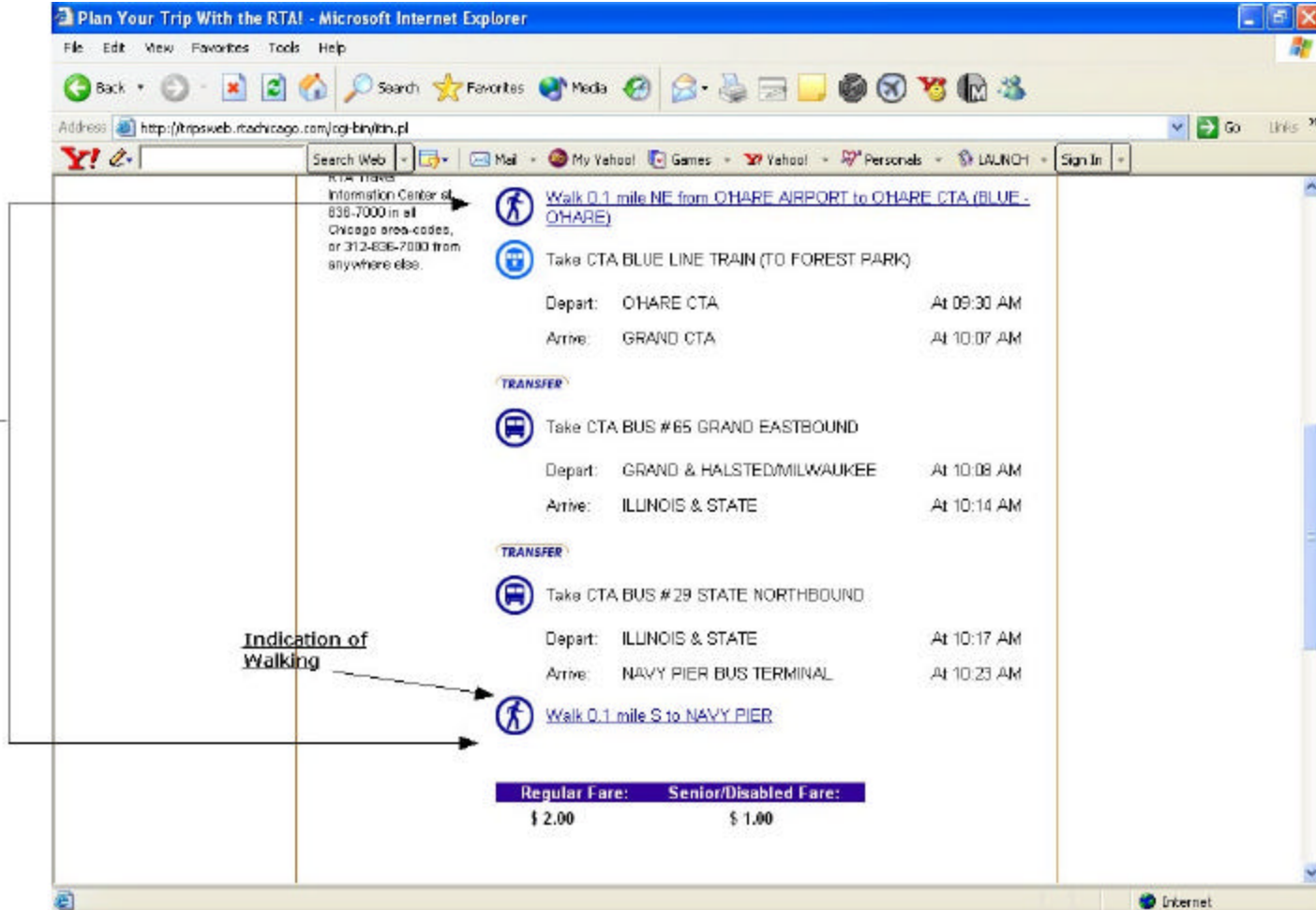


Figure 4: Results of Trip Planner (Continued from previous figure)

Plan Your Trip With the RTA! - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://tripsweb.rtachicago.com/cgi-bin/itin.pl>

Search Web Mail My Yahoo! Games Yahoo! Personals LAUNCH Sign In

NEXT ITINERARY

- Walk 0.1 mile NE from O'HARE AIRPORT to O'HARE CTA (BLUE - O'HARE)
- Take CTA BLUE LINE TRAIN (TO FOREST PARK)

Depart:	O'HARE CTA	At 09:30 AM
Arrive:	GRAND CTA	At 10:07 AM
- TRANSFER**
- Take CTA BUS #65 GRAND EASTBOUND

Depart:	GRAND & HALSTED/MILWAUKEE	At 10:08 AM
Arrive:	ILLINOIS & PESHTIGO	At 10:19 AM
- Walk 0.4 mile E to NAVY PIER

Regular Fare:	Senior/Disabled Fare:
\$ 2.00	\$ 1.00

To create an itinerary over the phone, dial 836-7000 from any area code in our service area.
 If you are calling from outside the RTA service area, dial 312-836-7000.
[Travel Information Center Home](#) | [Feedback Form](#) | [RTA Home Page](#)

Internet

Multiple Itineraries

Figure 5: Results of Trip Planner (Continued from previous figure)

Appendix U
Evaluating Quality in Use of
Online Services

(TASK 1)

This section identifies key metrics from the literature for evaluating the quality of an information system. The section reviews the attributes of software quality, approaches to ensure software product quality, and principles for user-centered design. It concludes with a new methodology for evaluating Quality in Use.

Software Quality

ISO 8402 states, *quality is the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs*. Figure 1 illustrates attributes of *software quality* from a users' perspective as described in ISO/IEC 9126.

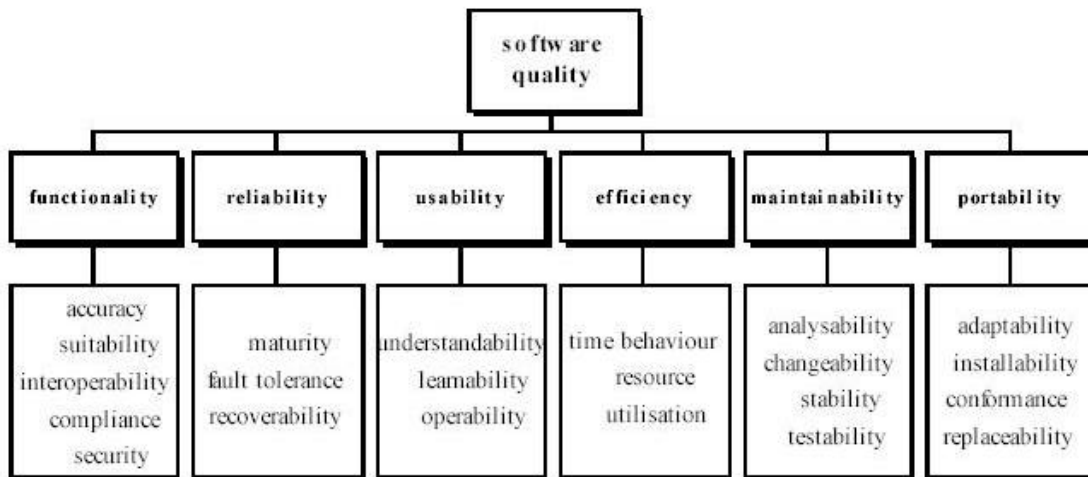


Figure 1: ISO/IEC 9126 Attributes of Software Quality

According to ISO/IEC 9126, *usability is a set of attributes that bear on the effort needed for use, and on the individual assessment of such use, by a stated or implied set of users*. These attributes are defined as follows:

Functionality is the capability of the software to provide functions, which meet, stated and implied needs when the software is used under specified conditions.

Reliability is the capability of the software to maintain its level of performance when used under specified conditions.

Usability is the capability of the software to be understood, learned, used and liked by the user, when used under specified conditions.

Efficiency is the capability of the software to provide the required performance, relative to the amount of resources used, under stated conditions.

Maintainability is the capability of the software to be modified.

Portability is the capability of the software to be transferred from one environment to another.

Quality in Use

Apart from the above-mentioned characteristics, ISO/IEC 9126 proposed a new model for quality, which distinguishes between three different approaches to product quality:

Internal Quality: This is measured by the static properties of the source code, typically by inspection such as path length.

External Quality: This is measured by the dynamic properties of the source code when executed such as response time.

Quality in Use: This is measured by the extent to which the software meets the needs of the user based on the context of usage.

The relationship among these approaches is depicted in Figure 2. Here, Quality in Use is the user's view of quality and is dependent on external measures that determine external quality such as suitability or operability. External qualities are likewise dependent on internal attributes of a system such as static measures of code.

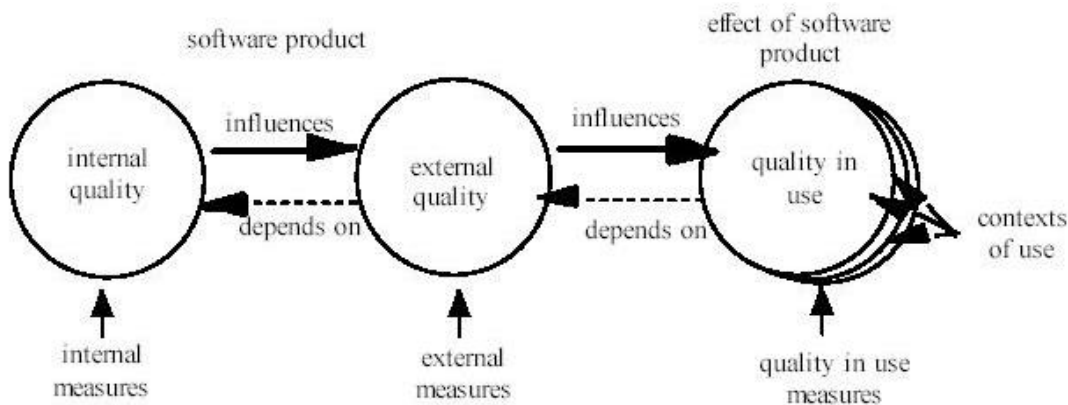


Figure 2: Approaches to Software Product Quality

Quality in Use measures the degree of excellence, and can be used to validate the extent to which the software meets user needs. Internal attributes are prerequisite to external qualities, where internal attributes of a software product ensure delivery of certain qualities to the user. Whether external qualities satisfy a users needs is dependent on the measurement of Quality in Use under specified conditions. These measures, or metrics, are the subject of this study and are validated against a small sample of Internet-based E-Government ATIS services. Practically, it is expected that these metrics will assist Internet-based service providers in improving their services.

User-Centered Design

ISO FDIS 13407 details a method to achieve Quality in Use by incorporating user-centered design activities throughout the life cycle of interactive computer-based systems. Four user-centered design activities are described that need to take place during all stages of a study. These activities are:

- Understand and specify the context of use,
- Specify the user and organizational requirements,
- Produce design solutions, and

- Evaluate designs against requirements.

The iterative nature of these activities is illustrated in Figure 3.

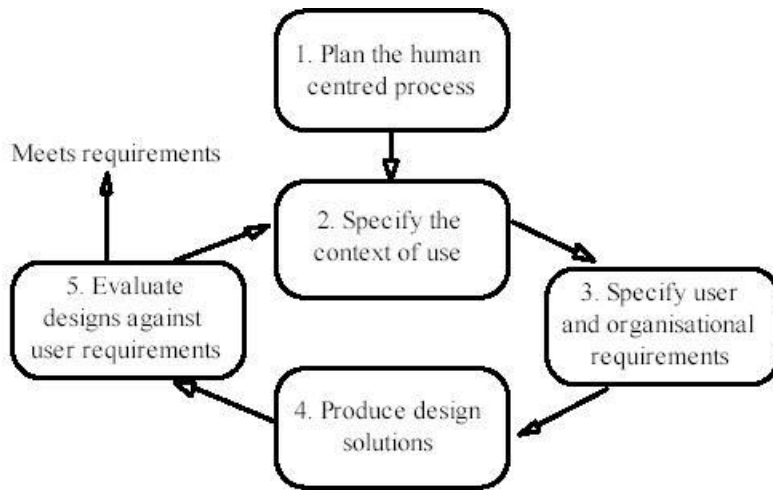


Figure 3: User-Centered Design Activities

Evaluating Quality in Use

Evaluation is the systemic assessment of the worth or merit of some object. The elements that comprise an evaluation study are enumerated below. In addition, the manner in which each element relates to current study is detailed.

Systematic assessment: Evaluation research is conducted with formality and rigor. For assessing ATIS services, an online evaluation tool using the questionnaire method is used.

Focus of investigation: Considers the social program or policy as the focus. For this study, the focus is Internet-based E-Government ATIS services.

Standards for comparison: Evaluation assesses the merit of an object by comparing the evidence to some set of expectations. This study uses a research-based, user-centered design approach to identify user requirements. It draws on guidelines as suggested by Transitweb as well.

Purpose of evaluation: Evaluation is a practical craft designed to help make social programs work better and to allocate resources to better social programs. In the context of this study, the evaluation of the quality of existing Internet-based E-Government ATIS services using an online evaluation tool would help decision-making at all levels:

- Users of ATIS services will be able to trace choices available to them.
- Administrators of ATIS sites may incorporate evaluation results when building their sites to serve the community of travelers better.
- Evaluation results may be used by funding organizations and/or auditors for their respective purposes.

Methodology for Evaluating Quality in Use

As illustrated in Figure 2, implementing a software product with particular internal qualities will result in a product with certain external properties. End-users use these external properties to gauge their expectations of usage. Figure 3 depicts the process of user-centered design. It illustrates how evaluation can be used to better serve a class of users by identifying their requirements. Figure 4, a combination of the above-described methods, represents a new methodology for evaluating Quality in Use.

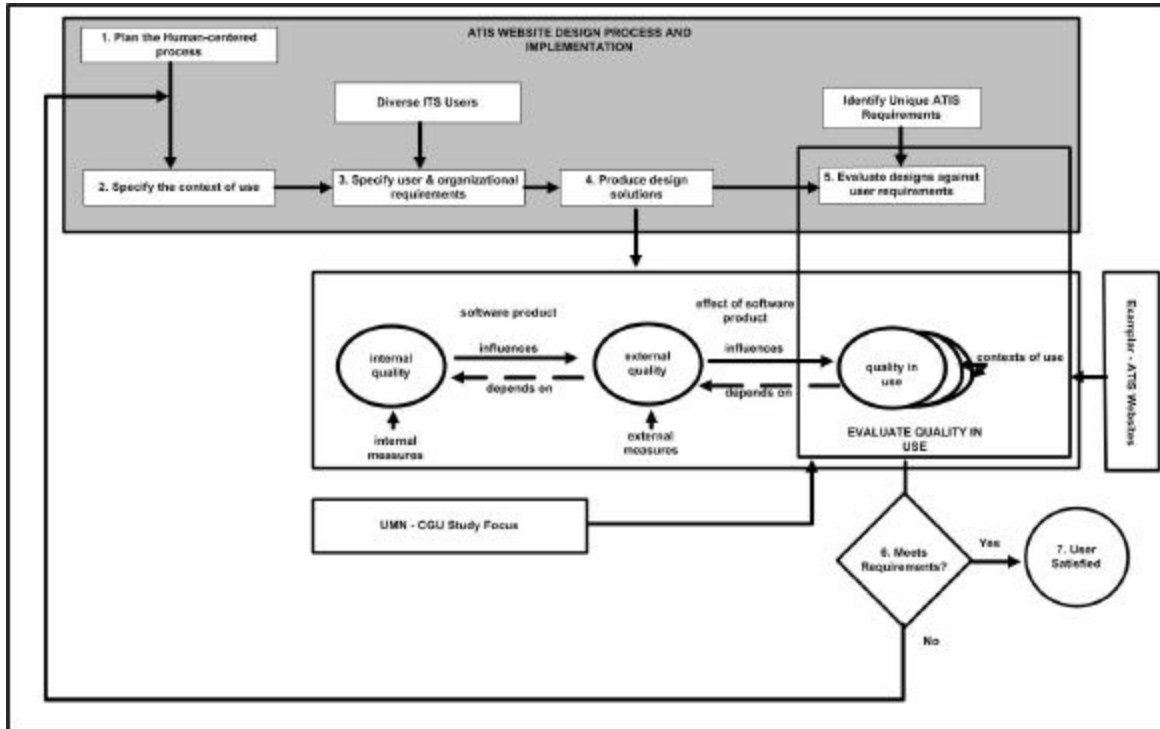


Figure 4: New Methodology for Evaluating Quality in Use

Appendix V
Advanced Traveler Information Systems
for Diverse Trips

(Task 2)

This section identifies key metrics for Internet-based ATIS. It reviews customer characteristics, trip types, and modes of transportation. It concludes with several examples of market-based personalized ATIS services.

ATIS

Use of Intelligent Transportation Systems (ITS) can help ease the strain, created by increasing demand for travel, on highways and public transit systems in the United States, through application of modern information technology and communications. The Federal Highway Administration has identified 16 program areas under ITS to ease this strain. One of these programs, "Traveler Information", would utilize a variety of technologies, including Internet Web sites, telephone hotlines, as well as television and radio, to allow users to make more informed decisions regarding trip departures, routes, and mode of travel. Information provided to the traveler in this manner can be delivered pre-trip, en route, and for tourism or discrete events. Pre-trip information can be provided through the Internet, telephone services like 511, or other media like television, radio or kiosks. En-route information can be provided through telephone services, radio or through various in-vehicle systems (IVS). Tourism and event-related travel information focuses on the needs of travelers in areas unfamiliar to them or when traveling to events such as sporting activities or concerts.

Advanced traveler information services (ATIS) are a part of the overall activity of creating an ITS infrastructure, and seek to acquire, analyze, communicate, and present information to assist surface transportation travelers in moving from a starting location to their desired destination. It is expected that ATIS will provide assistance in a manner that best satisfies the traveler's needs for safety, efficiency and comfort. According to the Intelligent Transportation Society of America, ATIS delivers data directly to travelers, empowering them to make better choices about alternate routes or modes of transportation. Further, travel, in this context, may involve a single mode of transportation, or it may link multiple modes together during various parts of the trip. This study focuses on Internet-based ATIS for domestic surface transportation mode of travel where the surface transportation system, according to, involves the movement of vast numbers of passengers and vast quantities of freight via road, rail, water and pipeline. This study specifically considers the transportation of passengers via road, rail and inland water (inland water includes shipping on all inland waterways and Great Lakes shipping engaged solely in the transportation of passengers or cargo between United States ports on the Great Lakes).

ATIS provides 1) real-time network information, whether traffic or transit, and 2) traveler information, such as route guidance or destination information, provided on advanced technologies, such as mobile phones enabled by wireless application protocol (WAP), personal digital assistants (PDA), the Internet and in-vehicle computers. Due to disparate nature of these enabling technologies, ATIS requires the integration of advanced applications for successful delivery. Enabling technologies in ATIS include personal computers digitalization, wireless communication, speech technology, global positioning system (GPS) and miniaturization. However, there are increasing expectations for

quality, both in the consumer and professional markets. It is no longer sufficient to just deliver products, which have technical excellence—products also need to be easy to use and to fit in within the context of usage. Characteristics of travelers and trips, in addition to other factors, determine customer demand for ATIS. Studies and surveys have identified these characteristics to be diversified in nature. Trips are made for different purposes and made by different kinds of travelers. As a result, research regarding the end-user has assumed paramount importance. Further, the importance of the end-user is recognized explicitly in 10-year Intelligent Transportation System (ITS) program plan.

Customer Characteristics

A recent study (Pucher & Renne, 2003) found that the private car continues to dominate urban travel among every segment of the American population, including the poor, minorities, and the elderly. This study, drawing on the 2001 National Household Travel Survey (NHTS), confirms most of the same travel trends and variations among socioeconomic groups documented by previous surveys. While the private car continues to dominate travel, there are important variations in auto ownership and travel behavior by household income, race/ethnicity, gender, and age. Overall, the poor, racial and ethnic minorities, and the elderly have much lower mobility rates than the general population. Moreover, the poor, Blacks, and Hispanics are far more likely to use public transit than other groups (minorities and low-income households account for 63% of public transit riders). Different socioeconomic groups also have different rates of carpooling, taxi use, bicycling, and walking and travel different distances and at different times of day.

Key findings show that public transport accounts for less than 2% of all urban travel where even the lowest-income households make only 5% of their trips by transit. An important discovery was the doubling in modal share of walk trips in cities due to an improved survey technique that captured previously unreported walks. Additional socioeconomic findings from this study are enumerated below:

Household Income – Income is the primary determinant of auto ownership, which, in turn, is the main determinant of modal choice. The ownership of even one car dramatically transforms travel behavior. Thus, transit use drops from 19.1% of trips by households with no car to only 2.7% of trips by households with one car. In addition, walking trips fell from 41.1% of trips by households with no car to only 12.5% of trips by households with one car.

Race/Ethnicity – Blacks and Hispanics have considerably lower incomes than Whites; the differences in travel behavior among these three groups also reflect differences among income classes. One thing they have in common is that they all rely overwhelmingly on the private car to get around. Although Whites make the most trips by car (87.6%), the others are not far behind, with Asians and Hispanics at 83.1% and Blacks at 78.9%

Gender – In terms of their travel behavior, women and men are becoming more and more alike; men and women both rely on the private car for about 86% of their urban trips. The only difference is that women are more likely than men to carpool (51.5% vs. 44.7%). Transit use, taxi use, and walking vary only slightly among men and women.

Age – Mobility rates are lowest for children and the elderly, both in terms of trips per day and mileage covered. The age group 25-64 has the highest mobility at 4.4 trips per day and 32.7 miles per day. Though mobility rates decline for the elderly, their choice of travel mode is quite similar to the rest of the adult population, they are overwhelmingly dependent on the car for getting around.

The American Disabilities Act (ADA) of 1990 prohibits discrimination on the basis of disability in—employment matters, state and local government, public accommodations, commercial facilities, transportation, and telecommunications. An individual with a disability is defined by the ADA as a person who has a physical or mental impairment that substantially limits one or more major life activities; a person who has a history or record of such an impairment; or a person who is perceived by others as having such an impairment (Americans with Disabilities Act, 1990). For the 54 million Americans with disabilities, access means simply being able to use, enjoy and participate in the many aspects of society, including work, commerce and leisure activities, and transportation is a vital link that allows full participation (U. S. Department of Transportation, 2003) .

Consequently, the socioeconomic groups, Household Income, Race/Ethnicity, Gender, and Age, as well as Disability Status form the basis of the Customer Characteristics used in this study.

Trip Types

The time spent, and miles covered, in traveling have been increasing over the past few years. Studies conducted by National Household Travel Survey underscore this finding. Classifying the various purposes for traveling contributes to a fuller understanding concerning the motivation for using ATIS. According to surveys conducted in 1995 by four Department of Transportation (DOT) agencies: Federal Highway Administration (FHWA), Bureau of Transportation Statistics (BTS), Federal Transit Administration (FTA), and National Highway Traffic Safety Administration (NHTSA) these various purposes, and their definition, can be classified as follows:

Work: Travel between home and a place where one reports to work.

Work-related: Trips for activities relating to job or business, other than to or from the workplace. Out-of-town business trips and professional conventions are included in this category.

Return to work (for work-based trips): Returning to the workplace after leaving for some reason like lunch, shopping or a meeting.

Family and Personal Business

Shopping: Trips to purchase commodities such as groceries, furniture, clothing, etc. This trip includes trips for window-shopping or if nothing was purchased at all.

Medical or dental: Trips made for medical, dental or psychiatric treatment.

Take someone somewhere (drop-off): Escorting someone else to their destination.

Pick up someone: Escorting someone on the return from their trip destination.

Other family and personal business: Includes purchase of services such as dry cleaning, haircut, banking, legal services, etc.

School: Trips to school, college or university classes, or attending school-related functions such as PTA meetings, seminars, etc.

Religious activity: Trips to attend religious services or to participate in other religious activities. However, social activities that take place at house of worship, but cannot be classified as religious, are not included in this category.

Social and Recreational

Vacation: Trips made for vacation.

Visit friends and relatives: Trips made primarily to visit friends or relatives.

Out to eat: Trips to restaurants or other eating establishments.

Other social and recreational: Trips taken to enjoy some form of social activity involving friends or acquaintances.

In this category, American Travel Survey (ATS) has provided further classification; they are as follows:

Rest/Relaxation

Sightseeing

Outdoor Recreation

Entertainment

Return home: Trips to residence.

Other: Trips that do not fit in any of the other trip purposes mentioned above.

Table 1 illustrates the correlation between Customer Characteristics and Trip Types described above. Here, all the possible combinations of Customer Characteristics (e.g., Household Income of \$20,000-\$39,999, Asian, Male, Age 25-39, Not-Disabled) and Trip Types (e.g. Work) are displayed. These form characteristics of various markets that an ATIS should serve.

Table 1 – Correlation Between Customer Characteristics and Trip Types

		CUSTOMER CHARACTERISTICS																	
		Household Income					Race/Ethnicity				Gender		Age				Status		
		<20000	20000-39999	40000-74999	75000-99999	100000-over	Black	Asian	White	Hispanic	Male	Female	5-15	16-24	25-39	40-64	65-over	Disabled	Not-Disabled
TRIP TYPE	Work																		
	Work-related																		
	Return to Work																		
	Family & Personal Business																		
	<i>Shopping</i>																		
	<i>Medical/Dental</i>																		
	<i>Take Someone Somewhere</i>																		
	<i>Pick-up Someone</i>																		
	<i>Other family and personal business</i>																		
	School																		
	Religious Activity																		
	Social and Recreational																		
	<i>Vacation</i>																		
	<i>Visit friends and relatives</i>																		
	<i>Out to eat</i>																		
	<i>Other social and recreational</i>																		
	<i>Rest/Relaxation</i>																		
	<i>Sightseeing</i>																		
	<i>Outdoor Recreation</i>																		
	<i>Entertainment</i>																		
	Return Home																		
	Other																		

Modes of Transportation

Considering the modes of transportation mentioned previously, the “nature of transportation” can be classified into two categories: mass transportation and other transportation. Mass transportation, also termed public transportation, is transportation by bus, rail, or other conveyance, either publicly or privately owned, providing to the public general or special service (but not including school buses or charter or sightseeing service) on a regular and continuing basis. Other transportation includes transportation not defined as mass transportation, comprising school buses, charter buses, sightseeing vehicles, and vehicles owned by and served to individuals.

Mass transportation services can be further classified into fixed-route and non-fixed-route. Fixed-route services, as defined by American Public Transportation Association (APTA), are provided on a repetitive, fixed-schedule basis along a specific route with vehicles stopping to pick up and deliver passengers to specific locations; each fixed-route trip serves the same origins and destinations, unlike demand response. Non-fixed-route services are not provided on a repetitive, fixed-schedule basis along a specific route to specific locations.

Fixed route services or non-fixed route services may be provided by public or private transit agencies. Further, non-fixed route services are termed paratransit. In practice, paratransit covers two broad areas: 1) a specific type of paratransit required for public transit agencies to be in compliance with the Americans with Disabilities Act of 1990 (ADA) called ADA complementary paratransit, and 2) all other paratransit, which covers other demand-responsive services. Table 2 summarizes these various modes of transportation.

Table 2 – Modes of Transportation

OWNED BY	MODES	EXISTING ENTITIES	FEATURES				
			ROUTE	STOPS	SCHEDULE	DISTANCE	
Mass Transportation							
PUBLIC	Commuter Rail	South California RRA, MTA Long Island Rail Road	Fixed	Fixed	Fixed	Regional	
	Heavy Rail	MTA Staten Island Railway in NYC, LA County MTA	Fixed	Fixed	Fixed	Regional	
	Light Rail	LA County MTA, San Diego Trolley	Fixed	Fixed	Fixed	Regional	
	Ferries	NYC Island Ferries	Fixed	Fixed	Fixed	Regional	
	Buses	MetroTransit in Twin Cities	Fixed	Fixed	Fixed	Regional	
	TrolleyBus	Trolleybus service in Seattle	Fixed	Fixed	Fixed	Local	
	Low-floor buses	Brownsville, TX http://bus.cob.us/Fleet.asp	Fixed	Fixed	Fixed	Local	
	Buses	Brownsville, TX http://bus.cob.us/Fleet.asp	Fixed	Fixed	Fixed	Local	
	TrolleyBus	Brownsville, TX http://bus.cob.us/Fleet.asp	Fixed	Fixed	Fixed	Local	
	Para-Transit	Sedans	Dial-a-Cab San Dimas	Flexible	Flexible	Flexible	Local
PRIVATE	Sedans	Dial-a-ride, Taxicabs	Flexible	Flexible	Flexible	Regional	
	Vans/Minibuses	SuperShuttle in LA	Flexible	Flexible	Flexible	Regional	
	Low-floor buses	Jitney	Fixed	Flexible	Flexible	Local	
Other Transportation							
PUBLIC	Schoolbuses	Public schools	Fixed	Fixed	Fixed	Regional	
	Sightseeing	Halifax Regional Municipality	Fixed	Fixed	Fixed	Regional	
	Charter	Halifax Regional Municipality	Flexible	Flexible	Flexible	Regional	
PRIVATE	Sightseeing	Gray Line Tours NYC	Fixed	Fixed	Fixed	Local	
	Charter	Greyhound Bus	Flexible	Flexible	Flexible	Regional	
	Van/Car Pooling	Pooling provided by personal request	Flexible	Flexible	Flexible	Regional	

Markets Leading to Personalized Service

Examining the intersection of customer characteristics, trip type, and mode of transportation can help to identify ATIS markets. The scenarios listed below are representative examples of these markets: Elderly person, making a health-care related trip. Middle-aged person, making a work-related commuting trip. Family, making a multi-modal, multi-regional, sightseeing trip. It is expected that market-based ATIS services such as these would benefit from the mass customization, personalization, and customer relationship management described earlier.

Dynamic Online Evaluation of ATIS Services

This section describes the development of a proof-of-concept for an online evaluation tool for assessing Internet-based E-Government ATIS. This proof-of-concept specifically incorporates the guidelines provided by Transitweb for the prototype. A screenshot provides a “snapshot” of this ongoing development effort.

Guidelines

Transitweb, through its Web site provides a searchable database to assist transit agencies in developing and improving their Web sites. Transit agencies can use these guidelines to provide information to public transit consumers faster and more accurately. According to Transitweb, there are five basic principles that underlie all the guidelines provided. They are explained below:

Efficiency – Minimize user time and effort to reach information.

Clarity – Making the available content and options as clear as possible to the user.

Proportionality – Keeping the design elements proportional to their functionality.

Consistency – Using consistent design elements on all pages.

Organization – Arranging related things together.

Web sites designed by various transit agencies may use these principles in their design. In this study these principles are identified as a class of goals. This was done to provide a perspective for measuring the performance of transit Web sites. Transit Web sites provide various features to satisfy these different classes of goals. These features are described below:

Content Organization – Indicates how a Web site has been organized, distributed and linked various contents throughout the site.

Navigation – Includes features such as design of the menu and related components for navigating among various options in the Web site.

Home page – This feature involves design of the home page for the site.

Maps – Indicates how system and route maps are designed.

Itinerary Maker – Involves design of an interactive itinerary maker.

Schedules – Includes design of pages for accessing and displaying route schedules.

Place Directories – Includes design of directories of streets, points of interest, towns or other geographic features intended to provide users with means to select an acceptable route when planning a trip.

Page form and performance – Indicates design and performance of pages.

Content – Involves form, format and appearance of site content.
 Links – Includes presence, position and appearance of html links.

Transitweb provide specific guidelines or qualities regarding these features. For this study, features are treated as metrics against which Internet-based ATIS services of transit agencies are evaluated. Explanations of these metrics are provided in Appendix M. The study questionnaire is based on these metrics. Here, a metric might consist of a single question or group of questions. Appendix N contains a table with the survey questions. This table is arranged, primarily, by class of goal, where a particular class of goal provides certain features. The following is an example of using these metrics for sites, such as the Minnesota Department of Transportation. For illustrative purposes, findings for the first metric “Content Organization” serving “Efficiency” as a class of goal is presented in Table 3.

Table 3 – Findings for <http://www.dot.state.mn.us>

Feature	Metric / Measurement	Class of Goal / Objective	Description	Minnesota Evaluation
Content Organization	Cross Mode and Service consolidation		Does the web site provide more than one transit mode?	Yes
			Are route maps grouped together?	Yes
			Are all the schedules grouped together based on same destination?	No
			Are the schedules grouped together based on mode?	Yes
			Does the system show evening and weekend routes together with daytime routes?	Yes
	Route-specific information consolidation		Are demand response services separate from scheduled services, for the same region?	Yes
			Is there a different home page, system map, linearity planner and place directory for different services or modes?	No
			Are services for adjacent cities combined in a single web page?	No
			For simple routes, does the web site display route schedule and maps on the same page?	Yes
			For complex routes with many stops, does the web site provide links to route-specific information?	Yes
Accessibility Information Collection		Are special event routes mixed with regular routes and are labeled for their limited availability?	No	
		Is the information relevant to specific routes placed solely in a consolidated part of the web site separate from route information?	Yes	
Administration Information Collection		For demand response of a small transit system, does the web site provide a phone number to call to get information?	No	
		Does the web site provide a section or separate URL for approved users of demand response systems?	No	
Page Filling		Does the web site provide a facility where the information relating to administration is provided?	Yes	
		If yes, does the facility provide service different types of users?	No	
		Is the information on a single page printable?	Yes	
		Can the information on a single page be read in its entirety, if printed?	No	
		Are the links selected by user displayed between branches of hierarchy in site hierarchy structures?	No	
Page Filling		Were there pages on the web site that required horizontal scrolling?	No	
		Were there pages on the web site that required vertical scrolling?	Yes	
		If there were any vertical scrolling, were there more than 2 pages the user had to scroll for information?	Yes	

This study builds on efforts such as Transitweb, specifically through a more nuanced approach to considering diverse traveler needs and a related consideration of how these diverse needs manifest different demands upon the online service structure and function. Proof of Concept Approach

It has been discussed that, the task of evaluating and improving the usability of Web sites can be daunting and as a result, some automated support for web designers and usability specialists will become an increasing necessity within the overall usability process. For example, the use of automated usability tools can:

- Save time and money in design and user testing;
- Improve consistency and quality of site design; and
- Improve the systematic application of usability standards

Adding automation to usability evaluation has many additional benefits such as aiding in comparisons between alternative designs and improving consistency in usability evaluation.

Usability evaluation is a process that entails many activities depending on the method employed and commonly includes:

Capture – collecting usability data, such as task completion time, errors, guideline violations, and subjective ratings

Analysis – interpreting usability data to identify usability problems in the interface, and

Critique – suggesting solutions or improvements to mitigate problems

Capture, as it relates to this study, is detailed in the section that follows. Analysis and Critique will be discussed as the study progresses.

Capture

The collection of usability data can be completed using three basic approaches: Rule-based, Empirical, and Model-based. These approaches are described as follows:

Rule-based approaches rely on design guidelines or heuristics to evaluate a design where the data being evaluated is the Web site itself. Empirical approaches gather data from actual users, whether from user testing, usage data, or questionnaire collection. Here, users may be guided through structured or unstructured tasks. Model-based approaches rely on the evaluator to construct a model of how a user would interact with the site. The idea is to develop a task analysis that the automated tool tests against, either in a theoretical model, or by using the candidate tasks to simulate usage of the Web site.

Appendix W

Summary of Recommendations

Summary of Recommendations

	Retirees			Disabled	Rural Immigrants			Urban Immigrants		
	Not yet	New	Older		Hmong	Somali	Spanish	Hmong	Somali	Spanish
Community-Based Transit	X	?	?	X	X	X	X	X	?	X
Carsharing					X		X	X		
Telecommunications	X				X				X	
ATIS	X	X			X					

Conclusions

As shown in the chart above, **Community-Based Transit (CBT)** holds the greatest potential to serve the needs of the populations studied in this project. Current paratransit already serves elderly and disabled populations, and the immigrant focus groups expressed interest in transit services that provide similar benefits. However, the CBT research showed that realizing this potential would require significant investment in technology, training, and even possibly reorganization of how the service is offered. Yet, while the current system of many relatively small providers serving a relatively circumscribed population is not an efficient model for significant service expansion, it should be remembered that one of the key elements of CBT is “community.” A few impersonal, large providers are not likely to provide the flexibility and comfort users will desire. Consequently, communication, collaboration, and standardization across providers will be necessary. Managers interviewed for this study indicated that they appreciated the information exchange that occurs at the annual Minnesota transit conference and felt that this type of opportunity for information exchange should be greatly expanded. This research also noted that Mn/DOT had attempted to lead in the deployment of ITS in CBT dispatching, but this program as since expired. A return of emphasis in this area would also be beneficial.

Recommendation: Mn/DOT should support the efforts of Community Based Transit operators to gain the benefits of advancing technologies. Mn/DOT should assist CBT operators in choosing appropriate and affordable technologies. Opportunities for information exchange and training should be provided along with technology.

Carsharing also presents significant opportunities for the immigrant population. In addition, it could bring the benefits of private automobile ownership to those who typically cannot afford a car of their own, or where ownership is otherwise inefficient,

such as university campuses. However, service to these populations is “uncharted territory” for car-sharing organizations, and, in some cases, the service will require continued operating subsidies. Nonetheless, the potential benefits should be examined, and, where possible, quantified.

Recommendations : Mn/DOT should support efforts to make carsharing a reality where it will bring greatest benefits, but also where the proper partners exist. The Technical Advisory Panel for this project has identified two types of partners for whom the time may be right: real estate developers and innovative insurance companies.

- In the insurance case, implementation would take the form of a demonstration of mileage-based insurance, where the insurance company provides coverage for the car sharing provider based upon the mileage driven by each car sharing member, rather than more conventional methods, which usually result in the carsharing provider having to pay the highest possible premiums. This creates advantages for the provider and carsharing members, through lower costs, and for the insurance company, as they are able to identify the risk each driver represents, and charge an appropriate premium.
- In the case of developers, two distinct audiences are considered: developers of housing for “downsizing empty nesters” and those marketing to immigrants. For the “downsizing empty nesters,” car sharing could be attractive to those who are looking to move from larger suburban homes to smaller urban townhomes or condominiums. In these urban settings, parking spaces for second or third cars can be quite expensive, and since an attraction of these urban settings is the proximity to many services and amenities, a second or third car (or even a first, in some cases) is rarely needed. However, since families occasionally have the need to travel in separate directions, car sharing could allow these families to “downsize” to one or no cars, but still have a second car available to them when necessary.

In the latter case, local government should be involved in the partnership. Findings from this research indicated that Hmong communities are well suited to take advantage of a car-sharing program. Given the influx of Hmong immigrants that are expected to move to the Twin Cities, provision of a car-sharing program could substantially reduce the costs of “getting started” in the US, while affording more mobility and access to jobs and other opportunities to assimilate into American life.

- As a final step, MnDOT should consider supporting third-party start-up initiatives, especially those that are designed to bring carsharing to non-traditional markets, including other close-knit ethnic communities and university populations.

Telecommunications and ATIS each also have areas where significant benefits can be achieved. These areas, however, require further research before they can be effectively deployed. As discussed in this study, those who are about to retire,

and the baby-boom population, which is likely to begin retiring in the next decade, are likely to benefit from advances in these areas.

Recommendations : Mn/DOT should support continued research into evaluation and definition of high-quality ATIS services and should continue to monitor efforts to expand e-services, especially in greater Minnesota. As the focus groups in this study highlighted a concern for personal safety, a connection with public safety agencies would be useful. Safety information about particular facilities was one idea suggested by the Technical Advisory Panel.

Similarly, public safety and transportation agencies could share information about travel to and from major events. Much of this information about directions, parking information, etc. is available about venues for these events, but it is not centralized, nor available in a dynamic format.

ATIS also provides opportunities to enhance the other applications. Currently, ATIS exists in the form of “511” services, which provide information about travel delay and other items useful to automobile travelers over the telephone. Further development of ATIS could allow it to also include information about alternative modes, such as CBT. This service could also link to reservation systems of CBT providers, or even car-sharing organizations. Certainly, the participation of CBT providers and car-sharing organizations would be needed. However, other potential partners could include employers, who could provide a base for organizing CBT operations, and/or large employers that have automobile fleets, including state and local governments, as potential partners for car-sharing organizations to share vehicles during off-peak times. Further research into the interest of these organizations in working together, the ability to add information from these providers in a centralized fashion, and the ease of customizing ATIS services for user needs will be needed to make this kind of “one-stop” service a reality.

Appendix X

Summary of Research Activities

Summary of Research Activities

	Event Type	Title	Location and Date	Audience	Author / Presenter	Follow-on Action?
1	Presentation	“Using ITS to Better Serve Diverse Populations”	ITS Research and Development Committee May 8, 2003	Minnesota transportation researchers and practitioners	Frank Douma,	
2	Product	“Behind the Wheel of a New Idea” (Video describing Car Sharing)	Completed August 2003	Car sharing organizations and interested clients	Humphrey Forum	Conveyed to hOurCar for their use
3	Presentation	“Using ITS to Better Serve Diverse Populations”	Peer Review meeting University of Minnesota October 2003	Prominent academics and high level practitioners	Frank Douma	Comments received and revisions made to work plan
4	Publication	“Using ITS to Better Serve Diverse Populations”	ITS America Annual Conference San Antonio Texas April 2004	Transportation Practitioners	Frank Douma, Denise McCabe, Jon Osmond	

5	Presentation	Transportation Alternatives for Diverse Populations	15 th Annual Center for Transportation Studies Transportation Research Conference St. Paul, MN May 4, 2004	Academics and practitioners	Frank Douma, Chandler Duncan	Advice for TRB papers
6	Presentation (TBD)	ITS Opportunities in Community Based Transit	84 th Annual TRB meeting, Washington, DC January 2005	Academics and High Level Practitioners	Frank Douma, Yufeng Guo	
7	Publication	ITS Opportunities in Community Based Transit	Compendium of Papers from 84 th Annual TRB meeting, Washington, DC January 2005	Academics and High Level Practitioners	Frank Douma, Yufeng Guo	
8	Presentation (TBD)	Transportation Opportunities for Diverse Immigrant Populations	ITS America 2005 Annual Conference Phoenix, AZ May 2005	Transportation Practitioners	TBD	
9	Publication (TBD)	Transportation Opportunities for Diverse Immigrant Populations	ITS America 2005 Annual Conference Phoenix, AZ May 2005	Transportation Practitioners	TBD	