# SMART
# Operational Field Test Evaluation: Dispatchers Survey Report

*FINAL REPORT*

June 1997

**The University of Michigan**

*Prepared by:*

**Zakia R. Shaikh, M.E.**
*Research Associate*

**Steven E. Underwood, Ph.D.**
*Project Director and Co-Principal Investigator*

**Richard R. Wallace, M.S.**
*Project Manager*

**Thomas B. Reed, Ph.D.**
*Research Scientist*

**Jonathan Levine, Ph.D.**
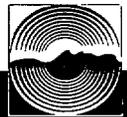*Co-Principal Investigator*

200 Engineering Programs Building
2609 Draper Drive
Ann Arbor, MI 48109-2101

Program Offices Telephone
(313) 764 4333

Program Offices Facsimile
(313) 763 1764

DOT/FHWA

150329

# SMART

## Operational Field Test Evaluation: Dispatchers Survey Report

---

*This report presents the results of the University of Michigan evaluation team's Dispatch Survey report on SMART'S development of advanced public transportation systems. This report also stands as one of the deliverables listed in the Statement of Work for the evaluation.*

# Table Of Contents

# EXECUTIVE SUMMARY

The Suburban Mobility Authority for Regional Transportation (SMART) has installed an automatic scheduling and dispatch system (ASD) in Southeast Michigan in accordance with their plans to implement ITS as a site for an operational field test. The purpose of this new system is to improve mobility and increase the efficiency of paratransit services in the region, in addition to contribute to meeting national ITS goals. SMART is among the first urban transit systems to implement scheduling and dispatch technology within its paratransit system before its linehaul system and the first to implement automatic vehicle location within its paratransit operations before its linehaul operations.

SMART has selected the University of Michigan to evaluate the new systems. This report is one in a collection reporting the results of the UM evaluation of the SMART's implementation of advanced public transportation systems (ARTS).

In order to assemble a comprehensive view on the system performance, a number of user groups were interviewed for their opinions on the system supplementing the objective measures addressed elsewhere in the evaluation. This report studies the effect of the scheduling and dispatch system upgrade on the paratransit dispatchers at SMART. The University of Michigan interviewed the dispatchers about the new scheduling and dispatch system, addressing the tools used during the day, interaction with various individuals, expectations and effects of the new scheduling and dispatch system, and attitudes toward the job. UM evaluators interviewed the dispatchers twice; first before they used the new system, all but a few had little or no experience with the new system, and then later after they all had several months of experience with the system.

The findings of this report indicate that the dispatchers are generally disappointed with the results of the new software. The dispatchers stated that TRAPEZE$^{TM}$-QV has affected their work tasks by making them more complicated and their job more stressful. The new ASD has increased the interaction between the dispatchers and individuals both within and outside of SMART. With the exception of one dispatcher, all the dispatchers preferred CARDS over TRAPEZE$^{TM}$-QV. However, the dispatchers expect the new system to improve SMART's paratransit system once planned modifications have been made to it. The dispatchers have a more positive view towards automatic vehicle location (AVL) system, anticipating the new AVL system to facilitate a number of their dispatching responsibilities.

# INTRODUCTION

Many factors contribute to the overall effectiveness of paratransit operations. A key factor is to make adjustments to changing circumstances throughout the day. Many things can disrupt the flow of the schedule including traffic congestion, road and weather conditions, as well as same day service requests and cancellations. The paratransit dispatcher is the liaison between the customer and the driver, and is responsible for communicating last minute requests and schedule changes to the driver. The dispatcher receives the trip request from the customer, determines which vehicle and driver should accommodate the customer at the appropriate time, and relays the message to the driver along with all other relevant information. The drivers are constantly in contact with the dispatcher throughout the day. The driver notifies the dispatcher when they encounter problems in the field while the dispatcher manages the situation from the terminal. The paratransit dispatcher, therefore, is an integral part of SMART's paratransit service.

In an effort to improve their community transit system and provide more efficient service to their customers, SMART has acquired a new scheduling and dispatch system. Since the dispatchers are in a situation to both work with the system and observe the immediate results of the system, their opinions on system performance carry some weight. The results of the interviews presented in this report provide the dispatchers perspective on the performance of the system and potential further enhancements that can be made.

**Scheduling and Dispatch System** - The overall SMART evaluation, including the findings of this report, addresses the benefits and costs associated with deploying a new scheduling and dispatch system, as well as several other components of SMART's new advanced public transportation systems (APTS). Scheduling and dispatch is the

focus of the Phase I evaluation effort. TRAPEZE™-QV is a network and PC-based scheduling and dispatch system, developed by Trapeze Software Inc. (TSI), that was selected by SMART to be installed as part of the SMART Enterprise Computer System, an ethernet communication system tying together Macomb, Detroit, Wayne, Oakland, and Pontiac computing sites. TRAPEZE™-QV replaced CARDS for Macomb County in early 1995, and was installed for Wayne and Detroit counties in late April 1996. Oakland County had TRAPEZE™-QV installed and went on-line in July 1996.

According to the TSI product literature, TRAPEZE™-QV provides 'real time' demand responsive scheduling and dispatching designed to register potential customers, take customer bookings (subscription, casual), schedule the customers to the available vehicles, and dispatch the vehicles and the drivers. The software is designed for a multi-user micro computer environment providing real-time dispatch, routing, and scheduling capabilities, allowing transit organizations to streamline their operations, maximize their resources, and improve customer service. The features of TRAPEZE™-QV include (see Appendix C for a complete list):

- Digital mapping functions that check travel times and distances between locations and display of vehicle itineraries,

- Customer registration with common destination assignment,

- Booking of requested trips with trip insertion and closest time rescheduling, and trip cancellation functions,

- Identification and correction of possible service difficulties dynamically, and a

- User interface that supports on-line help, edit messages, hot keys, and recall of previously-entered data

**Table 1. Features of CARDS and TRAPEZE™-QV**

|  | **CARDS** | **TRAPEZE™-QV** |
|---|---|---|
| **Application type** | Custom designed system to assist in reservation and dispatch system for paratransit scheduling | 'Real time' scheduling and dispatching designed to register potential customers, take customer bookings (subscription, casual), schedule the customers to the available vehicles, and dispatch the vehicles and the drivers |
| **Mapping features** | None | Street map displays with landmark and **location geocoding** |
| **Handling of client records** | Stores client information in INGRES relational database | Stores client information with location on street map |
| **Booking** | Books subscription trips and casual trip requests | Books subscription trips and casual trip requests |
| **Scheduling** | Trip insertion and alternate trip times | Trip insertion, alternate trip times, calculates distances by triangulation and routing |
| **Hardware implementation** | VT220 terminals with ethernet connection to VAX VMS | Desktop PCs running Windows '95 with ethernet and Novell Schedule and File Servers |
| **Type of user interface** | Text based; command driven | Windows '95; Windows NT in the summer of 1997 |
| **Vendor** | **GIRO** | Trapeze Software Inc. |

The move to a new scheduling and dispatch system represented a major upgrade in the computer and communications capabilities of SMART. Before the implementation of TRAPEZE™-QV, the operators used a VAX VMS-based database system called Computer Aided Routing and Dispatch System (CARDS) to schedule paratransit trips. The system was designed by GIRO Inc. out of Montreal, Canada, and was based on the INGRES relational database. With CARDS, the operators had to determine the most appropriate route and time to place the trip. Since it was up to the operator's discretion and judgment, there was always room for human error. With TRAPEZE™-QV this margin of error is greatly reduced by having the computer place the trip on the appropriate route at the appropriate time.

This study is one of three studies, Customer Service Operator Survey, Dispatcher Survey, and Scheduler Survey, addressing the perspectives of SMART personnel on the system upgrade. The methodology used in these three studies are identical, relying on individual interviews with the users of the system.

# METHOD

The approach taken in the dispatcher evaluation was to interview each subject individually, and in depth, after they have had some experience using a scheduling and dispatch product, and especially after they had some experience with the new TRAPEZE[TM]-QV Individual interviews were selected over focus groups in this case because the opinions of the individual subjects helped to establish the range of variation in their experience with the system. Open ended questions probed for the dispatcher's opinions, and the reasoning behind their opinions, so that the evaluation could assemble a more complete picture of what contributed to the dispatcher's attitudes toward any perceived advantages or disadvantages of the system. Furthermore, because of the relatively small number of subjects, ten during the initial set and eleven during the later set, and because of a need for open-ended exploration of the issues, qualitative information from the interviews provided greater insight on how to improve the new system as it evolves. As with the other components of the evaluation, the dispatcher evaluation of the system was formulated in light of the contributions expected from the other parts of the comprehensive SMART evaluation; evaluation of quantitative measures of performance will be coming from other data collection efforts planned in the SMART evaluation.

The subjects were interviewed twice. At the time of the first set of interviews, TRAPEZE[TM]-QV was implemented in parts of the service area, and dispatchers working for those areas had used TRAPEZE[TM]-QV to dispatch their vehicles, while the remaining dispatchers continued to use CARDS. At the time of the second set of interviews, all the dispatchers had been using the new system for at least six months. Because TRAPEZE[TM]-QV had already been implemented prior to the first data collection effort, the evaluation did not adhere to a comprehensive before-and-after design. However, a longitudinal reporting of dispatcher opinions was thought to be useful for tracking the dispatchers learning curve and evolving response. It was important to collect data from dispatchers who had experience with both CARDS and TRAPEZE[TM]-QV, and who could still remember CARDS, and it was important to talk to the dispatchers after they had some time to become familiar with the new system, so that they had some time to recover from whatever learning demands were imposed by the new system. A third survey will be conducted after the implementation of the automatic vehicle location (AVL) system and the dispatchers have had some experience with the vehicle tracking capabilities of the system.

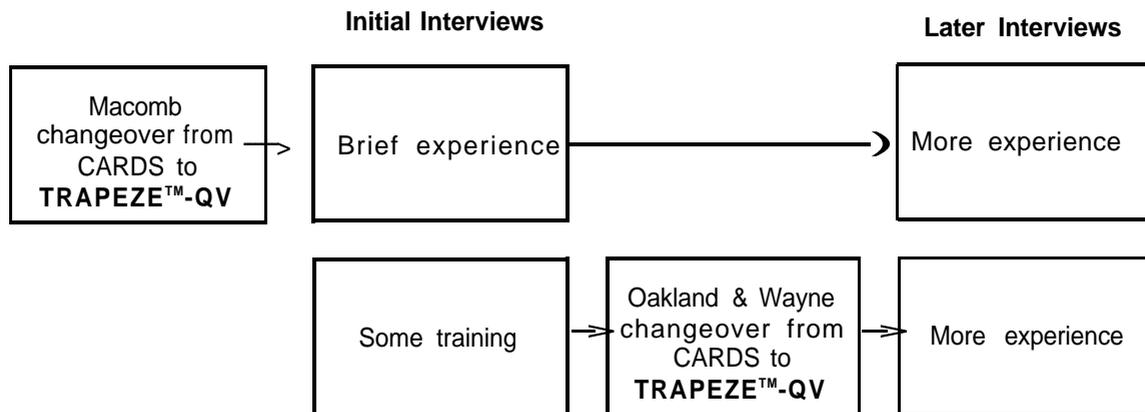**Figure 1. Longitudinal Survey Design for Dispatchers Opinions**

Table 2 summarizes the length of time the dispatchers worked for SMART. The average length of time for the dispatchers was over fourteen and a half years with responses ranging from seven years to nineteen years. However, as Table 2 displays, all of them have been dispatchers for only part of that time, between a year to sixteen years with an average of nearly five and a half years. Most of the subjects had been paratransit drivers, while some were customer service operators and schedulers before being promoted to dispatchers. When asked about previous positions they had held, they stated that the awareness of the possible situations the drivers may encounter and their knowledge of the geographic area gained from driving and scheduling in the area are assets in performing their jobs as dispatchers.

**Table 2. Length of Employment with SMART**

| Length of Employment | Number of Employees |
|---|---|
| **Employment with SMART** | |
| Less than five years | 0 |
| Five years to less than ten years | 1 |
| Ten yews to less than fifteen years | 2 |
| Fifteen years to less than twenty years | 7 |
| **Employment as a dispatcher** | |
| Less than five years | 7 |
| Five years to less than ten years | 1 |
| Ten years to less than fifteen years | 0 |
| Fifteen years to less than twenty years | 2 |

The University of Michigan developed two questionnaires that addressed the dispatchers' employment background with SMART, daily tasks and activities, the tools used to accomplish their tasks, and attitudes toward their jobs in general. Copies of the questionnaires are included in the appendices to this report. Since there are relatively few dispatchers employed at SMART, most of the questions were open-ended to allow for qualitative interpretation of the results. This report addresses several measures of effectiveness (MOEs) from the SMART APTS Operational Field Test Evaluation Plan (August 1995) including the dispatchers' perceptions on percentage of trip requests met, difference between requested and offered trip times, time to make reservations, ease of transfer, the number of trip requests, and dispatcher's satisfaction.

The evaluation plan called for interviewing each subject three times, once early after the implementation, once again after they had become more accustomed to using the new scheduling and dispatch system, and then again after they had reasonable time to master the scheduling and dispatch system and some experience using the automatic vehicle location system. The three interviews control for the impact of learning a new system and in a few cases, to see if there are any changes in attitude before and after the implementation of the new scheduling and dispatch system and the new automatic vehicle location system. This report provides the results of the first and second sets of interviews. The results of the third set of interviews will be provided in a separate report to be completed in Phase II of the evaluation.

The interviews were semi-structured and consisted of face-to-face discussions about the system with the selected dispatchers. These interviews were arranged with assistance from SMART personnel and conducted at the SMART Oakland terminal in Troy and the North Oakland terminal in Pontiac where the dispatchers work. The dispatchers were asked a series of questions on an interview schedule that followed a set protocol. Each dispatcher was interviewed individually by one and sometimes two interviewers. The interviewers took detailed notes to record the responses. The University of Michigan conducted a total of twenty one interviews, ten during the first set and eleven during the second set. Due to the turnover rate at SMART, the same individuals were not necessarily interviewed during both

sets of interviews. Table 3 displays the number of dispatchers interviewed during each set of interviews, the number of dispatchers common to both, and the number of dispatchers only at one of the two sets of interviews.

**Table 3. Number of Dispatchers Interviewed**

| Subject Groups | First Set of Interviews | Second Set of Interviews |
|---|---|---|
| Common to Both | 7 | 7 |
| First Set Only | 3 | -- |
| Second Set Only | -- | 4 |
| Total Interviewed | 10 | 11 |
| Not participating | 1 | 0 |

# FINDINGS

The findings are divided into several sections organized by interview set and topic. The first section summarizes the dispatchers' opinions in the initial set of interviews where, in most cases the respondents are asked to evaluate the systems before the complete installation of the new scheduling and dispatch system. The second section presents the results of the second set of interviews that were conducted after the majority of the dispatchers had over six months of experience using the system. Both sections address the dispatchers' use of scheduling and dispatch tools and technology, opinions regarding their experience with the current scheduling and dispatch tools, and expectations regarding the systems. The third section presents the dispatchers' response to questions asking them to compare CARDS and TRAPEZE[TM]-QV. The final section addresses the dispatchers' attitudes toward their jobs. The conclusion compares the initial and later interview responses, and highlights changes in response between administration of the questionnaires.
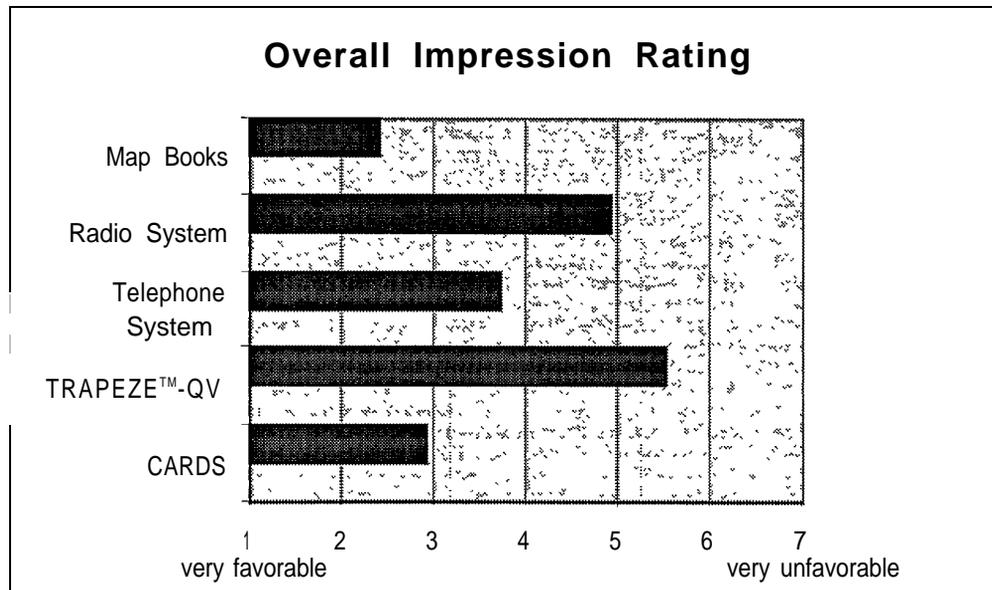
**Initial Interviews** - Ten out of the eleven SMART paratransit dispatchers participated in the first set of interviews. At that time only the five dispatchers for Macomb County were using TRAPEZE[TM]-QV to dispatch paratransit trips, and they had been using it for several months, while the dispatchers for the remaining counties were being trained to use TRAPEZE[TM]-QV while continuing to use CARDS.

The dispatchers perform a number of tasks with slight differences between individual assignments; some dispatch for one area only, some dispatch for all the areas, and some perform additional administrative duties. Tasks performed by the dispatchers include:

- Log in drivers, place them in the appropriate vehicles, and start them on the road on time.

- Provide road supervision.

- Supervise drivers over the radio.

- Supervise schedulers and CSOs.

- Write up discipline/violations.

- Report logs and incidents etc.

- Assist the drivers in locating addresses.

- Make sure the drivers maintain the schedule.

- Provide assistance to the driver during emergency situations.

- Dispatch DIAL-A-RIDE service.

- Serve customers calling about ASAPs, trip times, cancellations and return trips.

- Perform administrative duties.

While performing these tasks, the dispatchers use a number of tools including, CARDS, TRAPEZE[TM]-QV, telephone system, radio system and map books. They evaluated each tool on ease of use, effectiveness, satisfaction, time to learn, favorite and least favorite features, and overall impression. They were asked to rate the system between 1 and 7, with 1 being very favorable and 7 being very unfavorable. Figure 2 provides a summary of the dispatcher's overall impressions of the tools. Table 4 at the end of the section provides a detailed descriptive summary of their response. The next few sections describe each of the systems, the procedures the dispatchers follow in their use of the systems, and the dispatchers' evaluation of each tool.

Figure 2. Overall Impressions from Initial Interviews

## Overall Impression Rating

| | |
|---|---|
| Map Books | |
| Radio System | |
| Telephone System | |
| TRAPEZE™-QV | |
| CARDS | |

1    2    3    4    5    6    7
very favorable                    very unfavorable

## CARDS

Before moving to TRAPEZE™-QV, the dispatchers used the Computer Aided Reservation and Dispatch System (CARDS) to schedule and dispatch their paratransit trips. SMART procured CARDS in the late 1980s to help them run a more efficient paratransit scheduling system. CARDS eventually became outdated and has been replaced by TRAPEZE™-QV as a part of the operational test.

All ten dispatchers evaluated CARDS in the first set of interviews and gave it an overall mean rating of 2.9 with the individual responses covering the entire range from 1 to 7. The dispatchers found CARDS to be easy to use and well suited with respect to its original purpose. Most of the dispatchers mentioned that they were satisfied with CARDS: one commented that they were ready for a better system.

The amount of time it took the dispatchers to learn to use CARDS varied from a few days to two months. As for their favorite feature of CARDS, the dispatchers mentioned their ability to obtain information on clients, ability to view paratransit runs, ability to find maps, ease of coordinating transfers, and CARDS' maneuverability, simplicity, and suggestion screen. As their least favorite feature, the dispatchers stated that CARDS does not allow a "no show" to be logged in, does not provide accurate travel times, is cumbersome to book customers in, is not colorful, and is slow.

## Telephone System

The dispatchers rely on the telephone system primarily to communicate with the customers, providing same day trips and DIAL-A-RIDE service, and addressing general questions and comments. All ten dispatchers evaluated the telephone system. The dispatchers were not satisfied with the telephone system. They gave the telephone system an overall mean rating of 3.7, with individual ratings ranging from 1 to 7. Although they found the telephone system to be simple and easy to use, the dispatchers stated that the telephones are old and do not work very well. Sometimes the system shuts down. There is no volume control and it can be very difficult to hear the customers at times.

The dispatchers added that it took them anywhere between one day to one week to feel comfortable using the telephone system. Some of their favorite features include ease of transferring calls and the hold button. Their least favorite feature was not being able to hear the customers due to a bad connection or lack of volume control.

## Radio System

The radio system is essential for the dispatchers to communicate with the drivers. The dispatchers and drivers remain in constant contact over the radio. All ten dispatchers evaluated their radio system. They gave the radio system an overall mean rating of 4.9, with the individual responses ranging from 1 to 7. Six dispatchers found the radio system to be easy to use while the other four dispatchers found it to be difficult to use. Most of them stated that the radio system did not work very well. The connections are unreliable, a result of the congestion caused by sharing the radio channels with others in the region. In their opinion, there is excess static and interference, making it difficult to communicate with the drivers. They added that the system ceases to operate once in a while, causing problems since it is the primary tool for communicating with the paratransit drivers on the road. Most dispatchers were not satisfied with the radio system.

However, the dispatchers stated that it did not take them long to learn to use the radio system anywhere from one day to one week, and most already knew how to use it from using it as a driver. The dispatchers mentioned the following as their favorite features of the radio system: provides access to drivers, is helpful in emergencies, and is simple and easy to use. The following are their least favorite features: not being able to get on to the system due to channel overload or interference, and not being able to access all the channels.

## Map Books

A map book is a collection of detailed maps of SMART's service area. The dispatchers use this book to locate origin and destination addresses of the customers. Eight of the ten dispatchers evaluated the map books and gave them an overall mean rating of 2.4. Six dispatchers found the map books easy to use while the other two found it difficult to use. They stated that the map book worked well and they were satisfied with it. They learned to use it in one day, and many of them had used them as drivers. The dispatchers listed the alphabetical and geographical index and its simplicity as their favorite features. They mentioned the lack of newer roads and areas, and the small print as their least favorite features.

## TRAPEZE™-QV

At the time of the first interview SMART had been using TRAPEZE™-QV in Macomb County for approximately one year. Only the dispatchers working in Macomb County had experience using TRAPEZE™-QV and these five dispatchers gave TRAPEZE™-QV an overall mean rating of 5.5, with the actual responses ranging from 1 to 7. Two dispatchers found TRAPEZE™-QV easy to use while the rest found it very difficult to use. At the time of the first set of interviews, the dispatchers had not had much experience with TRAPEZE™-QV, thus, it was a learning process each time they used it. It was their opinion that TRAPEZE™-QV did not work well. They added that all the computer bugs had not been eliminated and TRAPEZE™-QV was not performing as effectively as it was originally expected to perform. The dispatchers were not satisfied with TRAPEZE™-QV

The amount of time it took the dispatchers to learn to use TRAPEZE™-QV varied from a couple of days to a few months. The dispatchers mentioned the following as their favorite features: ability to directly access the system, ability to locate streets in the map field, the color screen, and the TRAPEZE™-QV maps. They mentioned the following as their least favorite features: insufficient time for loading, unloading and transporting passengers, lack of maneuverability, and inadequate programming.

**Table 4. Dispatcher Evaluation of their Tools and Technology**

| | CARDS | TRAPEZE™-QV | Telephone System | Radio System | Map Books |
|---|---|---|---|---|---|
| Impression[a] | 2.9 n=10 | 5.5 n=5 | 3.7 n=10 | 4.9 n=10 | 2.4 n=8 |
| Ease of Use | Easy to use | Difficult to use | Easy to use | Easy to use | Easy to use |
| How well it works | Works well | Does not work well | Does not work well | Does not work well | Works well |
| Satisfaction with it | Satisfied | Not satisfied | Not satisfied | Not satisfied | Satisfied |
| Time to learn to use | One week to two months | A couple weeks to a few months | One day to one week | One day to one week | One day |
| Favorite Feature | Ease of scheduling transfers, ease of obtaining maps and information on clients, ability to see runs and who booked them, suggestion screen, maneuverability | Colors, map field, ability to get directly into the system the maps | Ease of transferring calls and hold button | Accessibility to drivers, helpful in emergency situations, simplicity, ease of use | Index, break down by areas, maps, it is self explanatory |
| Least favorite feature | Slow speed, numerous steps, black and white screen, inability to log a no show, process of booking customer trips | Programming problems, lack of maneuverability and inabiity to fit customers in where they need to go, overlap in time | Lack of volume control, bad connections | Inability to reach drivers, inability to cover all the driver radio channels, overlapping areas and overlapping channels, channel overload | Missing roads, small print, using the index |

a Ratings between 1 and 7 with 1 being very favorable and 7 being very unfavorable

The dispatchers recommended the following changes to their tools and technologies:

- Obtain a new radio system.
- Separate the telephone lines for each DIAL-A-RIDE.
- Separate the dispatchers from the CSOs and schedules.
- Upgrade the telephone system.
- Reengineer and fine tune TRAPEZE™-QV, or preserve CARDS.

## Same Day Service Requests

The number of same day service requests the dispatchers receive varies depending on the service area and the time of the month. There is greater demand for service at the beginning of the month when a large number of the riders receive government assistance checks. SMART provides two types of same day service, as soon as possible (ASAP) and DIAL-A-RIDE service. ASAP trips are provided in areas with advanced reservation trips and are scheduled for the day that it is called in, in contrast with two to six days before the day of the trip for advanced reservation. In the areas that provide ASAP service only, some dispatchers receive up to twenty requests while other dispatchers may not receive any requests on a given day. The dispatchers receive an average of nine same day trip requests a day. These requests are either accommodated on the initial telephone call or within half an hour, allowing the dispatcher some time to check the schedules and then call the customer back. Depending on the service area and the amount of trips scheduled for that particular day, the dispatchers can accommodate anywhere from 20 to 90 percent, with an average of 52 percent, of their

ASAP requests. These trips are usually scheduled close to the requested time, ranging from 15 minutes to 60 minutes, with an average offset of 28 minutes.

The number of same day trip requests are much greater in Beverly Hills, Birmingham, Pontiac, Trenton, and Troy, the areas with DIAL-A-RIDE service. Areas with DIAL-A-RIDE do not have advanced reservation trips, and all the trips are responses to same day service requests. Depending on the service area, the dispatchers receive varying numbers of DIAL-A-RIDE requests, ranging from 50 to 200 requests a day, with an average of 120 requests a day. The customers must be ready to be picked up at the time of the call. The dispatchers are able to accommodate nearly all the DIAL-A-RIDE requests.

The dispatchers stated that ASAP trips normally do not require transfers. They will occasionally schedule a transfer for an ASAP trip, although, this is uncommon because transfer trips require the dispatchers to schedule four buses for a round trip. Instead, they allow the paratransit driver to transport the customer directly to their destination. However, some of the DIAL-A-RIDE trips do require transfers. These transfers are done verbally over the radio and is not recorded into the computer (CARDS).

## Dispatchers Relation to Others

Figure 3 displays the dispatchers interaction with individuals both within and outside of SMART. The dispatchers stated that they have limited interaction the customer service operators (CSOs). The CSO transfers the customer's call to the dispatcher when they call for same day service or a cancellation. The dispatchers also consult the CSOs about nonfeasible trips and inaccuracies the CSOs have scheduled. At times the dispatchers will consult a scheduler if there is a problem with the schedule, since the schedulers look over and check the CSOs work (i.e. the trip schedules). The dispatcher uses the telephone, and CARDS or TRAPEZE$^{TM}$-QV, during this interaction.

**Figure 3. Dispatchers Interaction with Others**
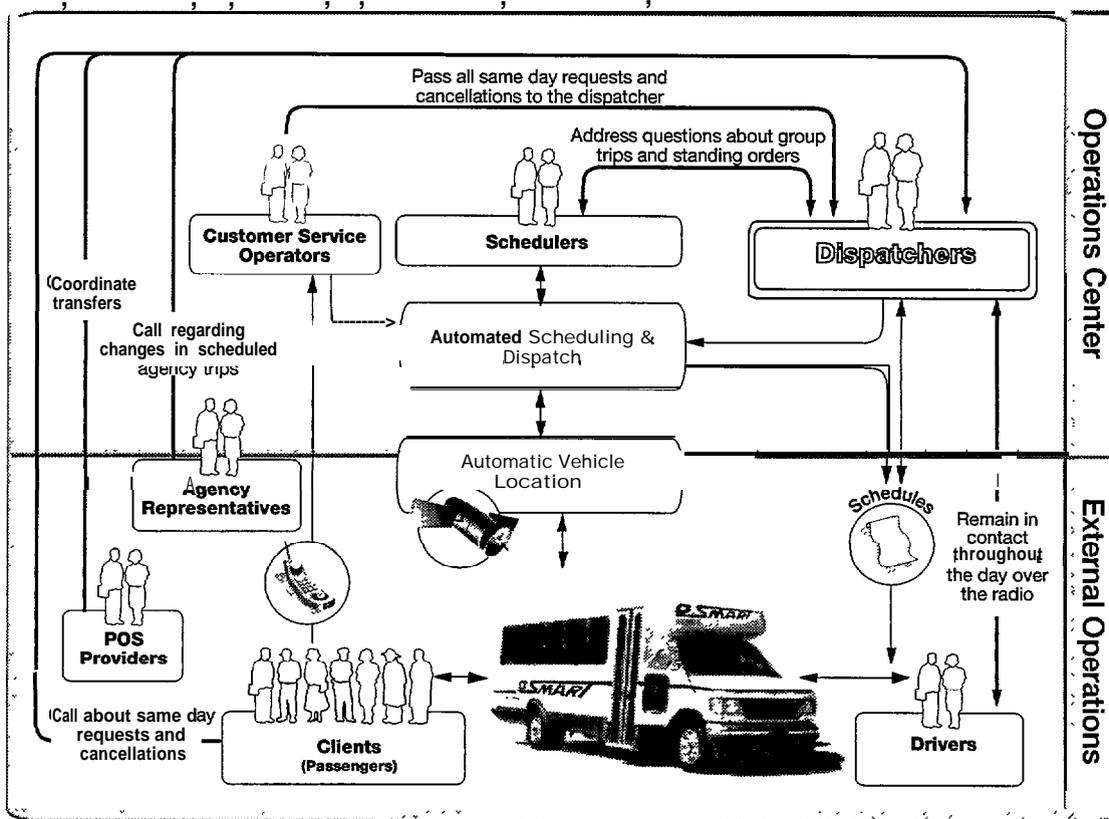
Interaction with the schedulers generally occurs when the dispatchers need to check on group trips or standing orders. The dispatchers also inform the schedulers about customers canceling permanently and repeat no shows because the schedulers are ultimately responsible for the paratransit trip schedules.

The dispatchers are all located together in their respective terminals in Pontiac and Troy, and they work together to ensure everything operates smoothly. If there is an emergency, then they help each other by calling 911, maintenance, and the road supervisor. When a dispatcher is very busy, the others help by answering the telephone and monitoring the radio. They also coordinate transfers with each other when needed.

The dispatchers supervise the paratransit drivers and remain in contact with them throughout the day. Most communication is over the radio and supplemented by the telephone. The dispatchers ensure the drivers start on time and pick up passengers in a timely manner. They help the drivers during the day with any situations the drivers may encounter: problems with the schedules, vehicles, and customers. The dispatchers inform drivers of last minute schedule changes including same day trip requests and same day cancellations. Whenever the driver has questions about certain addresses and directions getting to the addresses, the dispatcher provides them with assistance. If the driver needs to contact a customer, the dispatcher calls and relays the driver's message. The dispatcher is the driver's link to the terminal while the driver is on the road.

The dispatchers also interact with the customers over the telephone when they call for DIAL-A-RIDE trips, ASAP trips, and cancellations. The customers also call to change their pick up or drop off times, to find out where the bus is, or to verify their trips. Some call for general information or with service complaints.

The dispatchers have limited contact with agency representatives. While most agency interaction is with the schedulers, the agencies call the dispatchers to see where the bus is, if the bus is running early or late, or to call in a cancellation. Sometimes the dispatcher calls the agency representative to let them know that their bus is running late. Communication with agency representatives is entirely over the telephone.

The dispatchers have little to no interaction with the purchase of service providers. The four purchase of service providers in SMART's service area are Harper Woods Community Connector, Mt. Clemens Connector, Nankin Connector and Redford Connector. The dispatchers that have these providers in their jurisdiction have some interaction, primarily during transfer trips between the purchase of service providers and SMART paratransit. Communication with the purchase of service providers is entirely over the telephone.

## Expectations of the New Technologies

The dispatchers anticipate the new technologies to help them and make their job easier. A number of dispatchers stated that TRAPEZE$^{TM}$-QV is not efficient, however, they expect improvements once it has been reprogrammed and upgraded. Currently they rely on the paratransit drivers to inform them of their location. They expect the new automatic vehicle location system to provide assistance by displaying the exact location of the buses at all times, thus allowing them to accommodate same day requests. The AVL will also assist with situations where the customer states that the bus never arrived to their home to pick them up. These claims can be easily checked with AVL.

**Later Interviews -** During the second set of interviews, all eleven dispatchers commented on the new ASD, TRAPEZE$^{TM}$-QV, and its effects on their job. They indicated that the new scheduling and dispatch system has complicated their job and made it more stressful. Nine out of these eleven dispatchers have worked with both CARDS and TRAPEZE$^{TM}$-QV,

two relatively new dispatchers have worked only with TRAPEZE™-QV. At the time the interviews were conducted, TRAPEZE™-QV had been installed and used exclusively by all the counties for over six months. The second questionnaire is similar to the first with emphasis on TRAPEZE™-QV and changes resulting from the implementation of the new system.

Although dispatchers do not directly use the scheduling and dispatch software significantly, they rely heavily on the product of TRAPEZE™-QV, the paratransit schedules, to dispatch the vehicles throughout the day. It is the problems present in the schedules that have lead to their dissatisfaction with the new ASD system

In the later interviews five dispatchers stated that they do not use TRAPEZE™-QV a great deal and, therefore, it has not changed their work day. However, three dispatchers stated that TRAPEZE™-QV has made their work more complicated and the job more stressful. TRAPEZE™-QV has caused many booking errors, such as customer trips being canceled without notifying SMART employees, or customers being booked on the wrong day. Often customers are booked for one-way trips only and the dispatcher has to book the trip home. Finally, TRAPEZE™-QV does not show the number of wheelchairs on the bus, resulting in over-booking of wheelchair trips, and the dispatchers are responsible for remedying the situation. Dispatchers located at Pontiac, where the majority of their service is DIAL-A-RIDE service, do not use scheduling and dispatch software, and were unaffected by the changeover.

Several dispatchers recommended improving TRAPEZE™-QV or reverting to CARDS. According to dispatchers, the improvements to TRAPEZE™-QV should provide consistent trip times to both the customers and the drivers, not change the times the customers are scheduled for. Furthermore, TRAPEZE™-QV should provide

additional time to load and unload wheelchairs, and adequate time to complete a trip. In addition, they suggested improving the radio and the telephone systems, thus, improving communication with paratransit drivers and customers.

Most dispatchers, however, reiterated that they expect the new automatic vehicle location system to improve the current situation, alleviating problems with locating drivers and responding to customer inquiries. Some dispatchers, however, are still skeptical and are waiting to observe the actual effectiveness of me new AVL system.

## Evaluation of TRAPEZE™-QV

All the dispatchers evaluated TRAPEZE™-QV and commented on their direct interaction with the software. Some dispatchers learned the system quickly, while others were still uncomfortable using TRAPEZE™-QV, and were especially uncomfortable with the screens they use infrequently. Some dispatchers found TRAPEZE™-QV to be easy, while others found it to be difficult to use. The dispatchers who found TRAPEZE™-QV difficult explained that TRAPEZE™-QV does not allow certain trips when the dispatchers know they can be made. Although most agreed that TRAPEZE™-QV worked adequately for their needs, two dispatchers disagreed. They believe that it is not designed properly and all the features have not been implemented. They claim that the vendors "installed TRAPEZE™-QV and left without providing sufficient support." Most dispatchers stated that they are not satisfied with TRAPEZE™-QV because they receive flawed schedules.

The dispatchers identified their favorite features of TRAPEZE™-QV to be: the map and its ability to pinpoint locations, the crossroads, and the colorful screens. Their least favorite features were: system shutting down, geocoding addresses, inputting address changes, and scheduling ASAP trips. The dispatchers gave TRAPEZE™-QV overall ratings ranging from 3 to 7, with an average mean rating of 4.4 (rated it from 1 to 7, with 1 being very favorable and 7 being very unfavorable).

## Same Day Service Requests

The process of scheduling same day service requests, both ASAP and DIAL-A-RIDE trips, has not been affected by the implementation of TRAPEZE$^{TM}$-QV. Similarly, the procedure for scheduling a transfer is the same as it was with CARDS and has not changed with the implementation of TRAPEZE$^{TM}$-QV The dispatchers added that some DIAL-A-RIDE transfers are with the linehaul and these trips are accommodated according to the linehaul's printed schedule.

## Interaction with Others

Table 5 displays the change in the dispatchers' interaction with individuals both within and outside SMART since the implementation of TRAPEZE$^{TM}$-QV The five dispatchers that have worked with both CARDS and TRAPEZE$^{TM}$-QV reported that the changeover to TRAPEZE$^{TM}$-QV changed their interaction with the CSOs. While three dispatchers do not work with the CSOs, the others have had problems with the trip routes scheduled by the CSOs. The dispatchers stated that the CSOs inaccurately book trips (e.g., the pick up time for transfers is scheduled before the drop off time), book trips backwards, and double book trips. One dispatcher added that if TRAPEZE$^{TM}$-QV provided the CSOs with adequate information about a trip, fewer scheduling errors would exist.

The dispatchers explained that problems with the schedulers have increased. The addition of TRAPEZE$^{TM}$-QV has led to several problems, many the result of the CSOs' work. One of the schedulers' tasks is to check the paratransit routes compiled by the CSOs the night before they are distributed to the paratransit drivers and the dispatchers. During this check, the schedulers are responsible for detecting and correcting scheduling errors. The dispatchers reported more errors to the schedulers and asked more questions about the group trips arranged by the schedulers.

TRAPEZE$^{TM}$-QV produces numerous violations when scheduling certain trips. CSOs are unable to override these violations and, subsequently, the schedulers must schedule these trips. With the addition of TRAPEZE$^{TM}$-QV, the schedulers workload has increased. Two dispatchers added that they are temporarily understaffed in the scheduler position, and this shortage has led to some of the problems they are experiencing. Although, this situation has been resolved since the interviews were conducted.

**Table 5. Change in Dispatchers' Interaction with Various Individuals**

| Individuals | Change in Interaction |
|---|---|
| Customers Service Operators | More confrontation about errors in booking trips |
| Schedulers | Increased negative interaction when dispatchers must approach schedulers with scheduling problems |
| Paratransit Dispatchers | No change |
| Paratransit Drivers | More contact with the drivers as a result of increased problems |
| Customers | Increased number of complaints from the customer because the vehicles arc not arriving on time |
| Agency Representatives | Increased contact with agency representatives to inform them of problems arising when Quo TRAPEZE$^{TM}$-QV shuts down |
| Purchase of Service Providers | No change |

The dispatcher also reported that since the implementation of TRAPEZE[TM]-QV, the customers complain to drivers about not arriving at the pick up points on time. TRAPEZE[TM]-QV has changed pick up times by up to 60 minutes without any warning. The drivers often have to straighten out runs that are winding and do not flow well. Drivers have also been complaining to and blaming the dispatchers for these TRAPEZE[TM]-QV scheduling errors.

Many of these booking errors have made SMART paratransit customers angry and they are contacting the dispatchers with their complaints.

Although dispatchers have limited interaction with agency representatives, TRAPEZE[TM]-QV has stopped functioning a few times, losing data and affecting the agency schedule and trip times. Dispatchers are responsible for handling these problems by contacting the agency representatives.

Interaction among dispatchers and purchase of service providers has not changed with the implementation of TRAPEZE[TM]-QV

**CARDS versus TRAPEZE[TM]-QV** - All the dispatchers except one preferred CARDS over TRAPEZE[TM]-QV explaining that:

- It is easier to perform dispatcher duties in CARDS.

- CARDS provides blocked time for traveling whereas TRAPEZE[TM]-QV changes the times. TRAPEZE[TM]-QV does not take into account the passenger loading time and realistic travel time.

- CARDS does not remove customers from scheduled trips or change trip times like TRAPEZE[TM]-QV.

- Less booking errors exist in CARDS.

The dispatcher selecting TRAPEZE[TM]-QV preferred the features of the map and finds TRAPEZE[TM]-QV easier to operate than CARDS.

**Attitudes Toward Job** - Another method to observe the dispatchers response to the new scheduling and dispatch system is to track their attitudes toward their work environment. Tables 6 and 7 display the dispatchers' reported level of stress on the job and satisfaction with the job at the time of the first and second interviews.

**Table 6. Job Stress**

| Level of Stress | Initially (n=10) | Later (n=11) |
|---|---|---|
| Very Stressful | 8 | 6 |
| Stressfill | 2 | 4 |
| Not Stressful | 0 | 1 |

Implementation of TRAPEZE[TM]-QV had little impact on reported stress. Initially, all the dispatchers reported some level of stress in their job; most found their jobs to be very stressful, attributing it to the noise in their area and the inadequate tools used for their job. This did not change with TRAPEZE[TM]-QV. However, one dispatcher specifically stated that the job stress has been compounded with TRAPEZE[TM]-QV.

**Table 7. Satisfaction with Job**

| Satisfaction | Initially (n=9) | Later (n=ll) |
|---|---|---|
| Very Satisfied | 0 | 1 |
| Satisfied | 7 | 5 |
| Not Satisfied | 2 | 5 |

Although the dispatchers found their job to be stressful, Table 7 indicates that, initially, most were satisfied with their jobs. The cause of dissatisfaction was discontent with management's reluctance to address their issues such as their working conditions. During the second set of interviews, about half the dispatchers stated that they were satisfied with their job, about half were not satisfied with their job, and one dispatcher was very satisfied with their job. Although many were dissatisfied with their relation with management, they enjoyed providing the much needed transportation service. They, therefore, added that they liked their job regardless of whether they are satisfied or not satisfied with it.

Most dispatchers identified interaction with drivers and customers as the favorite aspect of their job. They especially enjoyed helping people by providing trips and maintaining the trip schedule.

During the initial set of interviews, the least favorite aspect of the job included the times when they are unable to help a customer or driver, times when the buses break down, the working conditions and environment, the noncaring management, the inadequate equipment, and the stress level. They suggested the following changes to improve their job:

- Improve working conditions by expanding their working area and separating it from the CSOs.

- Use newer buses.

- Replace the radios.

- Provide them with greater authority over the schedules, the CSOs, and the schedulers.

During the later interviews, the criticisms were similar, with a few additions: telephone constantly ringing, having to deny rides to the customers, attempting to talk to everyone at the same time (customers, drivers and dispatchers), dealing with angry drivers and customers, their low pay, and TRAPEZE$^{TM}$-QV. The dispatchers suggested the following additional improvements:

- Remove TRAPEZE$^{TM}$-QV.

- Increase the pay rate.

- Improve cooperation among the SMART employees.

# CONCLUSIONS

The results of the two sets of interviews with the dispatchers indicate the dispatchers are dissatisfied with the results of TRAPEZE™-QV, specifically the paratransit schedules generated by TRAPEZE™-QV. Both the initial and later sets of interviews support this conclusion to varying degrees. TRAPEZE™-QV has added to their daily work tasks, increased their interaction with individuals, and has added to the stress of their job. Regardless of their negative evaluation of TRAPEZE™-QV, the dispatchers believe that it can be improved and anticipate a more efficient paratransit system as a result in the near future.

Table 8 summarizes the dispatchers' evaluations of TRAPEZE™-QV both before and after the completion of the implementation. This table shows that the dispatchers' opinion of TRAPEZE™-QV has changed little between the initial and later interviews. Results suggest that the dispatchers believe TRAPEZE™-QV has slightly improved. Initially, they found it difficult to use and later they found it to be neither difficult nor easy to use. Initially the system did not work well and now it works adequately for their needs. With the rating ranging from a very favorable 1 to a very unfavorable 7, initially the dispatchers gave TRAPEZE™-QV an average

overall mean rating of 5.5 and later gave an average overall mean rating of 4.4. However, the dispatchers were not satisfied with TRAPEZE™-QV during either the initial or the later evaluations. During the initial interviews, only five out of the ten dispatchers interviewed evaluated TRAPEZE™-QV and during the second interviews, eight out of the eleven dispatchers evaluated TRAPEZE™-QV,

The dispatchers reported that their dissatisfaction with TRAPEZE™-QV is not based on their use of the software, rather the output of the system, the schedules and the way the trips are scheduled. They expect that once the CSOs are accustomed to and familiar with TRAPEZE™-QV, the schedules will improve.

SMART management stated that it took the SMART employees nearly a year to adjust to using CARDS for scheduling and dispatching paratransit trips. Since the later interviews were conducted soon after the completion of the implementation of TRAPEZE™-QV, there was some overlap with the learning phase of TRAPEZE™-QV It is anticipated that after several more months of experience using TRAPEZE™-QV, the implementation problems will be resolved and the dispatcher will be able to provide a less biased assessment of the system.

**Table 8. Comparing Initial and Later Evaluations of TRAPEZE™-QV[a]**

|  | **Initial Interviews** | **Later Interviews** |
|---|---|---|
| **Ease of Use** | Diicult to use | Neither difficult nor easy to use |
| **How well it works** | Does not work well | Works adequately |
| **Satisfaction with it** | Not satisfied | Not satisfied |
| **Time to learn to use** | A couple weeks to a few months | One day to a few months |
| **Favorite Features** | Colors, map field, ability to get directly into the system, the maps | Map and its ability to pinpoint locations, crossroads, colorful screens, and the controls |
| **Least favorite features** | Programming problems, lack of maneuverability and inability to fit customers in where they need to go, overlap in time | Ties when the system shuts down, geocoding addresses, inputting address changes, and scheduling ASAP trips |
| **Impression[a]** | 5.5<br>n=5 | 4.4<br>n=8 |

Ratings between 1 and 7 with 1 being very favorable and 7 being very . unfavorable

As far as the software problems SMART is encountering (shutting down for some time), SMART management is aware of this situation and is attempting to alleviate the problem by procuring an upgrade to the current TRAPEZE$^{TM}$-QV system. It will be in a Windows NT environment making it user friendly for the dispatchers. This system is planned to be installed during the summer of 1997.

The dispatchers added that they believe that the AVL portion of SMART's APTS will significantly affect their responsibilities directly. They expect it will assist them by making their tasks less complicated and easier. They are awaiting the implementation of the new automatic vehicle location system installed in the spring and summer of 1997.

## APPENDIX  A:  **Initial Questionnaire**

**Guidelines for Dispatcher Directed Interviews**

**Name of Interviewee:**      **Names of Interviewers:**

**Date:**

**State the following at the beginning of the interview:**

*[Give names]* We are here from the University of Michigan to conduct a study of the SMART paratransit dispatch operations and we would like to know what you, as a dispatcher, think about it.

This interview will help us understand how technology affects your work. Your cooperation and input will help us enormously.

Your participation in this study is completely voluntary and you may withdraw at any time.  You do not have to answer any questions you do not wish to answer or any questions that make you feel uncomfortable. Your comments will remain confidential and you will remain anonymous in our report. We expect this interview to take approximately 35 minutes. If you have any questions for me/us along the way, please feel free to ask them at any time.

**Questions:**

**1.**   A.   How long have you been working for SMART?

   B.   How long have you been working as a dispatcher for SMART? [What else *have you done previously for SMART?]*

   Which service area do you usually dispatch for?

   C.   How have your previous work experiences helped you in your current position?

2.   A.   Would you please describe the tasks that you need to accomplish in a typical work day and how you **use** the tools and technologies available to you to accomplish these tasks. *[Have them mention specific software (CARDS and Quo Vadis), hardware, phone, printed schedules, maps, and vehicle location techniques and technologies and how they use them.]*

   *[For each technology and tool mentioned, ask the following:]*

   How easy or difficult is _____to use?

   Very  Easy  =  1  2  3  4  5  6  7  =  Very  Difficult

   How well does _____ work?

   Very   Well=  1   2   3   4   5   6   7   =VeryPoorly

   How satisfied are you with _____ ?

   Very  Satisfied  =  1  2  3  4  5  6  7  =  Very  Dissatisfied

   How long did it take you to feel comfortable using _____ by yourself?

   What is your favorite feature of _____ ?

What is your least favorite feature of _____ ?

What would you like to change about your existing tools and techniques?

How comfortable are you with computers? How would you describe your computer abilities?

   Very  Comfortable  =  1  2  3  4  5  6  7  =  Very  Uncomfortable

B.   How consistent is your work load over the course of the day? week? month? *[Try to get some sense of busy v. slow periods.]*

C.   Describe any challenges that you may need to overcome to perform your work tasks. *[Methods for overcoming the mentioned challenges.]*

*[For questions 3 to 5, get an indication of how much interaction exists.]*

3.   A.   Describe how and why you interact with **customer service operators (CSOs) as part** of your job.

   How do the tools and technologies that you have mentioned affect this interaction? *[Probe if needed.]*

   **B.**   Describe how and why you interact with **schedulers** as part of your job.

   How do the tools and technologies that you have mentioned affect this interaction?

   C.   Describe how and why you interact with **other dispatchers as part** of your job.

   How **do** the tools and technologies that you have mentioned affect this interaction?

   D.   Describe how and why you interact with **paratransit drivers** as part of your job.

   How do the tools and technologies that you have mentioned affect this interaction?

4.   A.   Describe how and why you interact with **customers** as a part of your job.

   B.   How do the tools and technologies that you have mentioned affect this interaction?

   C.   How many ASAP trip requests do you receive per day? Per week?

   D.   How long does it normally take to accommodate an ASAP request?

   E.   How many of their *[customers']* ASAPs are you usually able to accommodate? [%]

   F.   What, if any, is the average difference between the requested and the offered trip times?

   G.   Do these trips require transfers? Describe the process of scheduling a transfer? *[Using* CARDS, *not Quo Vadis] [Try to get some sense of easy v. Difficult procedure.]*

5.  A.  Describe how and why you interact with **agency representatives** as part of your job. *[Agency reps. are the senior centers and the like (e.g., Operation Able).]*

    How do the tools and technologies that you have mentioned affect this interaction?

    B.  Describe how and why you interact with **subcontractors** as part of your job. *[Subcontractors are Nankin, Mt. Clemens, etc.]*

    How do the tools and technologies that you have mentioned affect this interaction?

6.  As you probably know, SMART is in the process of adding some new technologies, automatic scheduling and dispatching (Quo Vadis) and automatic vehicle location (AVL) to paratransit operations. How do you expect these new technologies to affect your work tasks? *[Changes in: ease of job, response time, quality of service and ease of transfers across blocks]*

    *[Quo Vadis is a 'real time' demand responsive scheduling and dispatching system designed to register clients, take client bookings, schedule the clients to the available vehicles, and dispatch the vehicles and drivers. AVL provides real time vehicle location through the use of satellites.]*

7.  How do you feel about your job in terms of job satisfaction and stress? How do you think your coworkers feel about it?

8.  What aspects of your job do you like? What is your favorite aspect of your job? What is your least favorite? What would you like to change about your job?

**State the following at the end of the interview:**

Are there any other questions you would like to ask us or anything else you would like to add? Are there any questions that you believe we have left out during the interview? If you would like to ask any questions or would like to add anything that you can' t think of right now, please feel free to call us.    *[Pass along a business card.]*

We may be contacting you in the future for clarification and/or a follow up interview. Thank you very much for your time and input.

## APPENDIX B: **Follow-up Questionnaire**

**Guidelines for Dispatcher Directed Interviews**

**Name of Interviewee:**     **Names of Interviewers:**

Date:

**State the following at the beginning of the interview:**

*[Give **names**]* We are here from the University of Michigan to conduct a study of the SMART paratransit dispatch operations and we would like to know what you, as a dispatcher, think about it.

This interview will help us understand how technology affects your work. We would like to find out what you now think about the technologies you use to do your work. Your cooperation and input will help us enormously.

Your participation in this study is completely voluntary and you may withdraw at any time.  You do not have to answer any questions you do not wish to answer or any questions that make you feel uncomfortable. Your comments will remain confidential and you will remain anonymous in our report. We expect this interview to take approximately 30 minutes. If you have any questions for me/us along the way, please feel free to ask them at any time.

Questions:

1.   Which service area do you usually dispatch for?

2.   A.   Describe the tasks that you need to accomplish in a typical workday.

    B.   How has Quo Vadis changed the tasks you must accomplish during a typical workday?

    C.   Has the application of the tools and technologies used to accomplish these tasks changed since the implementation of Quo Vadis? Please describe them and how they have changed. [phone, printed schedules, maps...]

    D.   What would you like to change about your existing tools and technologies?

    E.   How comfortable are you with computers?  How would you describe your computer abilities?

      Very  Comfortable  =  1  2  3  4  5  6  7  =  Very  Uncomfortable

    F.   How consistent is your work load over the course of the day? week? month? *[Try to get some sense of busy v. slow periods.]* Has Quo Vadis changed this in any way?

3.   A.   Has the interaction with **customer service operators** (CSOs) as part of your job changed with the implementation of Quo Vadis. How?

    B.   Has the interaction with **schedulers** as part of your job changed with the implementation of Quo Vadis. How?

    C.   Has the interaction with **other dispatchers** as part of your job changed with the implementation of Quo Vadis. How?

    D.   Has the interaction with **paratransit drivers** as part of your job changed with the implementation of Quo Vadis. How?

4.  **A.** Has the with customers as a part of your job changed with the implementation of Quo Vadis. How?

    B.  How many ASAP trip requests do you receive per day? Per week?

    C.  How long does it normally take to accommodate an ASAP request?

    D.  How many of their *[customers' ]* ASAPs are you usually able to accommodate? [%]

    **E.** What, if any, is the average difference between the requested and the offered trip times?

    F.  Do these trips require transfers? Describe the process of scheduling a transfer? *[Using Quo Vadis] [Try to get some sense **of** easy v. difficult procedure.]*


5.  A.  Has the interaction with **agency representatives** as part of your job changed with the implementation of Quo Vadis. *[Agency reps. are the senior centers and the like (e.g., Operation Able).]* How?

    B.  Has the interaction with **subcontractors** as part of your job changed with the implementation of Quo Vadis. *[Subcontractors are Nankin, Mt. Clemens, etc.]* How?


6.  I would like to get an overall assessment of Quo Vadis.

    How easy or difficult is Quo Vadis to use?

    How well does Quo Vadis work? *[i.e. performance, ability to get the job done]*

    How satisfied are you with Quo Vadis?

    How long did it take you to feel comfortable using Quo Vadis by yourself7

    What is your favorite feature of Quo Vadis?

    What is your least favorite feature of Quo Vadis?

    Overall, what is your impression of Quo Vadis?

    Very Favorable=  1        2        3        4        5        6        7 =Very Unfavorable


7.  Which system, Quo Vadis or CARDS, do you prefer? *Why? [Please provide an example.]*


8.  As you know, SMART is in the process of adding some new technologies, automatic scheduling and dispatching (Quo Vadis) and automatic vehicle location (AVL) to paratransit operations. Quo Vadis has been installed for a few months already and the AVL system should be installed within the next year. How has Quo Vadis affected your work tasks? *[Changes in: ease of job, response time, quality of service and ease of transfers across blocks]*

    *[Quo Vadis is a 'real time' demand responsive scheduling and dispatching system designed to register clients, take client bookings, schedule the clients to the available vehicles, and dispatch the vehicles and drivers. AVL provides real time vehicle location through the use **of** satellites.]*

    How do you expect the new AVL system to affect your work tasks?

9. How do you feel about your job in terms of job satisfaction and stress? How do you think your coworkers feel about it?

10. What aspects of your job do you like / favorite aspect? What is your least favorite? What would you like to change about your job?

**State the following at the end of the interview:**

Are there any other questions you would like to ask us or anything else you would like to add? Are there any questions that you believe we have left out during the interview? If you would like to ask any questions or would like to add anything that you can't think of right now, please feel free to call us. *[Pass along a business card.]*

We may be contacting you in the future for clarification and/or a follow up interview. Thank you very much for your time and input.

## APPENDIX C:  **TRAPEZE™-QV**

The Trapeze Software Group is an innovative developer and supplier of new technology software products for the trans-portation industry. Our software provides solutions for fixed route, rail, demand - responsive and flexible route operations of virtually any size.

Trapeze Software's products are developed for the microcomputer environment, using new technology programming and database tools. In keeping with the trend toward intelligent transportation systems, our products can be effectively integrat-ed with other systems, including vehicle location, commercial software products and other in-house systems.

Features of Trapeze-QV Mapping

    landmark and location geocoding
    import interfaces for digitized base maps of your service area
    street map displays
    calibration and viewing of distances
    display / edit zones and map grids

Client Records

    storing relevant client information
    locating/coding a client on a street map
    locating/coding a client in a service area that is not on the street map

Bookings

    booking subscription trips and one-time user requests
    automatic cancellation/redirection of bookings at the client and location level
    check for all bookings that do not return to origin
    book unscheduled returns
    book any number of days in advance
    check bookings while client is on the phone

Scheduling

    calculation of distances by xy, triangulation, and routing methods
    input of statutory holidays on the calendar to ensure, if necessary, that trips are not
    scheduled on certain days
    viewing of all the trips for a particular client (tabular, calendar)
    trip insertion, at request time, onto an existent schedule and view of the effect of the
    insert on the vehicle itinerary
    provision of alternate trip times when the requested time cannot be accommodated
    global/individual trip modification
    vehicle prioritization process
    flexible scheduling parameters
    selective vehicle availability
    batch scheduling
    graphical simulation of vehicle routing
    provision for trying what if scenarios
    save/restore multiple scheduling solutions
    match previous solutions from history database
    adhere to labor agreement

Dispatching

>vehicle profiles by time of day
monitoring of scheduled vehicles by time of day
trip reassignment
redistribution of tips from one vehicle to another
incident capturing
trip cancellation/schedule adjustment

Monitoring (Optional add-on for Vehicle Location Monitoring)

>capabilities to determine vehicle position
make logical trip decisions based on vehicle position
schedule adherence

Data Management

>complete data integrity at the record and file levels
standard record management system with a report generator
dynamic modification of input format (date, time, distance)
use of special keys to minimize user input
dynamic screen input management feature
forced data values on certain user defined input fields
backup and restore data without leaving the system

Reporting

>General unformatted data (locations, clients, schedules, vehicles)
Clients
Locations
Bookings
Vehicle Manifests
Driver Itineraries
Statistical (time & distance)

Interfacing

>interfaces for 'off-the-shelf' software (e.g. spreadsheets, word processors, desktop publishers)
interfaces for other systems (e.g. MDT's, AVL, etc.)
interface to TRAPEZE™-FX (Trapeze Software's fixed route scheduling system)