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# Foreword

The papers in this Record are from the 12th National Conference on Specialized Transportation, which was held in Sarasota, Florida, in October 1990. The conference steering committee decided that, although no publication had resulted from past specialized transportation conferences, the need exists to share experiences from ongoing programs to advance the art.

William Bell was the primary mover in the specialized transportation conferences. Four years ago, in anticipation of his retirement, Dr. Bell turned over the sponsorship of these meetings to TRB's Committee on Specialized Transportation. Dr. Bell was chairman of the 12th National Conference and had chaired all prior conferences. This was to be his final activity before retirement, but he died before the conference was held. This Record is dedicated to his memory.

Lave and Nestor discuss efforts to bring together small, independent providers of specialized transportation services for greater efficiency. The authors report on their recent study in Central Costa County, California, of bringing together existing providers by unification. Existing providers were placed under a common management umbrella. Management was consolidated but service was not. The authors state that unification is attractive because it is less of a threat to stakeholders, yet it provides the management structure necessary for accomplishing specific changes that are hoped for under alternative methods to bring providers together.

Newsom et al. discuss facilitating the development of alternative transportation services to assist persons with disabilities in overcoming barriers that limit employment opportunities in Tennessee. Existing transportation services for workers with disabilities were identified. Interviews were conducted to obtain information from service providers and users about employment opportunities, transportation problems, and potential solutions. Recommendations on improvements to transportation services for workers with disabilities are reported.

Hallock discusses Iowa's coordination of publicly funded passenger transportation. The state of Iowa channels state and federal public transit funding through locally designated transit systems in each substate region and urban area. These systems are responsible for contracting with other agencies to provide needed client transportation services as part of the public service. According to the author, this coordination has had a positive impact on the provision of passenger transportation services to the people of the state.

Bower discusses the COMSIS routing and scheduling system (CRSS) that addresses the paratransit scheduling problem. The system uses a highway network to model point-to-point travel times. The system has been implemented at a number of paratransit agencies, and comparisons are made between manually generated schedules and CRSS-generated schedules in the areas of service quality and operating costs.

Taylor discusses wayfinding training as a social work method to assist transportation-handicapped psychiatrically ill who travel by public bus to urban community mental health services. The author discusses guidelines for providing this type of training.

Axworthy and Kleeman discuss guidelines for design, installation, and servicing of automation for specialized transportation derived from the experience of WHEELS, Inc., a Medical Assistance Transportation Program in Philadelphia. WHEELS manages some 8,000 trips per day (4,500 via paratransit, 3,500 via fare-reimbursable transit) using automation developed by Solution Systems, Inc.

McLary evaluates the application of minivan conversions to transport handicapped individuals in both rural and urban environments. The primary evaluations were based on operational issues such as ability to meet demand, passenger and driver acceptance, operating characteristics (fuel consumption, brake life, etc.), and productivity.

Rucker and Lachs collected information from the states on the UMTA Section 16(b)(2) program of capital assistance to nonprofit agencies that provide transportation for the elderly and the handicapped. They present a national profile of the active network of nonprofit agencies funded by the program (agency characteristics, service modes, fleet size, and number

of vehicles). The second part of the paper used ridership and operational information collected from a national sample of recipient agencies to present a more detailed national profile of the program.

Walsh discusses CARE-A-VAN, which coordinates 27 agencies providing about 155,000 specialized transportation trips annually, targeting aged, disabled, or low-income persons. SAINT was a volunteer group established in 1983 to transport senior or disabled residents of Ft. Collins, Colorado. It became a volunteer division of CARE-A-VAN in 1988. Ridership and costs are discussed.

Sen and Radhakrishna discuss the role played by specialized public transport services as compared with other modes in transporting the elderly. Their study focused on type of service used and service characteristics that were most preferred and least acceptable to the elderly population. Primary and secondary data sources were examined to determine usage of and demand for specialized transportation services. The research findings should enable transit planners to better anticipate the future needs of the elderly.

Zarifi discusses a study on specialized transportation in the Puget Sound area. The paper documents the existing conditions, assessment findings, and recommended policy direction and implementation actions.

# Unification: Painless Consolidation of Special Services

ROY LAVE AND MALLORY NESTOR

Efforts to bring together small, independent providers of specialized transportation services to increase efficiency have been made for more than 20 years. Consolidation and coordination are two methods that have been attempted. The results are mixed. Sometimes consolidation and coordination fail because of political reasons, sometimes they are implemented but fail to provide improvements. Politicians are attracted to consolidation in theory but resist it if their jobs are affected. A third method, unification, was studied recently in Central Contra Costa County, California. Specialized transportation providers were placed under a common management umbrella. Management was consolidated but service was not. Unification is attractive because it is less of a threat to stakeholders, yet it provides the management structure necessary for accomplishing the specific changes that are hoped for under consolidation and coordination. The unified system discussed here is a type of brokerage system providing flexibility for multiple providers and service competition. How the concept of unification was developed, presented, and implemented in Central Contra Costa County is discussed in this paper.

Central Contra Costa County is a rapidly growing area in the San Francisco Bay region. The area is primarily suburban and includes several new commercial office developments and some rural areas. The Bay Area Rapid Transit runs through an edge of the area, but the primary intraregion transit is the bus service offered by the Central Contra Costa Transit Authority, which is called "County Connection."

In 1988 when the study described here was undertaken, the 10 cities of Central Contra Costa County offered elderly and disabled residents door-to-door paratransit services through one of three arrangements. One city-run service provided rides to its residents as well as to residents of a smaller city. This service used city-owned vehicles, which were driven by city employees. Six cities took advantage of an existing Joint Powers Agreement to contract with a private operator for service to their residents. The remaining two cities contracted with a not-for-profit agency for services.

Although the three services provided door-to-door transportation to seniors and persons with disabilities, they differed in age eligibility requirements, fare levels, priorities of trip types, hours of service, advance reservation requirements, and the like. In addition, the cost of the three services differed, partially because of the differences in area population densities and partially because of the mode of operation.

Principal financing for all services came from state sales taxes made available to local agencies. In addition, some of the cities spent general funds and provided in-kind services.

No funding provisions had been made for replacement of vehicles, however, and this lack of replacement funding motivated the study described here.

## BACKGROUND

In 1987 several of the cities approached County Connection and requested funding for fleet replacement. County Connection approved the funding contingent on a study of the performance of the special services. This condition recognized the obligation to ensure that tax funds were used effectively.

The study included an assessment of the existing services, estimates of demand, development of a financial plan, an analysis of alternative institutional arrangements, and an implementation plan. The institutional analysis is the topic of this paper.

Early in the study, the following two questions were posed as a means of giving direction to the institutional study:

- Should the three services be consolidated into fewer services?
- Who should operate the consolidated service or services?

Oversight for the study was provided by a Technical Advisory Committee consisting of staff representatives from each city, two regional organizations, and consultants.

During the study a significant event took place that changed prospects for special services—a ballot initiative passed that provided significant new funding for paratransit. More institutional arrangements were made possible by eliminating the barrier of inadequate funding, which would concern organizations that were candidates to assume responsibility for the service.

SYSTAN, Inc., Pat Piras Consulting Services, and Clayton Consulting conducted the study.

## FINDINGS AND RECOMMENDATIONS

Factors thought to affect the efficiency and effectiveness of the services negatively were identified by means of an assessment. For each of the findings, methods to overcome the problems were recommended.

### Institutional Structure

The key finding of the study was that the institutional structure consisting of three autonomous providers, managed by three

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managers, and under the direction of three policy boards was not adequate for the task of offering cost-effective service. However, an institutional change recommendation was considered to be one of last resort since it was thought that it would be difficult to gain political acceptance. Therefore, every effort was made to identify methods to resolve the issues and shortcomings with procedures that did not require organizational changes. It was only when the Technical Advisory Committee unanimously endorsed the concept that a new institutional structure was a necessity that the concept of unification was developed. Because this recommendation is the central thrust of this paper, it is discussed later. Other findings and recommendations are cited to make the case that only an institutional change could significantly improve the paratransit service offered.

### **Lack of Staff Training and Management Continuity**

In general, the supervisory and middle-management staff and front-line service staff had not been adequately trained. Two of the three services provided no formal training for drivers or dispatchers. The city administrators who oversaw paratransit did so as part of larger job responsibilities and none was trained in paratransit matters. Also, there was a lack of continuity among the management staff because of sharing of administrative responsibility among the cities and normal staff turnover. There was no back up management capability, either for ad hoc needs or for progression into the top management position.

No specific recommendation was suggested for management and training shortcomings because it is difficult to provide cost-effective training in small units. There are several ways, however, that institutional changes would provide trained staff. A combination of services would create a sufficiently large unit to allow training to be performed in-house or by contracting and would provide opportunities for on-the-job management development.

### **Low Productivity**

Although service productivities (passengers carried per hour of vehicle service) were within the ranges commonly found in paratransit services, they were well below the productivities of top performers. Because of the clustering of high population densities, combining trips was considered as a possible means to substantially improve the productivity of the city-operated system and modestly improve the joint powers system. The third provider operated in an area of sparse population so only slight improvements were thought likely.

A number of actions were recommended. Better dispatching procedures, perhaps with computer assistance, were recommended so that more trips could be grouped. The increased use of prescheduled trips to popular destinations was recommended. To this end, cooperation should be sought from those scheduling physician appointments to concentrate appointments within certain hours. Procedures for coordinating trips among the three providers were recommended to reduce interjurisdictional movements of empty vehicles. Increased use of paratransit as a feeder to fixed-route services was recommended to eliminate long paratransit trips.

### **Inadequate Management Data and System**

Each service prepared financial and performance reports, quarterly for the Regional Transportation Planning Agency (RTPA) and annually for the state. These reports were designed to ensure accountability for funds so report contents and format were not adequate for management or policy formation. The shortcomings were twofold. Much of the data necessary for management was not included; sometimes data were not collected and sometimes data were collected but not processed. The RTPA also did not assemble or use certain management data. They did not compile and release data reported to them, which providers could have used for assessment and planning.

The second difficulty was accuracy of information. Although standard definitions of data elements are prescribed by state regulation, the providers did not follow the definitions. Particular indicators from one operator were based on different assumptions than those used by other operators. The RTPA did not monitor or provide technical assistance to ensure that data were correctly reported.

The consultants recommended the following. A thorough management reporting system installed by each operator could provide timely and accurate reports to all those who have responsibility for the conduct of the services—policy makers, managers, and others. Documentation of the precise means of processing each measure in the reporting system was recommended. Further, technical assistance on this function should be provided by the RTPA.

These reports should be part of a larger management system of goal setting and achievement monitoring. No such system had been installed at any of the existing services. The search for improvement was not part of the culture of the operators.

### **Minimal Policy Board Oversight**

Ultimate responsibility for policy was vested with the city councils in each of the participating cities. For two of the services, the councils had delegated the policy function to management staff and required minimal reporting to the councils. The consultants believed that the existing services probably suffered from the lack of greater policy oversight.

It was recommended that the policy boards meet regularly and publicly with agendas and the other trappings of a publicly accountable organization. They should participate in annual goal setting, should receive regular service performance reports, and should report to their councils.

### **Little Coordination Among Services**

There were no mechanisms for coordinating trips or for sharing facilities and information among the three providers. Trip coordination might help improve productivities. Other types of coordination, perhaps in purchasing and in sharing of technical and market information, could also achieve cost savings.

To initiate coordination, it was recommended that a voluntary and informal operator's group should be formed, consisting of administrators, drivers, and dispatchers. The group would discuss options for coordination and identify those ac-



tions that would be mutually beneficial. It was suggested that the group meet regularly (perhaps bimonthly) and form task forces to investigate issues such as operations reporting, coordinating trips, purchasing, driver and management training, equipment and facility needs, training, and the like.

### **Low Market Share and Declining Ridership**

Ridership in all services had declined over the previous four years despite growing populations of eligible users. Staff reported that few new riders entered the program. Moreover, the number of actual users of the services was believed to be only about 10 percent of the eligible population. Although the people using the service may have been those needing it the most, the information necessary to verify this presumption and to determine the causes of declining ridership was not available.

Market research was recommended to evaluate existing services in meeting the needs of the intended users. An evaluation of how well the existing eligibility requirements really defined the intended market was recommended. If and when greater capacity became available, resulting from productivity improvements and the new funding, promotion among the target population should be instituted.

Anticipating that this marketing function could not be cost-effectively performed by any one of the services, it was recommended that the RTPA be asked to take responsibility for the research aspects of this function.

### **Inequitable Burden-Sharing Among Cities**

Three of the six cities in the joint powers' service provided in-kind support with the heaviest burden falling on two cities who shared the administrative responsibilities. This inequity of the sharing had become a major issue among these cities. Inequity was, of course, not an issue for the single city provider as they provided little service to the small neighboring city. In the third service area, the administrative duties had been passed around among the three cities in the service area and the equity issue had not risen. (The passing of the duties created its own problems, as cited above.)

It was recommended that the cities performing the administrative duties charge these costs to the service. Unfortunately, this charge would reduce the service available to the users. Furthermore, it was anticipated that even with remuneration, none of the cities would have taken the administrative job. This, then, was an unresolved problem short of an institutional change.

### **SUMMARY OF FINDINGS**

In general, it was concluded that the three services could be operated in a fashion that would increase their productivity and allow more trips to be offered within the existing budget. It was also concluded that service would benefit by more intensive management and the managers would benefit from paratransit training. It was observed that public accountability required a greater level of policy attention and oversight.

The consultants further concluded that many of the recommendations could not be implemented by individual actions of the providing agencies. Other suggestions, which might be implemented by collaborative action, would not be because there was neither the mechanism nor the incentive for that collaboration. In other words, coordination was not a viable option for achieving the needed reforms. A change in the organizational structure for offering the services, however, could create a structure in which the issues could be more easily addressed and would have a greater probability of success. For this reason, a change in structure was deemed to be desirable.

It was concluded that consolidation would permit the reforms, but it was believed that consolidation would not be seen as an acceptable political option. Therefore, the consultants searched for an arrangement that provided the benefits of consolidation without actual consolidation. The result was the concept described in the next section.

### **ORGANIZATIONAL ARRANGEMENT RECOMMENDATIONS**

The institutional decision was presented to the decision makers as a three step decision. First was whether or not there was a need for an organizational change. The second was the decision concerning which of the various possible changes should be instituted. The third was the decision concerning which organization would take responsibility for the service in the new institutional structure.

Although the consultants at this point felt that a new structure was the best technical solution and one that was most workable in the long run, they did not adopt an advocacy role. The method of presenting consultant recommendations is a matter of philosophy about the role of consultants in public policy formation. Consultants have widely divergent views on the subject although it is almost never a topic investigated during the selection of consultants. The consultants in this study believed it was their obligation to lay out the arguments for and against each alternative as objectively as possible. Every attempt was made to identify the political implications of each alternative without letting the political factors affect the findings, although they might affect the recommendations. Having determined a preferred technical approach, the consultants explained it and recommended it, but they did not advocate for it. (Advocacy is proper when it is an explicit contractual task and all parties understand that is the role of the consultant.) The danger of advocacy by consultants is that it compromises their real and perceived objectivity. They abandon their role as an objective analyst upon whom all parties may rely. The loss of credibility may make it impossible for the consultants to help their clients find a successful course of action, which may have to be different from the consultant's recommendation in order to achieve political consensus. Much that goes wrong with consultant studies does so because consultants let their egos become involved with their recommendations, and are not able to help their clients find a successful course of action—one that works in the real world. Turning from consulting philosophy to the study at hand, it was first necessary to consider if change was necessary.

## Was It Broken?

Consultants often face the question, "If it isn't broke, why fix it?" Study results led to the conclusion that the provision of service was broken, and, as the findings just cited demonstrate, the status quo was not efficient.

In addition, the recommendation for an organizational change was appropriate because the present situation was not stable. Something needed to be done about the inequity of administrative sharing among the cities. Moreover, the availability of new funding, which eventually doubled the resources available for paratransit, would cause sufficient changes to warrant reorganization. The existing practices could not have handled an increase in resources of that magnitude. The prospect of greater levels of service raised policy questions that could not be addressed by the existing policy formation structure. In other words, because changes were coming, it would be expedient to take advantage of the change to remodel the service delivery system.

## Analysis of Options

Several criteria were used for evaluating options for the institutional arrangements. An overriding consideration was whether a proposed option (i.e., definitive reporting channels, span of control, and the like) would be workable according to the precepts of organizational theory. For arrangements that were workable, several other factors were used to assess their strength: the impacts of changes on the performance (efficiency and effectiveness), the amount (supply) of service, the quality of service, and funding levels for the services. Additional factors considered included the degree of city control, equity among cities, adequacy of policy board oversight, capability of management, stability of the organization, ability to handle the new financing, and the ability to respect existing commitments.

For this analysis, the organizational structure was viewed as consisting of three parts. At the top are the policy boards that make policy and are ultimately responsible to the taxpayers for the use of tax funds. The second level consists of management—paid staff responsible for all aspects of offering the service under policies set by the policy board. The third level consists of operators or providers responsible for the day-to-day implementation of services. While management and operations are commonly combined, they are separated in this discussion because they can be vested in different organizations as they were in both the existing and the recommended structure.

The options for institutional arrangements consist of combinations of one to three policy boards, management, and operators. However, eliminating those options not meeting the criteria from organizational theory left only three candidates. Figure 1 indicates how these options differ at the three organizational levels. The existing three-provider arrangement with the recommended improvements was considered as the "do nothing" option. The second option was consolidation of all services into one. The remaining option was a particular form of combining the three services, which was called "unified." The unified service has one policy board, one manager, and any number of operators. Unified differs

LEVELS OF ORGANIZATION	OPTIONS		
	STATUS QUO	CONSOLIDATED	UNIFIED
POLICY BOARDS	3	1	1
MANAGEMENT	3	1	1
PROVIDERS	3	1	1 or more

NOTE: Numbers in matrix indicate the numbers of organizational units of each type.

FIGURE 1 Institutional options.

from consolidated, which usually refers to a system that has one policy board, one manager, and one integrated operator. Consolidation is a subset of unification.

## Arguments for Unification

The single policy board is an important characteristic of a unified system. With one policy board, decisions can receive more intensive policy analysis and review.

The single manager is the most important aspect of a unified system. Concentration of management could provide the resources necessary to obtain a well-trained and experienced manager and could allow that manager to be dedicated to paratransit. Dedicated management should pay many dividends in improved service and improved policy board involvement. Moreover, single management would ensure that the benefits of more effective packaging of trips would occur because responsibility for such coordination would not be divided among organizations, as was true for the old systems.

Another important benefit of single management is that it provides a home base and resources for a centralized passenger scheduling and vehicle dispatching system. Such a system was seen as an important means to increase rides per vehicle hour and to achieve better management control over on-the-road management. Also, computerization allows more precise eligibility requirements to be implemented and trips to be tailored to better suit the needs of users by maintaining quickly retrievable records.

Unification has the advantage of allowing for several providers, an important option that permits tailoring operators to services, using a competitive selection process for providers, and allowing users to choose from competing providers. Also, in the case of Central Contra Costa County, unification allowed the existing providers to be maintained, a fact that was believed to mitigate the resistance to change from both cities and users, while allowing the flexibility to subsequently replace providers that did not perform well.

In the unified system, the inequity of current city contributions would be eliminated. No individual city would be responsible for administration or for in-kind services and none would be required to contribute from their general fund to

fill paratransit budget deficits. The issue of inequity of current contributions was eliminated. On the other hand, if cities wished an extraordinarily high level of service, they could purchase those additional services from the unified organization with their own funds. Cities would also be free to provide special paratransit services for their own programs or facilities in addition to those provided by the unified organization. In this way existing volunteer services could be maintained.

### Arguments against Unification

It was foreseen that withdrawing the service from the cities' control would have caused the cities to withdraw their cash and in-kind contributions. This became a nonissue when the new tax monies became available and more than covered the withdrawn funds and also supported expansion of the services.

Cities feared that unification would mean loss of control of services and the loss of personalization of service. The city, especially, took pride in the highly personalized service it offered. On the other hand, it was believed that this was a perceived but not a real issue and that a unified service could be well tailored to individual needs. Full-time management oversight of the service, better training of drivers and order takers, and a computer-assisted reservation system would all support a high level of quality and attention to the users. If any of the cities felt very strongly that they wished to maintain contact with their constituents to ensure personalized treatment, they could establish their own order takers who would coordinate with the central reservation system.

Cities also may have feared that the loss of control over the service might mean a decline in the amount of service available in their city. To the extent that the political process distorts these decisions because of the personalities and seniority of policy board representatives, this could be a legitimate fear. However, all the cities would be in the same boat and it is incumbent upon them to develop resource allocation plans that are "boundary blind." Oversight by the RTPA should also minimize inequitable treatment.

### UNIFYING ORGANIZATION

The decision to unify was separated from the question of which organization could best serve as the unifier. This approach was adopted to ensure that the strengths or shortcomings of existing organizations would not dominate the analysis of whether unification was an idea with merit. Clearly, the lack of an appropriate organization would affect the decision to unify or not.

The criteria applied to analyze the existing organizations included: consistency with the organization's mission, appropriate representation on the policy board, skills of current staff, existence of appropriate support functions, eligibility for state specialized transportation funds, and appropriate geographic scope.

The candidate organizations included the following:

- A newly formed organization for this purpose;
- The Paratransit Coordinating Council—an advisory organization to the RTPA on funding and coordination;

- A transportation authority created to impose the new transportation sales tax—an organizational means of imposing new taxes in spite of California's tough anti-tax initiatives;

- Any one of the participating cities;
- Any of several existing social service agencies; and
- The Central Contra Costa Transit Authority (County Connection).

Only County Connection met nearly all the organizational criteria. Its only shortcoming, shared with all the other candidates, was that it would have to hire or train staff to manage the paratransit operation.

At the outset of the study the consultants were told by County Connection management that they were not candidates to operate the service. However, when the analysis was completed, those management persons indicated they were convinced of the logic for its involvement and they would support the recommendation.

The consultants recommended that County Connection express to the cities its willingness to assume full responsibility for special service transportation using the state and newly passed local taxes. The pros and cons for this recommendation are cited in the following and were presented to the board with the recommendation.

### Arguments from Public Policy Viewpoint

From a public policy point of view, the argument that County Connection should take responsibility for paratransit in Central Contra Costa County was threefold. First, there is precedent in the region for this arrangement existing in two neighboring transit agencies. County Connection was also planning feeder-paratransit services. Second, County Connection could be a cost-effective provider because it already had many of the support functions in place common to transit and paratransit. Finally, it was appropriate for County Connection to assume paratransit operations. It had an appropriate policy board consisting of representatives from each city and from the county, it had an appropriate charter, and it was the only candidate organization that could make these claims.

### Arguments from County Connection Viewpoint

One benefit to County Connection of offering paratransit was that it would enhance its public role by expanding service to an additional set of constituents thereby increasing support for transit. Economic advantages to County Connection existed as well. The special-service paratransit was to be fully funded and would provide an expanded economic base, over which a number of overhead functions could be spread. Finally, paratransit offered opportunities for contracting that would contribute to their privatization goals.

On the other hand, paratransit would be an added burden to the board and top management. Moreover, although paratransit would come to County Connection fully funded, the new funding would expire after 20 years and could thereafter become a financial burden. However, the consultants found that by placing some of the new tax funds in a trust fund, paratransit could be funded at the existing level into perpe-

tuity, even after allowing for inflation. It was recommended that such a trust fund be established.

### **Arguments from Cities' Viewpoint**

The cities would benefit in several ways from County Connection offering special services. Their constituents would be the principal benefactors from the unified service. In addition, service would be offered by a known and stable organization in which each city had a policy voice.

The cities might have feared that paratransit would become a stepchild of transit and receive less attention than it did currently. This possibility was unlikely if the recommended full-time dedicated management was installed. It is true that some cities would have less control over paratransit and this is the chief price they would have to pay. Other cities would have more control than they did under the old structure. The corollary of loss of control is alleviation of responsibility and the savings in general funds and in-kind services.

The cities had to face the issue of possible displaced paratransit staff or contract providers to whom they felt an obligation. To achieve a smooth and fair transition, the consultants recommended that the existing providers be kept initially and that if providers changed, employees would be given consideration for employment.

### **Arguments from Users' Viewpoint**

The users' fears were similar to those of the city. They were comfortable with the familiar and feared that change would result in less service. These fears were picked up by the press. In fact, the users would receive a higher level of service in all respects because better service to the user was the prime reason for recommending unification. More trips would be available for more purposes. The system should be better able to accommodate special needs, particularly short-notice trips. It would be management's responsibility to make change as easy to understand and nonthreatening as possible.

Users would have a policy board, meeting regularly, to which they could express their suggestions and complaints. Management would be better able to address their suggestions and complaints. They may have been concerned that a more remote policy board would be less responsive than their city council. Actually, they could make their concerns and wishes known either through their city councils or directly to the County Connection Board.

### **Alternative to County Connection**

The consultants provided a backup recommendation if County Connection did not accept the role as paratransit provider or if it was not acceptable to the cities. In this case, it was recommended that a new organization be formed by the cities under state law, called Consolidated Transportation Service Agencies, which are eligible to claim state funds.

## **IMPLEMENTATION**

### **Designation of the Service Responsibility**

The consultants' report was submitted to the Board of Directors of County Connection in February 1989. The Board

soon approved a resolution stating that they would be willing to operate unified special services in Central Contra Costa County if the cities requested such an arrangement. In May 1989 all ten cities and the county had agreed to let County Connection assume responsibility for the service with varying conditions on the transfer. None of the cities required a contractual maintenance of level-of-service agreement to ensure their service would not decline. This was a significant omission, since such an agreement was required by the cities when the transit district, County Connection, was created.

The Accessible Service Committee of the board recommended that the services should be offered by contract, as recommended by the consultants, rather than directly by County Connection.

The consultants had interviewed the principal council members and city staff at the beginning of their work to ascertain the acceptable options concerning organizational arrangement. Most of the cities were willing to give up the service. Others were not, because of either concern for the users or for the providers of the service. At that time it appeared that unanimous consent of the cities would not be obtained easily.

Ultimately, the cities that resisted the concept of unification accepted it. The acceptance was aided by gestation of the unification idea over a fairly long period. Although the study was originally scheduled for six months, it was delayed to await the outcome of the sales tax for transit election so that a specific financial plan could be included in the study. The result was that the study took a year. This allowed time for everyone to understand and reflect on the recommendations.

### **Management of the Service**

The consultants recommended that a manager of the implementation process be designated. They also recommended that the same person be the manager of the unified service and that the manager be free of other unrelated responsibilities that would dilute his or her effectiveness. In May 1989, after accepting responsibility for the service, County Connection promoted the staff person who was most active in this study to the position of Manager of Accessible Service, which included responsibility for both accessible fixed-route service and the newly acquired demand-responsive services. The creation of one manager for all accessible service was logical, and in view of the recent federal Americans with Disabilities Act of 1989, a portentous decision.

The manager of the service was, then, the person with the best knowledge of the existing services and the consultants' work. She was in a position to plan the implementation and to prepare the bid documents. She was aided in this process by a transition team consisting of the existing providers and one representative of each city. In January 1990 when the three services became unified, she became the manager of the unified service with the three current providers reporting to her.

The existing Accessibility Advisory Committee of users was expanded to include special service users. The manager created an informal advisory group consisting of people from the human service program agencies to ensure their input into service considerations. This group will also be used to investigate offering contract transport service for human service programs.

## Bidding Process and the Results

During the latter half of 1989, a request for proposal to offer the service was prepared by the County Connection manager. Providers could bid to provide service in any number of or all of the three existing service areas. The proposal was issued on January 10, 1990.

A prequalifying procedure was established on the advice of County Connection legal counsel to ensure that those bidding were financially responsible and capable of providing service.

Thirteen bidders attended the bidders' conference. Five bidders qualified. Both the city that provided service and the existing social service agency provider were deemed not to be qualified. The third existing private provider qualified.

Three proposals were received. All bid to provide service to any and to all of the three areas. The contract was awarded to a new provider for service to the entire region.

The failure of two existing providers to qualify was the significant outcome in the move to the unified system. There were no protests to the qualification process. The use of the competitive process to judge the qualifications of existing providers probably avoided acrimony that would have accompanied such a decision if it were made in the political realm.

The winning bid offered \$9.79 per vehicle hour in operating costs plus \$37,000 a month in fixed administrative and maintenance fees. The total vehicle hour cost came to \$24.42 for 30,480 hours. The vehicles, owned by County Connection, were those from the old providers, with new vehicles expected to arrive in late 1990. The contract is for a one-year term with three one-year renewal options.

The contracted service, inaugurated on May 30, 1990, started in July 1990.

## Description of the New Service

The unified service consists of a single zone with a zonal fare system. Because a single provider won the competition, the service appears to be consolidated but in fact the structure exists so that the different subareas can be bid on separately and providers could also be allowed to compete in the same area. The service is a type of brokered system with County Connection as the broker. Under the single-provider contract, services were changed to make them consistent with one another. Standard operating hours were established, which were longer than any that the previous three systems offered. The city-operated service had provided some evening service for senior recreation and they kept vehicles to continue that service on their own.

System capacity was deficient and demand exceeded supply. This resulted in many service denials but would change as new vehicles arrived. While capacity was deficient, preference was given to medical, adult day care, and nutrition services by allowing reservations to be made 48 hours in advance, whereas all other trips are not scheduled until 24 hours in advance. Ultimately, the goal is to achieve same-day reservation.

The age of eligibility was changed from 60 years in two of the previous systems to age 65 for all trip purposes, except for nutrition services, which are available at age 60. All persons with disabilities continued to be eligible.

Marketing in the old systems was minimal so that demand for the new service was higher because of the high visibility resulting from the transfer of services. Because of the single-zone operation, trip lengths are estimated to be longer than in the previous systems (trip lengths were not calculated for the old services).

The new contract provider uses a computer-aided scheduling and dispatching system, as recommended by the consultants.

At the time of preparing this paper, there is less than one year's operating data available from the single-contract, unified service and at a time when vehicles were in short supply. Because of the short history, a comparison would not reveal any useful findings. At some time in the future, operating statistics will be studied. The new management information system generates data that will enable better control and adjustment of services.

## SUMMARY

When the study started, there was no precondition favoring a recommendation of consolidating services. In fact, the one admonition from the transit agency sponsor was that they did not want to take over the system. However, as the findings were made, it was clear that the systems were too small and of too little importance to the city sponsors to be operated efficiently. Although improvements could be made to each service, there did not appear to be the will to do so. The consultants together with the Technical Advisory Committee, representing the cities and the transit district, concluded that only a change in organization that brought the services together would be successful in improving them.

Nevertheless, there was resistance to changing the organizational structure for service delivery from some city council persons, from provider staff, and from users. To resolve the conflicts, the consultants proposed a concept of unification, which brought the individual services under a common management umbrella. All the cities and County Connection approved the unified concept and approved placing the service under County Connection.

It was recommended that the unified service be started with the existing providers, but that a competition to select providers be conducted at some later time. This would allow retaining good providers and replacing the weak ones. A competitive bid was held less than a year after the study had been completed. A provider who was not previously involved in the service was selected to provide service in all three areas. The service started in July 1990.

Although the unified service appears to have been consolidated because there is a single provider, it is not. The structure is in place for multiple providers who may operate in different zones or may compete in the same service areas.

# Development of Transportation Services To Expand Employment Opportunities for Persons with Disabilities in Tennessee

THEODORE J. NEWSOM, DEBRA MARTIN PETTY, CAROLYN HENDERSON,  
AND PAULA AUSTIN

A process to facilitate the development of alternative transportation service options to assist persons with disabilities in overcoming barriers that limit employment opportunities was initiated. Activities concentrated on collecting information about existing transportation resources, work-trip problems, and potential solutions. A study team was assembled and a survey of county executives and city mayors across Tennessee was conducted to identify existing transportation services for workers with disabilities. Transportation study groups were formed and group interviews conducted to obtain information from service providers and users about employment opportunities, transportation problems, and potential solutions. These activities have produced recommendations about transportation services for workers with disabilities. The recommended services represent potential service demonstration projects, which will be pursued in the next phase of the project.

Tennessee, along with many states across the nation, is experiencing substantial economic development and growth. Each of the three major regions of the state (east, middle, and west) is reaping the benefits of increased employment opportunities resulting from the expansion of existing businesses and the relocation of new businesses to the state. Many persons have taken advantage of the opportunities to obtain new employment or experience career growth as a result of increased economic activity. However, certain segments of the population, such as persons with disabilities, are unable to participate fully in this economic growth. Such problems as lack of education and training, day care, and worksite inaccessibility are barriers that must be overcome to facilitate job placement and retention. In many cases, employment opportunities are limited simply because employees cannot drive or cannot afford transportation. In addition, many potential worksites are located in areas not served by existing transportation services, and work schedules often do not correspond to scheduled public transportation services.

The overall intent of the project described in this paper was to initiate a process for developing alternative transportation service options, which would assist persons with disabilities in overcoming barriers that limit access to employment opportunities and inhibit participation in the economic growth of Tennessee. The targeted client group was composed of Tennesseans with disabilities who are currently employed or

will be employed in competitive positions. In addition to employees with disabilities, other audiences involved with the project included transportation operators and community service agencies who transport employees with disabilities to worksites, employers who recruit and hire employees with disabilities, and support agencies who provide funds to facilitate the employment of persons with disabilities. Under the direction of the University of Tennessee Transportation Center, these groups provided input on the development and design of transportation services for employees with disabilities.

The project was conducted from October 1989 through June 1990. The results pertain to activities conducted during the first phase. On the basis of study results, the project will continue into a second phase in which transportation service demonstration projects will be developed, implemented, and evaluated as solutions to work-trip transportation problems for persons with disabilities. The major objectives of the first phase of the project were to

- Establish a study committee to work with staff to formulate project goals and objectives, develop a work plan, and review and monitor progress;
- Develop a profile of existing transportation services in Tennessee that serve the work-trip needs of workers with disabilities;
- Assemble and conduct transportation study group sessions in urban and nonurban areas of east, middle, and west Tennessee to assess transportation problems of employees with disabilities and to define a specific package of service options that can provide solutions; and
- Select specific transportation service options defined by transportation study groups and develop a service demonstration and shared-cost financing plan for implementing and field testing selected transportation services.

The methodology used and the initial results of project implementation during phase one are now discussed.

## METHODOLOGY AND RESULTS

### Project Study Committee

A project study committee was assembled to assist the project staff with formulating project goals and a general workplan

and to review and monitor progress. The study committee was formed in November 1989 and includes 17 members, who represent a variety of local and state community service agencies and transportation organizations. Many of the representatives are members of the Tennessee Initiative on Employment Management Team (TIE). TIE is an interagency team of state agencies and organizations who collaborate to develop a statewide system of services that will facilitate the employment of persons with disabilities.

The committee members have assisted in developing survey instruments and group interview guides and in recruiting participants for transportation study group interviews. These interviews were conducted in six locations throughout the state. Committee activities will continue during the second phase of the project and will include assisting with tasks regarding the development, design, and implementation of selected transportation service demonstration projects.

### Existing Transportation Services

To identify existing services for the transportation work-trip needs of persons with disabilities in Tennessee, project staff conducted a statewide survey of county executives and city mayors. A transportation services information form (copies are available from T. J. Newsom) was developed and mailed to a total of 114 potential respondents. Persons completing the survey were asked to identify existing transportation services that serve workers with disabilities in their jurisdiction. Approximately 40 percent of the surveys were returned by mail. Follow-up phone calls were made to encourage the completion of surveys and to obtain information. Information was obtained for all 95 counties in the state and for 19 cities with populations of more than 15,000.

Rural and urban public transportation providers were identified for each county. Additional public agencies and private transportation providers were identified for many of the counties, in particular for those with large urban centers. All respondents expressed an interest in the work-trip transportation problems of persons with disabilities and acknowledged the need to identify and expand current services and develop new services to fill any remaining mobility gaps.

The final product will be a document that inventories the work-trip transportation services for persons with disabilities in Tennessee. The document is being prepared for review and comment by the study committee members. The final document will be distributed to appropriate individuals and organizations as a referral resource on available commuter transportation services for employees with disabilities.

### Transportation Study Group Formation and Meeting Results

The next task was to assess transportation problems of employees with disabilities and to explore potential solutions. Modified focus groups, referred to here as transportation study groups, were assembled. Group interviews were conducted in urban and nonurban areas across Tennessee. Transportation study groups were assembled in March 1990 in Sevierville and Knoxville in eastern Tennessee, in April 1990 in Columbia

and Nashville in middle Tennessee, and in May 1990 in Martin and Memphis in western Tennessee. Each group consisted of invited representatives of transportation providers, supported-employment programs, employers, Job Training Partnership Act (JTPA) agencies, and consumer organizations. A total of 70 individuals participated in the transportation study group meetings and the typical size of each group was 11 participants.

Project staff conducted group interviews with each of the six groups using the research study group interview guide (copies are available from T.J. Newsom) that had been developed by the staff and the study committee. The interview guide was designed to obtain qualitative information about employment opportunities, current transportation options, preferred transportation options, incentives and disincentives, and financial considerations. Each group session was taped and notes were taken. Participants were also asked to complete a short opinion questionnaire before the group discussions.

The information obtained from the six transportation study group interview sessions was reviewed and analyzed to ascertain overall opinions and thoughts about transportation needs, problems, and solutions for employees with disabilities. These qualitative results from the group interviews are now summarized.

- *Employment opportunities* for persons with disabilities are numerous, primarily in the food, hotel, and janitorial service sectors. These jobs offer pay increases and benefits, but advancement opportunities are limited. Both full- and part-time employment opportunities are available. However, work-trip transportation continues to be a major problem in obtaining employment. Transportation to accommodate part-time workers, especially when public transportation service is not operating, is a major problem that creates lost employment opportunities. Of those participants who responded to the questionnaire, 95 percent stated that transportation availability was a major barrier to employment opportunities for workers with disabilities.

- *Current transportation options* for employees with disabilities are limited. Employees will ride public transit to work in urban and rural areas if the service is available and can accommodate the work trip. Many employees cannot ride public transit when priority seating is assigned to medical or other trips, or when the bus or van can get them to work but cannot provide a return trip home, or when door-to-door service is not available. Most workers rely on transportation provided by family members or friends, job coaches, or volunteers. Many workers are able to ride on agency vans during job training programs, but must find other transportation options after the training period has been completed. On occasion, workers must use taxicab service for all or part of a work trip, but most workers find taxicab service too costly to use on a regular basis. Some workers with disabilities own vehicles and are able to drive to work, but others who are capable of driving do not because they lack driver training and experience, cannot afford a new vehicle or the costs to repair currently owned vehicles, or cannot qualify for, or afford the cost of, auto insurance. The responses to the opinion questionnaire are in general agreement with these findings in that 45 percent indicated that public transportation was the

typical means for persons with disabilities to commute to work. Riding with family, friends, coworkers, and volunteers was stated as the typical means of traveling to and from work by 34 percent of the respondents. Fourteen percent of the respondents indicated that driving was the usual means of traveling to and from work.

- *Preferred transportation options* for employees with disabilities included various options, but an emphasis was placed on developing options that provided a maximum degree of independence for the worker. These transportation alternatives included

- Expansion of existing transit services provided in urban and rural areas. Suggestions included obtaining more vans and drivers for rural transit systems, purchasing additional lift-equipped vans and buses, and establishing new routes or extending existing services into evenings and weekends. This option was clearly the preferred one among persons completing the questionnaire: 54 percent of the respondents were in favor of expanding existing public transportation services.

- Develop a door-to-door, dial-a-ride type service, which features taxicab service at low-cost group rates. A reservation-based system that would operate on a 24-hour schedule was suggested.

- Establish modified driver education programs to help persons with disabilities learn to drive and obtain drivers' licenses. Programs may need to be lengthened to accommodate special needs of drivers with disabilities.

- Create a vehicle procurement program for workers with disabilities who can drive. The program could offer opportunities for workers to lease or purchase vehicles for commuting to and from work.

- Provide technical assistance to agencies in identifying individuals (i.e., coworkers, volunteers, etc.) willing to transport persons with disabilities to worksites. It was suggested that computer software be obtained to assist agencies with ride matching.

- Develop a system to disseminate information about existing transportation resources available for workers with disabilities. Printed information and perhaps a telephone "hotline" were suggested as alternatives.

- Expand programs that teach workers with disabilities how to use available transportation services. This program would move beyond classroom instruction to a "hands on" approach (i.e., field training on how to ride a bus or how to form a carpool).

- *Incentives and disincentives* for agencies to provide work-trip transportation options for persons with disabilities were linked primarily to funding resources available to operate specific services. In most cases, a contract between a community organization (e.g., senior citizen center or vocational rehabilitation agency) and a transportation provider is sufficient to obtain transportation for special groups. Service priorities are generally established by a board or an advisory committee that sets transportation policy. Work trips are given priority by some transportation agencies, but most agencies provide a greater number of trips for medical and nutrition purposes. Transportation providers indicated that an increase in funding levels for service operations would be the major incentive to increase work-trip transportation services for employees with disabilities. Indeed, more than 70 percent of the

respondents to the questionnaire indicated that additional grant funding would be a major incentive to encourage transportation providers to expand work-trip services for employees with disabilities.

- *Financing* the suggested transportation options for workers with disabilities should incorporate shared-cost arrangements among service providers, service users, employers, and the community. It was consistently expressed that the employee was expected to pay a fair share of the costs of transportation to work. In addition, it was strongly believed that any major improvements in transportation must be shared by the community as a whole through increased funding of existing and new services. Mechanisms to obtain such new funding would involve increased taxes or fees, such as wheel taxes, sales taxes, and other forms of dedicated taxes for community transportation. Sixty-four percent of the respondents generally agreed that a shared-cost arrangement was the appropriate way to pay for the transportation services.

### Transportation Service Demonstrations

Pertinent information about transportation service problems and solutions was obtained through the group interviews conducted throughout the state. As mentioned previously, various options were suggested as preferred alternatives for transporting workers with disabilities to and from work. Several of these options, such as information dissemination programs or technical assistance to establish computer ridematching services, are low-cost alternatives relative to the costs for implementing such options as developing a door-to-door, dial-a-ride service or creating a vehicle procurement program. The expansion of existing services and modification of current transportation education programs are feasible from time to time, but would depend on financial assistance in addition to current operating funds. All of the options suggested by the participants in the group interview sessions are potential service demonstration projects. The development of specific service demonstrations, selection of test sites, and service financing options are activities that are currently underway as phase two project tasks.

### SUMMARY AND FUTURE ACTIVITIES

The overall intent of the project was to initiate a process to facilitate the development of alternative transportation service options that will assist persons with disabilities in overcoming barriers that limit employment opportunities. Activities during the first phase of the project have been completed and, as described previously, concentrated on collecting information about existing transportation resources, work-trip problems, and potential solutions. During this phase, a study team was assembled, a survey of county executives and city mayors across Tennessee was conducted to identify existing transportation services for workers with disabilities, and transportation study groups were formed and group interviews conducted to obtain information from service providers and users about employment opportunities, transportation problems, and potential solutions. These activities have produced recommendations about transportation services for workers



with disabilities. The recommended services represent potential service demonstration projects, which will be pursued in the second phase of the project.

Phase two will continue the development of alternative transportation service options, which will assist persons with disabilities to overcome barriers that limit employment opportunities. The work during phase two will focus on developing and implementing transportation services at demonstration sites throughout the state. The major tasks to be accomplished during this project phase include the selection of demonstration sites, the design of transportation services to be tested at each demonstration site, and the development of financial resources to fund the demonstration projects. The

operations of funded demonstration projects will be monitored and the benefits, costs, and lessons learned from the demonstration projects will be evaluated. The results of the project will be documented and disseminated to other communities in the state interested in implementing similar transportation services for workers with disabilities.

#### **ACKNOWLEDGMENT**

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# Iowa Transit Coordination Policy

PETER H. HALLOCK

Iowa has been in the forefront of state efforts to mandate coordination of publicly-funded passenger transportation. Iowa has achieved this in part by a policy of channeling all state and federal public transit funds through locally designated transit systems in each substate region and urban area. These designated transit systems are responsible for contracting with other agencies to provide needed client transportation services as part of the public services. Iowa also has legislation requiring agencies who use other public funds to purchase or provide passenger transportation to coordinate or consolidate those services with the designated transit systems to the maximum extent feasible. That legislative mandate evolved from a general statement of principle in 1976 to a specific procedural requirement for coordination compliance reviews with sanctions for noncompliance in 1984. Implementation of the review process has presented some problems which are currently being addressed on an administrative rules level. Despite the problems, the coordination effort is seen to have had a positive impact on the provision of passenger transportation services to the people of the state.

The idea of transportation coordination is to get the maximum benefit from every public dollar spent for passenger transportation. Many agencies spend public funds on passenger transportation and most of these agencies are interested only in providing services to a limited clientele. If each agency owns and operates one or more vehicles to serve only that clientele, agencies may be duplicating services. Two agencies may each purchase a vehicle when one vehicle would be more than sufficient. There may also be members of the community in need of transportation but not able to get service despite the large sums of money spent on transportation. Each transportation service operates with plenty of empty seats, but each operates to serve someone else.

Iowa first addressed the transportation coordination issue in 1976 when the 67th General Assembly amended Chapter 601J of the Iowa Code. The amendment required that any organization spending public funds to purchase or provide passenger transportation services, other than school transportation services, had to be in compliance with the state transit plan. That plan proposed that all funding for transit services be channeled through a limited number of urban transit systems or regional transit systems designated by local officials.

The urban transit systems in Iowa generally serve a single community with populations of over 20,000 or a cluster of contiguous cities and are similar to their counterparts around the country. The regional transit systems, however, were a unique Iowa invention. The state had already been divided into multicounty regions. Within each region a single organization was selected by local elected officials to be respon-

sible for providing public transit services for all areas not served by an urban transit system.

## COORDINATION OF STATE AND FEDERAL TRANSIT FUNDS

This concept of channeling all transit funding through the urban and regional transit systems continues to be used by the Iowa Department of Transportation (DOT) to guide its distribution of both state and federal transit-assistance funding. At this time Iowa has 19 urban transit systems and 16 regional systems, which cover the entire state.

The transit systems, particularly the regional systems, are encouraged to combine these transit resources with those available from other agencies to provide a comprehensive passenger transportation program. The goal is to expand the travel opportunities available both to social service clientele and to the general public. Portions of the service may be designed around the specific transportation needs of a particular clientele, allowing that group to share in the benefits of the federal programs. All services using the federal operating funds or vehicles distributed by the department, however, must at all times be open to all client groups and to the general public.

Services may be either directly provided by transit systems or contracted from other agencies. Contracted services may be appropriate where most of the transit need in an area centers around a single client group and where the agency responsible for that group is willing to operate the service without limiting access by any other persons in the community who may wish to use the services provided. As the variety of transportation needs increases, subcontracted operations become less attractive. In general, direct service by the transit system is preferred, thereby providing greater assurances that the services will be open to all and that other federal requirements will be followed.

If a transit system does choose to have some of its services provided by another agency under contract, they may lease vehicles provided to the system by the department. That agency can use the vehicles under the contract. Such vehicles continue to belong to the transit system as the actual recipient of the vehicle grant. The transit system is responsible for ensuring that the vehicles will be operated in an open fashion, that they will receive at least a minimal level of use each year, that they will be properly maintained, and that they will be properly insured. These issues are to be dealt with in the terms of the lease agreement, which is subject to approval by the department. Failure to comply with these requirements should result in cancellation of the lease by the transit system. If noncompliance does not result in lease cancellation, it may

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Air and Transit Division, Iowa Department of Transportation, International Airport Office, Des Moines, Iowa 50321.

result in forfeiture of the equipment by transit system. Any riders other than agency clients may be charged a reasonable fare which can be used to help offset service costs.

When services are provided directly by the transit system, they may still be focused on the needs of a particular clientele. A client agency may contract with the transit system for the particular services its clients need. Depending upon the extent to which the agency's needs tie up a vehicle, the agency may be asked to pay for the subsidized cost of certain hours of vehicle operations with any fares paid by nonclients credited against agency billings or they may pay a prorated hourly cost for shared operations or even a per trip rate.

The federal funding for transit vehicles requires payment of nonfederal match. In Iowa this match has been set at 25 percent. Transit systems are encouraged to provide these matching funds from system resources and then to collect a vehicle replacement fee on the basis of usage. A number of systems, however, allow client agencies and particularly those providing services with leased vehicles to provide the matching funds up front. This is because the client agencies have indicated that they are more willing to incur onetime costs for capital match rather than increased operating charges to rebuild a capital-match reserve account. Generally this practice is not favored because it often leads to the belief by both parties that the client agency should have complete control of the equipment.

Federal operating-assistance funds are provided along with state transit-assistance funds. These are each distributed under formulas based on the amount of public transit service being provided by the transit system. Generally these funds should be available on a more-or-less equal basis to help support any services that are being provided open to the public. It is recognized, however, that there may be specific services that may require a higher level of support because no other funding source is available.

#### **COORDINATION OF OTHER PUBLIC FUNDS USED FOR PASSENGER TRANSPORTATION**

In 1982 the Iowa Governor's Blue Ribbon Taskforce on Transportation expressed concern that little progress had been made to reduce the vast array of organizations each spending their respective amount of public funds on uncoordinated and restrictive passenger transportation services. It was recommended that public schools be included in the coordination effort and that the coordination mandates of Chapter 601J be strengthened, with financial penalties for organizations failing to comply. In 1984, the 71st Iowa General Assembly responded. They amended 601J requiring a pilot study of coordination between schools and public transit. The language was changed to require organizations that spend public funds on passenger transportation services (other than school service) to coordinate with the urban and regional transit systems. The original language referred to compliance with the state system. Penalty clauses were also put in, giving DOT the responsibility to monitor compliance and trigger the enforcement.

Iowa DOT's Air and Transit Division worked with an advisory committee made up of representatives of other state agencies and local providers to develop a review and certi-

fication process to carry out the department's responsibilities under the law. The review process was implemented during fiscal year 1986. A total of 512 organizations was contacted. These included the public transit systems as well as groups identified by the Department of Human Services, the Department of Elder Affairs, the Department of Health, the Board of Regents, County Boards of Supervisors, and the federal Action program. About one third of the agencies were reviewed. Most of these found to be either compliant with the coordination mandate or with adequate reasons for non-coordination so that they were certified "compliant with waiver" under the rules. The review process became bogged down, however, because most organizations contacted either did not respond or did not provide sufficient information for a review to be performed. This was despite both written and telephone follow-up requests. Some organizations complained that the process was too burdensome, but these comments appeared not to be related to the actual effort required in order to respond. Rather the complaints seemed to be made on the basis of a belief that, although public funds were being spent, they should not have to account for how the funds were being spent.

As a result of both the problem with nonrespondents and the complaints received, the Air and Transit Division formed another interagency advisory committee to help formulate revisions to the coordination review process. The review process has been suspended while revisions are being formulated.

The process has not yet been completed. With the advisory committee's assistance, the Air and Transit Division is currently working on rules that will create an ongoing interagency council to advise DOT on the compliance determinations for local agencies. This should help to improve the level of acceptance of the process and avoid the image that it is DOT trying to control everyone else's funds. It is also hoped that there can be a legislative change to formalize the sharing of responsibility for the coordination decisions.

At present it is conceived that the council will involve all state agencies that put money into transportation as well as federal agencies that directly fund local programs. Private-sector funding sources such as United Way or Variety Club as well as groups representing local city and county government may also be included. DOT's Air and Transit Division will continue to serve as staff, but other state agencies will be asked to help in the initial collection of review information.

As visualized by the committee, an organization would be considered compliant (coordinated) if it is contracting with a public transit system for either purchase or provision of services accessible to the public, or if it is found that the public transit system is not currently able to provide the needed service, or if the service available from the transit system would cost the organization more than its own fully allocated costs to provide the services.

It is anticipated that the new process may be ready to go by the beginning of next fiscal year.

#### **RESULTS OF COORDINATION**

Even with the difficulties getting the coordination review process fully operational, the last decade has seen a real improvement in transit coordination in Iowa. Although many noncoordi-

nated providers remain, many other formerly independent client services have merged with public transit systems. Their costs have thereby been reduced and additional members of the community have been able to benefit from the services. A fair share of this change occurred either directly as a result of the review process or as a result of people's anticipation of review activities. In many cases, agencies that for years resisted any discussions with transit officials, once faced with the prospect of a coordination review, finally agreed to discuss the possibility of participating in a public transit program. These agencies found that participation could be to their agency's benefit after all.

Other factors have also supported the improvements in coordination during this time. For one thing, the Iowa transit industry was successful in securing increased state funding for transit at a time when many social service programs were seeing drops in their federal funding. The desire to tap into these state transit funds channelled through to transit systems helped outweigh the previously perceived benefits of exclusive client transportation.

Another factor was the hardening of the insurance market. Insurance for client transportation tends to be considerably cheaper than for public transit. As the cost to insure a client transportation service rose, however, there was often a sud-

den recognition of the overall drain that service represented to the agency. In addition, there was often an increased willingness to look to the public transit system for alternatives.

Finally, there has been an indirect impact of the state's coordination efforts. In those areas that have consolidated transportation services provided by the designated transit system, there is a growing recognition by other agencies that these people are the professionals. Once creditability had been established by working with various client groups, others willingly turned to them for help in escaping the headaches of independent operations, even in the absence of the threat of state reviews.

## OUTLOOK

Completion of the rules revision to reactivate the coordination review process will again provide a powerful tool to motivate agencies to consider coordination alternatives. At the same time, the pressure will remain on the designated transit systems to provide an economically viable alternative and to convince the other agencies that they can deliver a quality, caring service to social service clientele and to other members of the public.

# Automated Paratransit Routing and Scheduling Using a Highway Network Model

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The quality of vehicle routing and scheduling has a great impact on the operating cost and service quality of any paratransit service. The difficulties associated with many-to-many trip requests, vehicle availability and capacity constraints, traffic patterns, and geographical obstacles are such that the process, when done manually, is error prone, labor intensive, and difficult to optimize. The development of computer software that creates paratransit schedules can, in addition to addressing these problems, significantly reduce the cost of generating schedules and improve the overall efficiency of providing service. COMSIS Corporation has developed the COMSIS Routing and Scheduling System (CRSS) to address these issues. It uses a highway network to model point-to-point travel times that recognizes geographical obstacles. CRSS takes a set of trip requests entered by means of a paratransit management information system and generates vehicle manifests. The program also tracks the estimated vehicle locations and remaining vehicle capacity throughout the day. The software is processed in batch after all requests have been received. CRSS has been implemented at a number of paratransit agencies, and comparisons have been made. Manually generated schedules have been compared with CRSS schedules in the areas of service quality and operating cost and the results are favorable. Areas for further development have been identified.

Paratransit scheduling can be considered an expansion of the classic traveling salesman problem, which involves the calculation of an optimum itinerary for visiting a number of predetermined nodes on a network. The use of a network to model a roadway system provides a realistic representation of geographical obstacles and travel costs, thus enabling the development of a feasible itinerary. In its simplest forms, this problem has a closed solution using linear programming techniques.

In the paratransit scenario, the following constraints beyond the traveling salesman problem exist:

1. There are two types of stops—pickup and drop-off. All are paired and each pair must be serviced in sequence. A pickup–drop-off pair can be considered a trip request.
2. Trip requests may have unique pickup and drop-off locations. Thus the problem presents a many-to-many instead of a one-to-many scenario.
3. Many vehicles may be available to service trip requests. Each vehicle has a capacity limit, and the capacities of vehicles may vary. Also, some vehicles may be physically unable (too wide, too high) to access certain locations. Furthermore, some

vehicles may be used preferentially, such as agency-operated vehicles versus supplemental contract carrier vehicles.

4. Types of passengers may vary. At a minimum, one must distinguish between wheelchair and ambulatory passengers for the use of vehicle capacity and the variations in load and unload time.

5. Constraints must be placed upon the amount of time a passenger is kept on a vehicle (i.e., a limit on ride time).

6. Limits must be placed upon the amount of variation between a requested pickup or drop-off and a scheduled pickup or drop-off to ensure timely service.

7. Some trips may have a greater priority than others. This may involve the division between promised, recurring service (standing orders) and ad hoc (demand-response) trip requests. In the case where not all vehicles can transport passengers in wheelchairs, a priority may be placed upon the wheelchair trips.

These constraints upon the traveling salesman problem, in the author's opinion, render the problem intractable. Even if a closed solution was possible, the computing resources necessary to produce solutions in a timely fashion would be prohibitively expensive. The only practical methods of paratransit scheduling are to perform the task manually, or to develop a computerized heuristic to solve the problem.

## MANUAL PARATRANSIT SCHEDULING TECHNIQUES

Manual techniques for paratransit scheduling vary in application from agency to agency; however, the substance of various methods is largely the same. Simply stated, the process for a service with no preference by trip type involves

1. Sorting trips chronologically. This is a simple sort throughout the trip requests for a service day.
2. Grouping trips geographically. Trip grouping involves collecting parallel trips at similar times of the day. This is done with consideration of geographical obstacles and traffic conditions.
3. Assembling groups into manifests. Once trips are collected into groups, the groups are sequenced chronologically into manifests.
4. Resolving exception trips. Trips that do not fit into groups, as well as ones that are handled outside the rules, are inserted into the schedule as best the scheduler can.

A common variation involves assigning priority to trips by trip type. In some cases, standing order (prearranged) trip requests take precedence over ad hoc requests. If a vehicle fleet is only partially equipped to handle wheelchairs, priority would commonly be given to the wheelchair trips. To handle priorities, one would make multiple passes through the procedure, one for each of the priorities.

Throughout the second and third steps, the constraints should not be violated. Specifically, this involves constructing groups that do not exceed vehicle capacities. Manifests must be arranged to provide service without keeping any passengers on the vehicles for inordinate amounts of time and without changing requested pickup or drop-off times too severely. Above all, the resulting schedule must be feasible. The schedule must be written considering expected traffic conditions and the existing connectivity of highways so it can be driven on time.

#### ADVANTAGES AND DISADVANTAGES OF MANUAL PARATRANSIT SCHEDULING

There are many advantages and drawbacks to manual scheduling. Foremost among the advantages is versatility. A good scheduler can be adept at handling exceptions. In cases where service demand starts to exceed capacity, the scheduler can make judgments about where to bend service policy rules. Even under an automated system, the resolution of exceptions is still best left as a manual process.

Another advantage is the low capital cost. The tools needed for manual paratransit scheduling can be as simple as a large table and a set of trip requests, each on a standard form.

It should be noted that, in some cases, the day-to-day effort involved in a manual procedure can be small, even for a relatively large number of daily trip requests. This typically happens when most trip requests are standing orders. In such a case, the schedule for the standing trips is written once for each day of the week. It is refined periodically as standing requests change, but it changes little from day to day. For each service day, relatively few demand-response requests need to be added to the largely standing-order schedule.

The disadvantages of manual scheduling include the amount of labor necessary to schedule a large number of trips, when most are not standing requests. Here, the schedule must be, to a great extent, written from scratch every day. A typical case is that of Capital Metropolitan Transit Authority (Austin, Texas), where 18 to 22 person hours are required to prepare a weekday schedule of 1,600 trips. Sixty percent or more are not standing orders.

In agencies serving a large number of trips every day, it is difficult to maintain a consistent level of service quality. Often, as deadlines approach, the scheduler hurries to make the last vehicle assignments, sometimes with less regard to efficiency and passenger service quality than were the case with the first trips scheduled. Furthermore, like any manual process, the element of human error exists, resulting in conflicts and infeasibilities in manifests.

For paratransit services where the amount of work presses the limits of the human ability, a computer program to create paratransit schedules can be very useful. The output of such a program should meet the following goals:

1. Schedules must be feasible. There must be sufficient time between scheduled stops to allow for on-time service. Physical and operational constraints (e.g., vehicle capacity, ride-time limits, etc.) must not be violated.

2. Schedules must be created quickly. Ideally, the scheduling process should take considerably less time than with manual processing, to allow for review and revision as necessary.

3. Schedules must conform to service quality criteria. Like trips must be dealt with equally and within the limits of a set operating policy.

4. Schedules must be cost-effective, while still providing service quality within set limits.

#### SERVICE QUALITY MEASURES

A set of criteria is necessary to judge schedules. To measure the passenger's perception of service quality, ride time can be considered. Here, the passenger could be said to enjoy adequate quality service if the scheduled ride time was no greater than some factor of the direct ride time. The closer the scheduled ride time is to the direct ride time, the better the service quality.

The difference between the requested pickup and the scheduled pickup should also be considered. Here, the closer the schedule adheres to the passengers requested time, the better the quality of service. (Note that, if the passenger is concerned more with the drop-off time than the pickup, such as in the case of on-time arrival at the passenger's workplace, the difference between requested and scheduled drop-off times would be the criteria.)

#### SERVICE PRODUCTIVITY MEASURES

Paratransit productivity can be measured by a number of criteria. Two that can be useful are passengers served per vehicle hour, and total vehicle hours. The first measures the overall rate of service provision; the higher the rate, the more productive the service. Total vehicle hours have a direct effect on the overall cost of operation. Here, if the annual budget allows for a set average cost per day, this almost directly translates to a limit on total vehicle hours.

Note that some measures commonly used for fixed-route services can be misleading when applied to paratransit. For example, the ratio of live to dead vehicle time is of little value when it disregards the overall number of vehicle hours. It is entirely possible to arrange vehicle tours so there is little or no idle or deadhead time by simply retaining passengers longer than necessary, by making circuitous routings, or by both. In these cases, service quality can suffer, and the overall number of vehicle hours (and therefore overall cost) is higher.

Depending on the ratio of rate of pay to drivers to the cost of vehicle operation (fuel and maintenance), the issue of total mileage can be significant. Where driver pay is a relatively high percentage of total vehicle operating cost, it may not be necessary to consider reduced vehicle mileage separately from reduced vehicle hours. If, however, vehicle operating costs are a large portion of overall cost, the overall vehicle mileage can be a significant concern.

**TRADEOFFS BETWEEN SERVICE QUALITY AND QUANTITY**

For any given level of service supply (determined by driver and vehicle availability, and ultimately, an operating budget) and a given level of scheduling ability, there is an intrinsic tradeoff between quality and quantity of service. To improve service quality to the passenger (by reducing ride time or improving service timeliness), productivity (passengers per vehicle hour) must be reduced. In essence, to improve service to some passengers, one would be unable to take some others. Conversely, to improve productivity under these constraints, service quality to more passengers is reduced.

A computerized scheduler might be able to improve productivity without degrading quality, if the computer program is more capable than the person performing the task. Once the level of scheduling ability is established, the ability to control the tradeoff between quality and quantity is needed.

**COMSIS ROUTING AND SCHEDULING SYSTEM**

COMSIS Corporation has developed the COMSIS Routing and Scheduling System (CRSS), a computer program designed on the basis of the rules and goals outlined previously, to address the paratransit scheduling problem. This program includes a scheduling function, which is surrounded by functions to maintain the data bases needed to support the scheduler. It is not a full-functioned paratransit management in-

formation system (MIS); rather, it is a tool intended for use with an MIS.

The client list, standing order, and daily trip entry functions are managed by the MIS. Once all trips for a service date have been input to the MIS, the trip information for that date is transferred to CRSS. CRSS performs the scheduling functions, then reports the schedule back to the MIS. The MIS is then used to print driver manifests. CRSS can be integrated with any MIS that can export trip information and import schedule information by means of formatted ASCII files.

In addition to the trip request information imported from the MIS, CRSS maintains a number of data bases to accommodate variations in operating policies and conditions among paratransit agencies. One file describes the loading characteristics and restrictions on each vehicle type. A run file identifies, on a daily basis, a run's availability, preference type, starting location, and assigned vehicle type. A third data base describes a highway network of the service area, recording travel distances and speeds. From this network file, minimum path travel times are automatically derived, as well as a data base of geographical proximity. (See Figures 1-4 for data file layouts.) The use of this highway network is described at length later in this paper.

CRSS addresses the goals for the scheduling process as follows:

1. *Processing speed.* CRSS is written entirely in C, which is perhaps the fastest programming language that can be ported between computer systems. On a 20 MHz 80386-based PC

CRSS		TRIP FILE		CRS1010
Trip Number:	< _____ >			
Trip Type:	< [ ] >			
Carrier:	< [ ] >	_____		
Client Name:	< _____ >			
Service Date:	< __/__/__ >			
Requested Pickup: ____ - ____		Requested Dropoff: ____ - ____		
Origin Address: _____		Destination Address: _____		
_____		_____		
Zone: ____ - ____		Zone: ____ - ____		
Wheelchair Lift Needed?:	_____ -	Preassigned Run:	_____	
PassType: [ ] _____		Going/Return Trip (G/R):	_____	
Wheelchair Passengers: _____		Corresponding Trip:	_____	
Ambulatory Passengers: _____		Link to Wait Trip:	_____	

FIGURE 1 CRSS trip file screen displays select information about trip requests.

CRSS	VEHICLE TYPES	CRS2020
Vehicle Type: <__> _____		
Wheelchair Lift?: _____		
Seating Capacity: _____		
Wheelchair Capacity: _____		
Wheelchair to Seat Conversion Factor: _____		
Restricted Passenger Types: [__] _____		
[__] _____		
[__] _____		
[__] _____		
[__] _____		
[__] _____		

FIGURE 2 CRSS vehicle type file tracks the capacity and passenger type limitations of each type of vehicle.

CRSS	RUN FILE	CRS2010					
Run Number: <____>							
Vehicle Type: <[__]> _____							
Carrier: <[__]> _____							
Garage Zone: _____							
	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Option (Y/N/O/R)?:	_____	_____	_____	_____	_____	_____	_____
Earliest Start:	_____	_____	_____	_____	_____	_____	_____
Latest Finish:	_____	_____	_____	_____	_____	_____	_____
Break 1 Start:	_____	_____	_____	_____	_____	_____	_____
Break 1 Finish:	_____	_____	_____	_____	_____	_____	_____
Break 2 Start:	_____	_____	_____	_____	_____	_____	_____
Break 2 Finish:	_____	_____	_____	_____	_____	_____	_____

FIGURE 3 CRSS run file describes vehicle availability by time of day and starting location and identifies a vehicle type for each run.



CRSS	LINK FILE MAINTENANCE	CRS3010
Origin Zone:	< ___ >	
Destination Zone:	< ___ >	
Link Distance:	_____	
	Speed	# Observations
Off Peak	—	—
Morning Peak	—	—
Evening Peak	—	—

FIGURE 4 CRSS highway network link file computes minimum travel times and distances as part of scheduling process.

running Xenix, schedules of 300 trips are calculated in 15 min or less. Running time does not increase linearly; a schedule of 1,300 trips can take as long 90 to 100 min. (Performance varies with the hardware configuration and operating system. Running times are typically up to 50 percent greater with identical hardware under MS DOS.)

2. *Consistency.* CRSS allows the user to identify any number of trip types (for example, combinations of standing, demand response, ambulatory, and wheelchair are common). Service quality limits can be set independently for each trip type. Any number of passenger types can be defined, and load and unload times are independently set for each. Once these constraints are set, CRSS does not violate them. Thus, a consistent level of service is maintained, regardless of the person using the software, the number of trip requests, vehicle availability, and so on.

3. *Control of quality-quantity tradeoff.* Beyond the setting of absolute of passenger service quality, CRSS provides a mechanism to control this tradeoff. This is done during the scheduling process by means of a disutility function. When inserting a group of trips on any given run, CRSS calculates the following factors:

- Additional minutes for all passengers in the difference between requested and scheduled trip times.
- Additional minutes of ride time for all passengers.
- Change in total live vehicle time.
- Change in total idle vehicle time, where idle time is when the vehicle is "on the road," but sitting still with no passengers aboard.
- Change in total deadhead vehicle time, where deadhead is any time the vehicle is moving with no passengers on board. This is not limited to the time to and from the garage at the beginning and end of the day.

The user of CRSS may assign a different weight to each of these factors, signifying relative importance of minimizing each independently. By manipulating these factors, the user can bias the schedule program's decisions toward vehicle productivity or passenger convenience.

4. *Feasibility.* As used here, feasibility of a schedule refers to the degree to which a driver can make all pickups and dropoffs on time and in proper sequence. The means by which CRSS addresses this issue are through the use of a highway network model of the service area. This approach was chosen primarily to avoid errors in schedule sequences and travel times inherent in Cartesian ("crow-flies") distance estimations and average travel time methodologies.

Illustrated in Figures 5–7 is a simple example of two trip requests. The points labeled Pickup 1, Dropoff 1, Pickup 2,

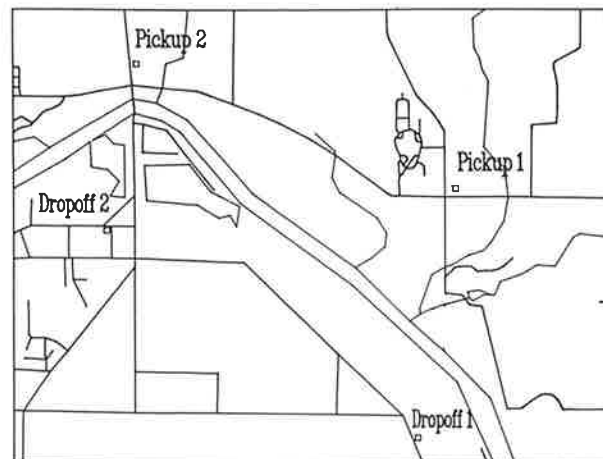


FIGURE 5 Segment of a paratransit service area.

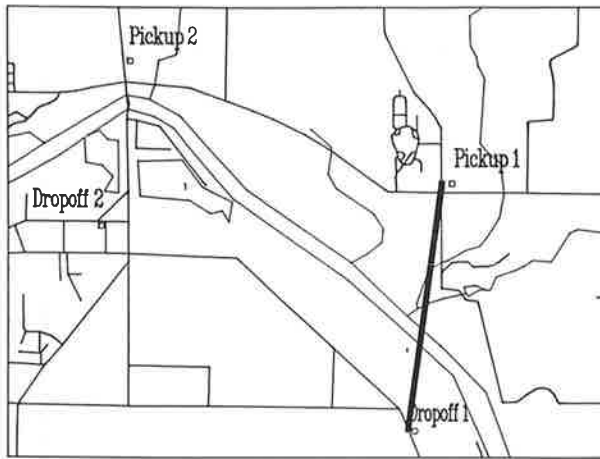


FIGURE 6 Intermediate step in scheduling process—line-of-sight travel estimations.

and Dropoff 2 represent the origins and destinations of two trip requests at the same time. The trips are separated by a river with only one bridge. As each trip is entered, the origin and destination addresses are assigned coordinates. (This may be done many ways, ranging from simply looking up the coordinates on a map, to automatically matching the addresses against a list of all streets in the service area.) The travel times between each stop in a manifest are calculated from the distance, and a typical travel speed is determined.

Using a grid-based system, with constant travel speeds, a scheduling program might schedule the first trip (P1-D1) in correct sequence, but with insufficient travel time. Using the straight-line distance between the pickup and drop-off, there is no accounting for the lack of a bridge at that point on the river. Thus, the travel time calculated by this method is inadequate.

If the second trip is added to the vehicle's itinerary, the errors compound. Not only is the time between the first two stops too short, but the sequence would be P1-D1-P2-D2. Given the location of the bridge, the driver would have to pass the pickup and drop-off of the second trip on the way

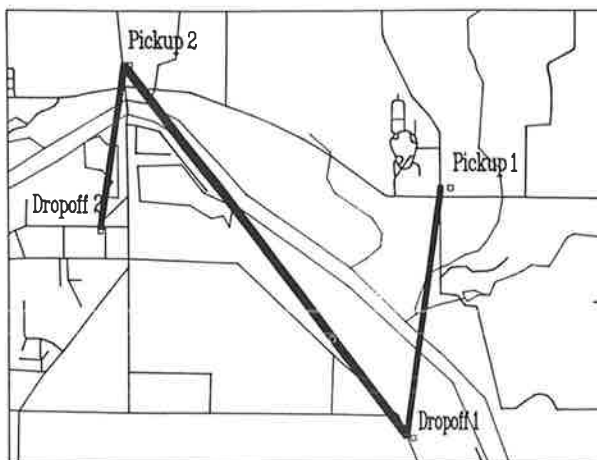


FIGURE 7 Final step of the scheduling process—line-of-sight estimations.

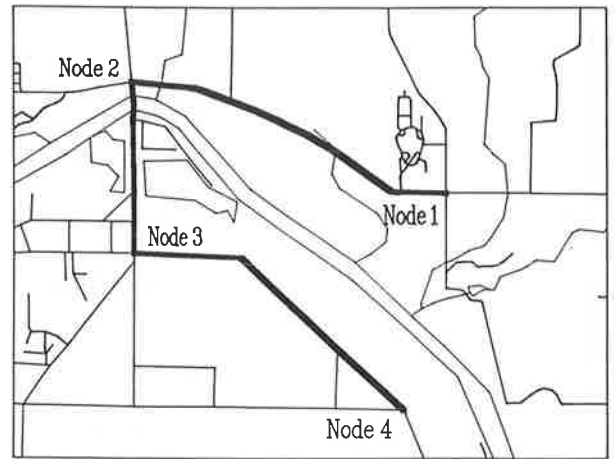


FIGURE 8 Highway network for sample paratransit service area segment.

to the drop-off of the first, then backtrack to serve the second request.

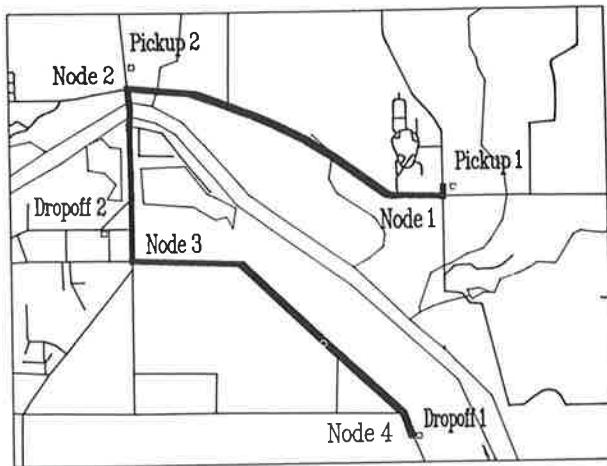
The way that one considers this problem, using CRSS, is to first describe the highway network available for use. Networks appropriate for operational use are much simpler than typical transportation planning networks. CRSS only requires the distance of each link, and the typical speeds (accounting for stops and turns) during the morning-peak, evening-peak, and off-peak travel. This information may be adapted from a transportation planning oriented network, depending on how closely the general travel demand follows that of paratransit travel. As illustrated, it is not necessary to code every last street and alley. However, it is necessary to define the network in sufficient detail so that no two commonly visited locations are associated with the same node.

In the example seen before, four nodes would be defined as shown in Figure 8. Six records would be entered into the link data base as presented in Table 1. Two records are associated with each link (one for each direction). This allows proper representation of directional congestion by time of day; typically, inbound congestion during the morning peak, outbound congestion during the evening. Note that each adjacent pair of nodes has two, one-way links between them.

As each trip request is accepted, the origin and destination are geocoded as before, but only one number is assigned: that of the nearest node in the network. P1 would be coded to Node 1, and so on. Assuming that the trip requests are for the morning peak, when the first trip is scheduled (Figure 9),

TABLE 1 CRSS HIGHWAY NETWORK LINK DATA

Orig Node	Dest Node	Distance	AM Speed	Off Peak Speed	PM Speed
1	2	.5	15	20	20
2	1	.5	20	20	15
2	3	.2	15	30	15
3	2	.2	15	30	15
3	4	.6	25	25	25
4	3	.6	25	25	25

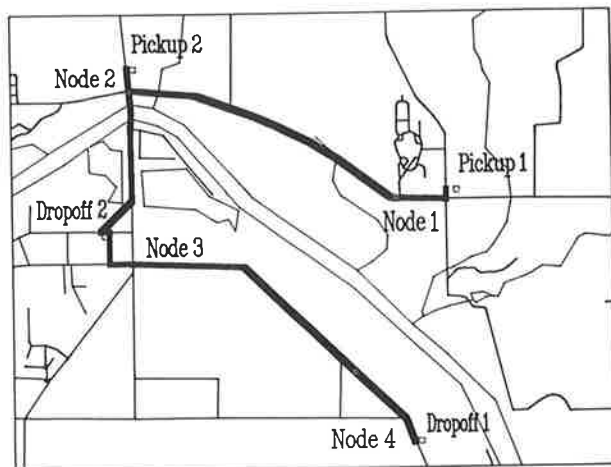


**FIGURE 9** Vehicle manifest produced by CRSS after inserting the first trip.

CRSS uses the morning peak travel time along the minimum travel path defined by the network. In this case, the minimum path is by means of the bridge so the travel time used is 5 min. (CRSS works with integer time values; here, the fractional value of 4.5 min is rounded to 5 min.) Since CRSS will only route vehicles by the links defined, a line-of-sight time and distance are not considered for the first trip. An adequate amount of time is allotted.

CRSS considers all the feasible sequences when it inserts the second trip into the manifest (Figure 10). However, since travel times are derived from the highway network, CRSS uses a more representative time for each possibility. The vehicle time required by the solution from the crow flies' method (allowing one extra minute for loading and unloading) totals 12 min. A better solution would be P1-P2-D2-D1, which takes 9 min.

When the second trip was inserted, its proximity to the vehicle's path along the network was determined to be close enough to allow it to be scheduled on the vehicle as it served the first trip. The resulting manifest is correctly sequenced, and using travel times derived from the highway network, the manifest is feasible.



**FIGURE 10** Final vehicle manifest produced by CRSS.

Note that, with any method, if the only way to accommodate the second trip is to cause the first passenger to be late for an appointment, it would be necessary to schedule the second trip on a different vehicle, or in a different sequence.

### Maintenance of the Highway Network

During day-to-day use of CRSS, the data composing a highway network remain relatively static. Changes are necessary only when links on the network change. This occurs when bridges are closed, lanes are closed on major highways for maintenance, new roads are opened, and so on. Typically only a few records need to be changed. To change the speed on the bridge in the four node example, one would alter two records. If a new bridge was built between Nodes 1 and 4, two new records would be added. (Note that doing so could change nearly every point-to-point travel time in the service area.) Once this maintenance is done, one would run a function to automatically recompute the minimum paths, and scheduling may resume.

CRSS provides a separate method to address across-the-board travel time changes, such as those resulting from inclement weather. Instead of slowing down travel times on each link of the network, the user can enter a factor which is multiplied by each travel time as it is accessed. Thus, there is no need for long-range planning for weather adjustments. If the schedule needs to be slower on the next day, then one simply changes one entry and runs the schedule function.

### Other Uses of Highway Network Information

In addition to computing travel times during the scheduling process, CRSS uses these travel times to group trips. CRSS defines a group as a set of trips with common or nearby origins and destinations, occurring at approximately the same time of day. To determine geographical proximity, CRSS uses the travel time between origins of trips. If the travel time is less than a configurable parameter, the trip origins are considered sufficiently close. The same test is applied to destinations. If both tests pass, and the requested time of day is within a configurable window, CRSS will attempt to schedule the trips onto the same run. (Considering vehicle capacity, passenger appointment times, and so on, all trips in a group might not end up on the same vehicle.)

CRSS uses the network travel times after a schedule is complete to assist in computing passenger hours and vehicle hours in a statistical summary. (See Figure 11 for an example.) Combined with the total number of passengers scheduled, these data can be used to compute average ride time (passengers per passenger hours), and vehicle productivity (passengers per vehicle hours). These measures can be useful in judging the effect of variations on service constraints, service quantity and quality weights, and so on.

### Recent Implementations of CRSS

The task of quantitatively evaluating the effectiveness of a computerized paratransit scheduling program is often diffi-



cult. This is not because of the lack of information provided by the software, rather it results from the difficulty in obtaining an historical data base for comparison purposes. It is often the case that a paratransit agency is very tightly funded, and the efforts of the entire staff are involved in providing service. Little time is left for collection of operational data beyond the requirements imposed by funding agencies. Under such circumstances, it is difficult to make a quantitative judgment on the improvement between manual and automated scheduling.

Data that typically are available for comparison involve the total number of passengers served with the number of vehicles available, and the total effort required to produce schedules. Information on such variables as average passenger ride time and on-time service, among other things, is at best only collected according to UMTA Section 15 reporting criteria, which are oriented towards fixed-route service, not paratransit. A test using similar data under similar conditions is often not possible.

An agency where some good data has been available is Central New York Regional Transportation Authority, of Syracuse, New York (Centro). They did not computerize an entirely manual system; rather COMSIS Paratransit Information System software replaced an older paratransit MIS. Shortly thereafter, CRSS was installed; and the old system was run parallel with the new one.

At Centro, significant benefits were realized in improving productivity as well as reducing the staff time required to prepare schedules. Part of this resulted from the new MIS software: the average telephone request was handled in approximately 3 min, which was a 300 percent improvement over the old system. The average number of requests per hour increased from 50 to 125.

Improvements strictly relative to CRSS were in the area of staff effort and vehicle productivity. Vehicle productivity improved from 2.1 passengers per vehicle hour to over 2.8 passengers per vehicle hour. This translates to an increase from 375 trips per day to 450 trips per day. The level of staff effort is significantly reduced. Under previous methods, 2 to 4 overtime hours were necessary every day to finalize schedules. Under current conditions, no overtime is typically needed.

It is necessary to reiterate that the level of improvement at any given agency will vary. An example might be Miami Valley Regional Transit Authority, of Dayton, Ohio. In this case, the agency serves overall a small number of trips; typically 250 per weekday. Under this relatively light load, the scheduling staff produces good schedules in less than 4 hr a day. CRSS schedules have no noticeable improvement in productivity, although the CRSS scheduling process takes approximately 15 min.

## Future Development

From experience at these sites, as well as others, COMSIS is implementing a number of improvements to CRSS. Among these are two dealing specifically with the way that the highway network is used.

The first is a method of better identifying trips "along the way." Here, CRSS will consider all the nodes in the minimum path between the origin and destination of a trip. All trips at that time of day will be checked against the list of nodes in the minimum path. If there is a trip going in the same direction along any part of the minimum path, it will be considered part of the group.

Many agencies have a significant variation in the geographical density of service requests. At any given time of day, there are a number of trips in one area. A half hour later, the activity moves elsewhere. If a vehicle "runs out of work" in an area, CRSS tends to send it to where the work is instead of letting it sit idle, even though there will be work in the area 15 to 30 min later. Under such circumstances, vehicles migrate throughout the service area.

For agencies where this is not desirable, it is necessary to place penalties on live and deadhead travel distance independent from travel time. To lessen migration, one would emphasize a penalty of deadhead miles, but not necessarily deadhead and idle time. The overall productivity may be less, but vehicles would tend to work in the same areas.

## CONCLUSION

The development of CRSS has been ongoing since 1987. A great deal of experimental effort has been directed toward providing a practical paratransit scheduling package. The author would like to emphasize the practical implications of the paratransit scheduling process upon the development of CRSS. The scheduling problem is very difficult and complex. There is a calibration process, parallel to that encountered in urban transportation planning. Users of the package must be trained to enter realistic trip requests. (One cannot, for example, expect the software to schedule ten widely scattered pickups at the same time to the same vehicle, even though it is what was being done via manual scheduling.) It has also been learned that the highway network information can be used effectively to determine proximity in the process of grouping.

Results have been favorable as of early 1990. It is believed that CRSS is a viable response to scheduling needs in the paratransit industry. During this effort, it was believed that a great deal has been learned about automating the scheduling process. As progress continues, it is expected that further refinements to the package will be made.

# Social Work Practice with the Transportation-Handicapped Psychiatrically Ill

BRENNEN TAYLOR

Wayfinding training with the transportation-handicapped psychiatrically ill who travel by bus to urban community mental health services is discussed. Information from environmental wayfinding theories is used to teach psychiatric clients how to travel on public buses. Guidelines are provided for this type of training. Public bus transit combined with wayfinding training is seen as the most effective way to promote compliance with deinstitutional services.

Enactment of the Urban Mass Transportation Act (UMTA) and the Community Mental Health Centers Construction Act (CMHC) was critical in the development of America's mental health movement. UMTA eased restrictions that existing transportation systems imposed on handicapped populations. It introduced "transportation handicapped," defined as any person incapacitated by illness who is unable to ride mass transit without special facilities, planning, or design (1,2). CMHC included a policy of discharging numerous patients from mental hospitals and maintenance of those persons in less restricted environments outside hospitals. The effectiveness of deinstitutionalization was predicated on factors such as economics, idealism, legal developments, and the advancement of antipsychotic medication (3). These laws were implemented by human service organizations to foster normal living practices among handicapped persons who had been assessed for community-based services. Specialized transportation, the intraurban passenger transit systems that serve specific riders while retaining the convenience of a private automobile, was made available to facilitate access to treatment for the travel disabled. It proved to be effective during the formative stage of deinstitutionalization among clients who, because of economic or psychosocial constraints, had no other travel options. The mix of specialized transportation, public bus transit, and wayfinding training programs provided by human service organizations strongly influences the use of community mental health services by the travel handicapped (4-8).

The benefits of specialized transportation in the movement to deinstitutionalize the psychiatrically ill have generated a renewed interest in the role of public transportation in mental health. The helping profession (psychiatry, psychology, social work, and nursing) has recently identified three transit-related issues that significantly increase clients' compliance with community mental health services (9). First, UMTA was extended

to the institutionalized chronic psychiatrically ill undergoing deinstitutional services. This population totals about 900,000 (10). Second, human service providers are becoming increasingly concerned about the limits of specialized transportation in the community mental health movement. Such training services as wayfinding and public bus riding represent a better goodness-of-fit to the goals of normalization (11). Last, the helping profession has realized that the convergence of clinical practice, public transportation, and environmental psychology is necessary for the relocation of travel-disabled people into the community (12).

A historical theme of specialized transportation relates to architectural barriers that hinder access to services. However, psychosocial barriers are of equal importance to the travel disabled. Clinicians in the helping profession seek to reduce or eliminate psychosocial barriers through public bus travel training programs. Travel training, often referred to as wayfinding or orientation and mobility training programs, represents another method of enhancing normalization (13). These programs develop a person's ability, both cognitively and behaviorally, to reach destinations in the environment (14).

Recently social work has begun to provide services to the transportation-handicapped psychiatrically ill who participate in community mental health services. The purpose of social work is to enhance the psychological and social functioning of the psychiatrically ill through measures of prevention, restoration, and remediation. Social work practice is defined as a responsible intervention (15) and seeks to

- (1) enhance the developmental, problem solving, and coping capacities of people;
- (2) promote the effective and humane operation of systems that provide resources and services to people;
- (3) link people with systems and opportunities; and
- (4) contribute to the development of social policy.

These activities are conducted within the Social Work Code of Ethics and are made available to clients within the parameters of individualization, self-determination, confidentiality, acceptance, a nonjudgmental attitude, and controlled emotional involvement. The premise of social casework, a one-to-one social work practice technique, is to help a client make a better adjustment to life situations, address a problem, fill a need, or receive a service. It is a temporary relationship for achieving specific client goals and can take the form of various therapeutic interventions (16).

Wayfinding training has been demonstrated to be an effective social work practice intervention with the transportation-

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handicapped psychiatrically ill. This population includes persons who suffer from emotional and mental disorders that interfere with their capacity to execute daily living activities. They also encounter difficulty traveling stairs, carrying weight of up to 10 pounds, prolonged walking and standing, and moving in crowds. These persons usually require mental health care for extended periods. Moreover, they lack the necessary skills to negotiate public transportation. Their inadequate wayfinding and public bus riding skills result in high outpatient treatment dropout rates. In essence, psychosocial and architectural barriers reduce the transportation-disabled's capacity to travel by any mode (17-20). Psychiatric clients who engage in independent public bus travel to community mental health services often operate in an uncertain world because of various social skill deficits (21). Wayfinding programs that incorporate travel training procedures and use public bus transit systems put into effect deinstitutionalization with greater specificity.

The purpose of this paper is to provide an overview of social work practice with the transportation-handicapped psychiatrically ill involved in community mental health services at Barney Neighborhood House (BNH) psychosocial program. BNH's clients come from St. Elizabeths Hospital and the greater Washington, D.C., area. The program primarily serves an adult population of 45 clients who have been institutionalized for five years or longer and have been diagnosed as schizophrenic. Social skill training is used to teach clients daily living skills for their return to the community. Wayfinding training is conducted by an outreach social caseworker. Clients are taught to develop techniques for community travel, develop and facilitate support systems for travel, and to negotiate public bus transportation. The outcome of wayfinding training is the ability to travel independently. There are three parts to this paper. First, a summary of wayfinding theories as they relate to travel behavior is presented. Second, wayfinding theory is applied to the transportation-handicapped psychiatrically ill and demonstrated by means of a public bus seating diagram. Last, guidelines for this service are presented.

## ENVIRONMENTAL PSYCHOLOGY WAYFINDING THEORIES

Environmental psychology has developed extensively as an applied science. Ecological psychology, environmental perception, and environmental cognition have been used interchangeably in the literature to describe environmental learning. Environmental psychology is an evolving area of applied psychology that combines and analyzes the human transactions, interrelationships, and actions with pertinent aspects of the socio-physical surroundings (22-25). Conceptually, the environment is represented by an array of interrelated elements in a dynamic matrix. It consists of social and physical components. The former include people, their characteristics, behaviors, and relationships. Institutionally, the social component consists of laws, policies, religion, and an ecological climate dimension that derives from interaction of these elements with the perceptual framework of constituencies. Physically, the environment encompasses the natural and man-made, operationally defined by categorization of space. Small-

or micro-scale environments include table-top model spaces that can only be observed or manipulated from the outside. Medium-scale or navigable environments are spaces large enough to permit travel within but still can be viewed in their entirety from a single vantage point. Finally, large-scale environments are spaces in which a traveler can move around and occupy multiple viewing locations to extract all of the spatial information needed to generate a complete representation. Environments shape and are shaped by human behavior. Physical environments are at the same time social and cultural environments (26). Essentially, environments are tools that can be modified, abandoned, or destroyed if social or other goals are not achieved (27,28).

Environmental psychology has developed a number of theories that explain human wayfinding in large-scale environments. The literature stems from geography and psychology, which view wayfinding as one expression of cognitive mapping (29). A review of relevant wayfinding theories indicates that wayfinding is acquired through information processing. For example, it is posited that wayfinding behavior is predicated on a traveler's decision making. A traveler's action is largely determined by his or her organized spatial knowledge. That knowledge contains the residue of past experience, accommodates current sensory information, and varies widely in range, relative to specific senses. Sight is the most important sense for wayfinding among visual persons. The oval visual field has boundaries that extend about 180° laterally and 140° vertically. About 90 percent of human knowledge about the environment is received through the eye. A person moving along a distinct path encodes, decodes, interprets, and uses visual cues for wayfinding. Movement from one geographical point to another involves opening up the vista ahead while closing the vista behind. The placement of these vistas in order results in understanding the structure of the environment. Technically, a traveler sees, learns, and navigates the environment not solely with the eyes but also in a travel mode with the eyes-in-the-head-on-the-body-resting-on-the-ground (30-32).

The human environment transactions of wayfinding have also been conceptualized as a frontier outpost. Four human responses to continued and persistent uncertainty in an enveloping environment are theorized. Wayfinding in a new environment requires that a traveler process information, consolidate new ties within the environment, dissolve bonds with the old environment, and form a social network so that the new environment serves as a point of reference for future life space activity (33). The life space or life world is developed through a traveler's movement, rest, and encounter within the environment. Movement helps a traveler to assimilate unfamiliar places into a world of familiarity. Rest anchors a traveler in his or her autobiographical travel knowledge. Encounter involves the learning of routes. In general, a traveler who demonstrates the tendency toward environmental merger acquires independent wayfinding. Noticing and heightening contact with the environment is associated with a person's positive mental health.

However, during transit a traveler may tend toward environmental separateness. This is characterized by a traveler's becoming oblivious to an environment, which results in inadequate route learning (34). Environmental separateness is correlated with but not restricted to mental illness. Moreover,

cognitive deficits influence wayfinding learning within a wide range of mobile-handicapped populations. Starks (20) notes its impact on wayfinding training as follows:

Poor attention reduces the individual's ability to memorize routes, make transfer and recognize disembarkment points. Poor visual acuity creates difficulties in distinguishing bus numbers, route names, and color codes. Conceptual problems involve the abstract notions of time and distance and create difficulties in comprehending fixed-routes, schedules, fares, and transfers. Inadequate verbal skills, including poor speech ability and a lack of transit related vocabulary, reduce the retarded individual's ability to request information or assistance. Social incompetence results in inability of the retarded to comport themselves in public because of a lack of knowledge about what constitutes appropriate behavior. In addition, being under a time pressure to make decisions can cause a retarded individual to disintegrate in a social situation, such as that occasioned by riding a public bus. Diminished self-esteem, based on the retarded individual's unwillingness to expose his or her handicap in public, can cause a lack of assertiveness necessary to seek assistance when required. Spatial difficulties include a lack of geographical awareness. Retarded people's lack of awareness of the immediate environment served by public buses reduces their capacity to travel independently by any mode: bus, walking or taxi.

In summary, UMTA and CMHC contributed to the development of wayfinding training programs for the transportation handicapped. The helping profession has drawn on clinical practice, transportation, and environmental wayfinding theories to assist the handicapped psychiatrically ill in traveling to community mental health service centers by means of public buses. Clinical practitioners have found that independent travel requires a degree of spatial information processing that ranges from the simple to the complex. The travel-disabled client may see his or her destination, develop rote learning to travel a certain path, or develop a cognitive map for wayfinding (35-37). Currently, wayfinding services represent the most effective way of providing access to community-based programs to the transportation handicapped.

#### **PUBLIC BUS APPLICATION: PSYCHIATRIC CLIENTS**

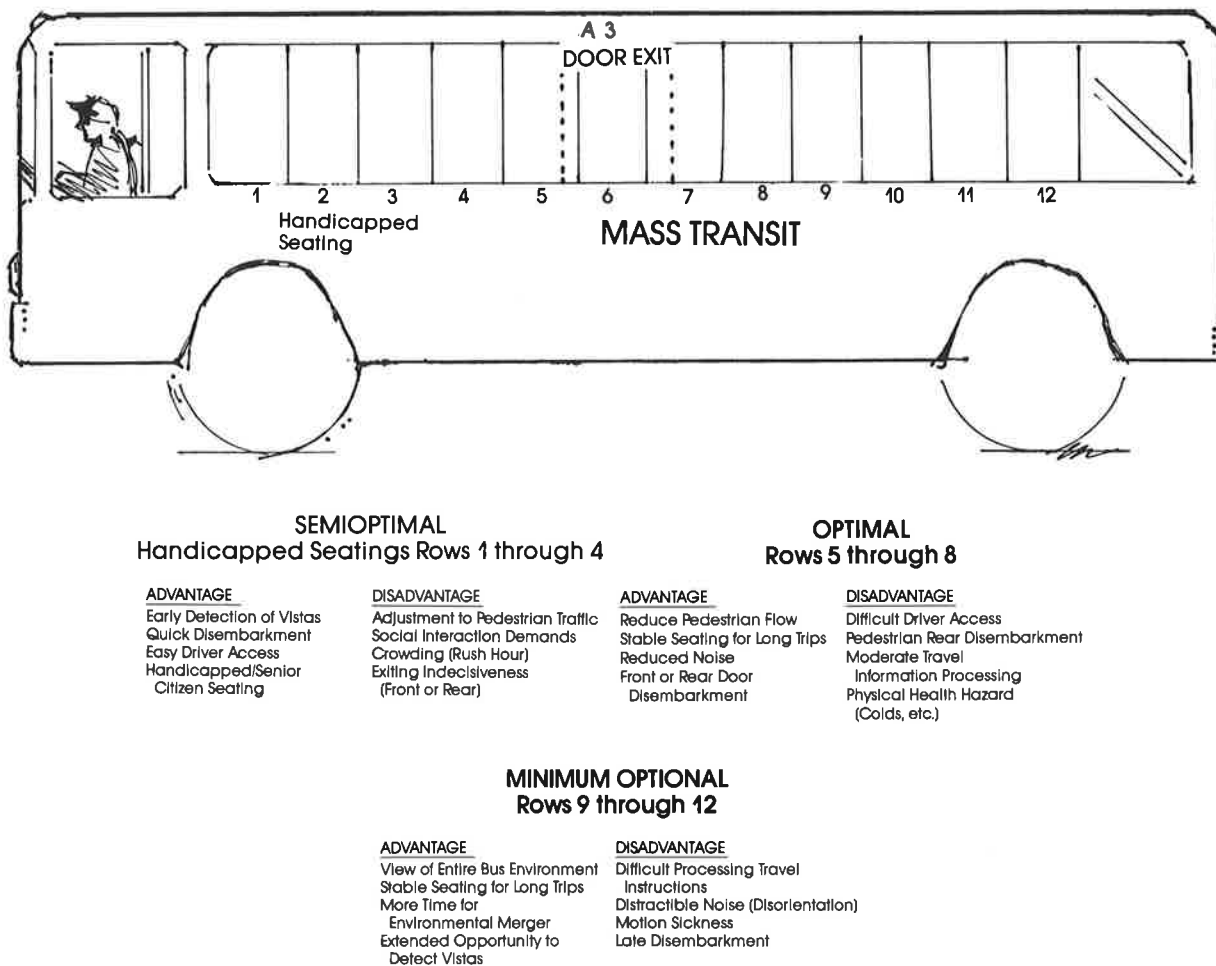
Training the transportation-handicapped psychiatric client to use public buses for transit to community services is a recent development. Public-bus fixed-route transit services have been the primary form of public transportation in most urban areas. These services are designed to transport large numbers of passengers along corridors of high demand at a relatively low cost per passenger. Urban areas tend to be served by radial, grid, radial criss-cross, and trunk line with feeder network systems. Each of these transit systems has its advantages and disadvantages, to which passengers must adjust (38). However, the seating arrangements of transportation-handicapped psychiatrically ill persons on public bus transit for wayfinding learning have been largely unexplored. Theoretically, a public bus represents a medium-scale environment with a dynamic culture. Thus, wayfinding training occurs on and in a medium-scale environment (bus) within a large-scale environment (community) that facilitates environment learning of bus riding and travel skills during locomotion along

a specific fixed-route system. The public bus culture carries travelers with a wide range of attitudes and behaviors influenced by numerous factors. Some of those factors include time of travel, number of persons in the life world, weather conditions, and adjustments to one's life circumstances. The interplay of these and other factors is germane in using public buses for wayfinding training. Outreach social caseworkers' knowledge of the merits associated with public bus seating sections serves to enhance clients' travel learning. (See Figure 1.)

The seating preference for psychiatric clients' learning should be the center, front, then rear of the bus. This is predicated on a client's psychosocial functioning. However, during peak demand the bus environment may become difficult for clients' wayfinding learning. Noise and motion sickness may result in a client's disorientation and lead to a feeling of being geographically lost when mental images fail to correspond to the real world (39). The inability of a psychiatric client to associate current community location with a destination that is out of immediate perceptual range results in his or her being lost. This is accompanied with fatigue, frustration, irritability, and panic. All of these factors detract from clients' wayfinding learning. Outreach social caseworkers use a combination of supportive strategies, ranging from time outs to discontinuing the training, to prevent the onset of psychiatric episodes. The following are suggested guidelines for wayfinding training with the transportation-handicapped psychiatrically ill (Taylor, 1990, unpublished):

1. A thorough assessment of clients' senses is a prerequisite for wayfinding training. An impairment in any of them creates learning barriers that will have to be accommodated during the training. Clients' accurate environmental orientation is a critical factor for this type of learning.
2. The social casework relationship is core to effective wayfinding training. It determines whether a client will risk learning independent travel to urban community mental health centers by means of a public bus.
3. Wayfinding training should be undertaken on the basis of a psychosocial assessment and the functioning of the client. Designing programs for individuals should proceed from the simple (rote learning) to the complex (cognitive mapping).
4. Wayfinding training is most effective on a one-to-one basis that incorporates travel-training procedures. It should be given in the order of nonrush hour, semipeak demand, and peak demand hours.
5. Outreach social caseworkers should provide wayfinding training on a grid-type bus route network if possible. Clients learn independent travel more efficiently when the number of transfers is reduced.
6. Coordination of wayfinding services must include the client as a core participant. The client, community mental health program, and the sheltered setting must be assigned tasks to promote compliance with services.
7. Any change in clients' psychotropic medication during the training needs to be reported to the outreach social caseworker doing the training. New strategies may need to be devised to continue the training.
8. Clients should be seated next to the window of the public bus on the side closest to the sidewalk heading toward the destination. The optimal and semioptimal bus areas are pre-





**FIGURE 1** Public bus seating of the transportation-handicapped psychiatrically ill.

ferred for client seating. Prolonged sitting or standing in these areas is desirable to seating throughout the minimal section based on clients' psychosocial functioning.

9. Social work practice principles must be modified during wayfinding training in a public bus environment.

## CONCLUSION

The convergence of knowledge between UMTA, CMHC, and clinical practice continues to extend deinstitutionalization of the psychiatrically ill. A shift from specialized transportation to public bus transit coupled with wayfinding training has increased compliance of the transportation-handicapped psychiatrically ill with outpatient services. Wayfinding training represents a frontier outpost of learning in that a comprehensive knowledge base does not exist on the social work practices with the transportation-handicapped psychiatrically ill. There is, nonetheless, a major implication drawn from its contents. A core premise of deinstitutionalization is to promote living skills required for a normal life according to the least restrictive alternatives available. Specialized transportation, despite its limitations, remains a viable transit mode to transfer psychiatric clients into the community. Yet, normalization is likely to occur more efficiently with greater client

use of wayfinding programs on public bus transit. The transportation-handicapped psychiatric clients' social, emotional, and psychological attachment to the amenities associated with specialized transportation poses a significant threat to the use of public bus transportation. There exists a need to investigate whether transportation-handicapped persons are becoming institutionalized toward a particular mode of transit. This knowledge would assist the helping profession to design community mental health services, which enables psychiatric clients to have access to services by multiple travel modes. Determining the interactions among human experience, human behavior, and the physical environment and what effects they have on wayfinding learning of specific travel modes by psychiatric clients is likely to substantially change deinstitutional services in an increasingly mobile society (40).

## ACKNOWLEDGMENT

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# Flexibility Within Complexity: Design of Automation by Solution Systems, Inc., for WHEELS, Inc., of Philadelphia

SUZANNE AXWORTHY AND NEIL L. KLEEMAN

WHEELS, Inc., manages some 8,000 trips per day—4,500 paratransit and 3,500 fare-reimbursable transit trips—using automation developed by Solution Systems, Inc., (SSI) in collaboration with WHEELS. With this system, WHEELS registers clients, reserves and schedules paratransit trips, verifies transportation charges, and collects and distributes reimbursements to carriers and individuals. SSI processes the data and operates the system on its mainframe computers. The successful development of this system suggests that any such system must take into account all program features, the complexities of daily management and activities, and the program's need for flexibility in dynamically managing change and growth. Transportation management must thoroughly define its needs for information entry, use, processing, recall, and storage. The computer supplier must respond by designing programs and procedures that can be enhanced readily over time, by providing for data processing and maintenance, and by placement of equipment that meets original and changing needs.

Specialized transportation and computerization for the industry are both relatively new enterprises. However, any specialized transportation service or computer system supplier may find some guidelines for designing, installing, and servicing a system in the experience of WHEELS', Inc., Medical Assistance Transportation Program (MATP). WHEELS is coordinator of Medicaid-funded transportation for the city and county of Philadelphia. WHEELS manages the program under a contract awarded by the Pennsylvania Department of Public Welfare—a contract that WHEELS has held since 1983 when the state first placed the program in the hands of county administrators.

WHEELS uses a computerized system developed for the MATP by Solution Systems, Inc., (SSI) of Narberth, Pennsylvania. That development suggests that such a system must take into account the fundamental features of the transportation program, the complexities of day-to-day transportation management and activities, and the associated need for great flexibility. Experience also suggests that managing a computer system is a separate area of expertise. The success of the WHEELS-SSI collaboration also shows that the transportation management must thoroughly define and think through its needs for information entry, use, processing, recall, and storage. The computer system supplier must be equally thorough in designing, providing, maintaining, and improving the procedures and equipment needed.

## CHALLENGES OF AUTOMATION

### To Computer System Suppliers

The environment of specialized transportation challenges computer system suppliers because of its program complexities. Most programs require handling information for a diverse series of activities—client registrations, trip reservations, trip scheduling, records of paratransit trips or trips by other modes, multiple sponsors with various service standards, and a variety of fiscal arrangements. Moreover, static record keeping does not suffice for specialized transportation. An effective computer system must be flexible enough to enable the transportation manager to handle frequent and sometimes constant changes within and among program elements. The system must offer procedures that interact continuously in managing and processing those changes.

### Specific to SSI

WHEELS challenged the supplier, SSI, to design a system for a program with large volumes—up to 25,000 active clients, 4,500 daily paratransit trips, and 3,500 daily trips by means of public transit with fare reimbursement. In the MATP, WHEELS registers the medical assistance clients, ensures their current eligibility, and assigns each to travel either by paratransit or by fare-reimbursed modes. WHEELS reserves and schedules all paratransit trips, brokers delivery of services to private paratransit carriers, manages and monitors the carriers' delivery of service, reviews and analyzes in-service records, invoices the Pennsylvania Department of Public Welfare, distributes all state reimbursements for the program, and prepares and distributes all service reports. The basic roles of the state and WHEELS are outlined in Figure 1.

WHEELS outlined to SSI how the data to support this complex program would need to flow through an automated system. Each client enters the system by registration with WHEELS, which makes the appropriate assignment to travel by paratransit or by a fare-reimbursed mode. Each client's registration is rigorously checked by WHEELS to determine its accuracy and currency. Each client's paratransit trips are reserved and scheduled by WHEELS, with private carriers receiving their schedules from WHEELS daily. All transportation records, both paratransit and transit, are reviewed trip by trip, by WHEELS' staff. When and as verified by WHEELS,

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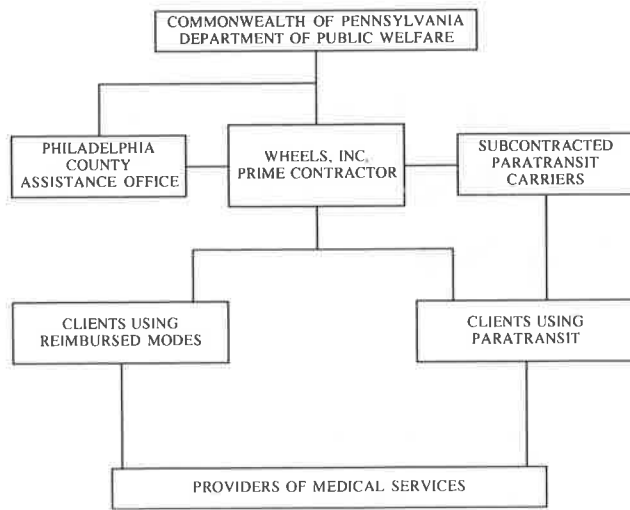


FIGURE 1 Medical Assistance Transportation Program organization chart, Philadelphia, Pa.

all claims for reimbursements—from private paratransit carriers and from individuals who use transit—are invoiced to the state by WHEELS. The state’s payment is distributed for all verified reimbursements by WHEELS.

WHEELS outlined the general flow of data required for these processes as presented in Figure 2. WHEELS also pro-

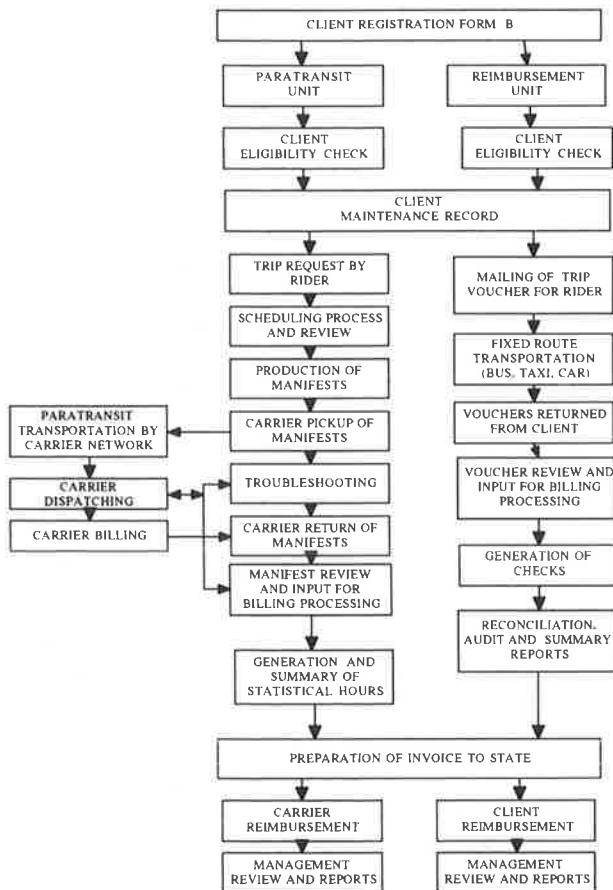


FIGURE 2 WHEELS overall data flow.

vided SSI with a closer look at the flow of data it needed to administer various types of clients. For example, as shown on Figure 3, multiple complexities are introduced with reservations and scheduling of trips, trip delivery by the carrier network, analyses of returned manifests (driver logs), monitoring and quality assurance activities by WHEELS, and statistical summaries to support billings. On Figure 4, different requirements are involved—clients are supplied with vouchers to record their fixed-route trips, the vouchers are returned and analyzed to support reimbursement, checks are produced to pay each client, and statistical analyses are performed to support billings.

In discussion with SSI during development of the system, WHEELS also made it clear that, like all specialized transportation systems, the MATP is subject to change at many levels. Client eligibility has a limited duration and, often, potential reinstatement. The state may add, delete, or alter eligibility categories, affecting thousands of client records and trip plans. The paratransit schedules for the 150 vehicles in service change daily. The subcontracted carrier group changes at least annually. Preplanned vehicle tours must be revised because of real-time incidents in daily delivery of service and fundamental changes in service methods may be introduced from time to time. WHEELS’ challenge to SSI was to translate its established manual procedures for handling all changes into procedures that could be operated through computer terminals and printers, and filed by using the power of automation to store immense quantities of data.

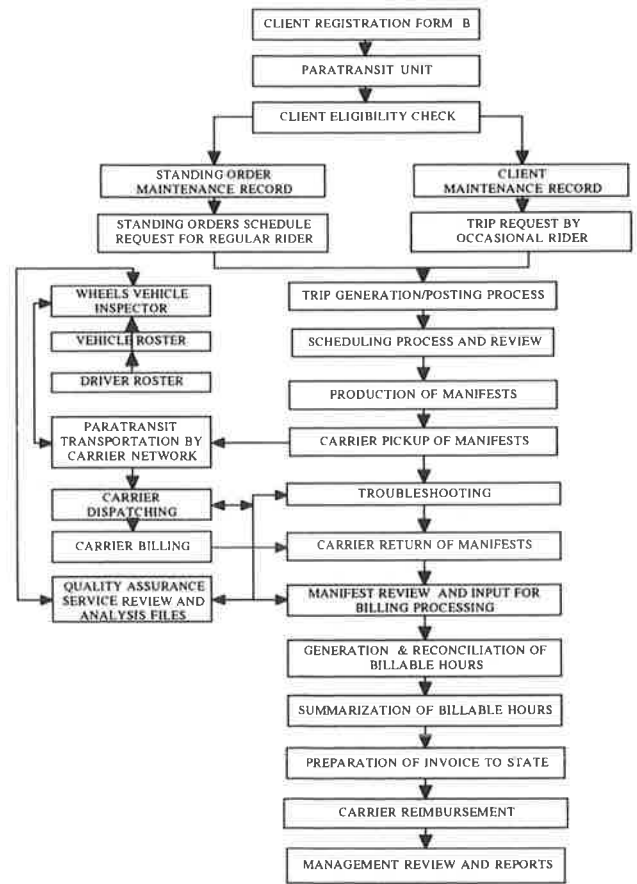


FIGURE 3 WHEELS data flow for paratransit unit.

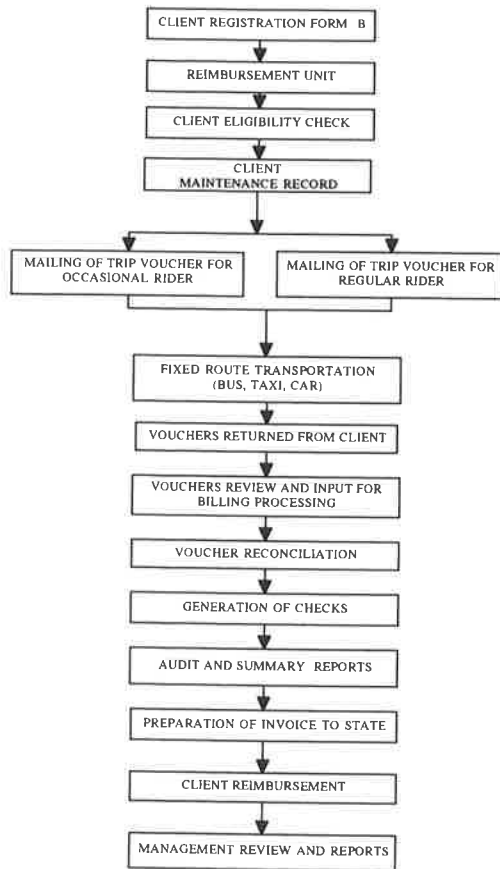


FIGURE 4 WHEELS data flow for reimbursement unit.

In its procurement, WHEELS also asked SSI to satisfy certain fundamental concepts that reflect how the information is used—concepts that demonstrate the need for flexibility and for interaction among the program elements. WHEELS asked for a dynamic approach in which many users, working simultaneously at separate work stations on different activities, are able to access the specific information that they need, selected from literally scores of files. The normal flow of information may be bypassed to present to the worker only those records needed for a particular process. WHEELS also asked SSI to enable selected information to flow in any direction needed, similar to the “people-flow” of information, which is evident when using manual procedures. WHEELS added a challenge to SSI for ready and fast manipulation of data. The system must act quickly on each process. Moreover, the scheduling element of the system must conduct repetitions, each with some change, and quickly, which enable the scheduler to arrive at a finely tuned set of vehicle routings. To help SSI to meet these challenges, WHEELS acquainted SSI with its staff and their organization, as outlined in Figure 5. WHEELS requires no more than 50 individuals to carry out all of the steps involved in this massive program of 2 million trips per year.

WHEELS also addressed SSI on the challenges of computer system management. Having been selected by the Department of Public Welfare as an expert in specialized transportation that could manage the MATP efficiently, WHEELS in turn sought an expert computer systems supplier. WHEELS adopted off-site system management as recommended by SSI. As a result, WHEELS has not had to incorporate the staff, time, and activities of computer system management. That collaboration has worked well for WHEELS’ specific needs.

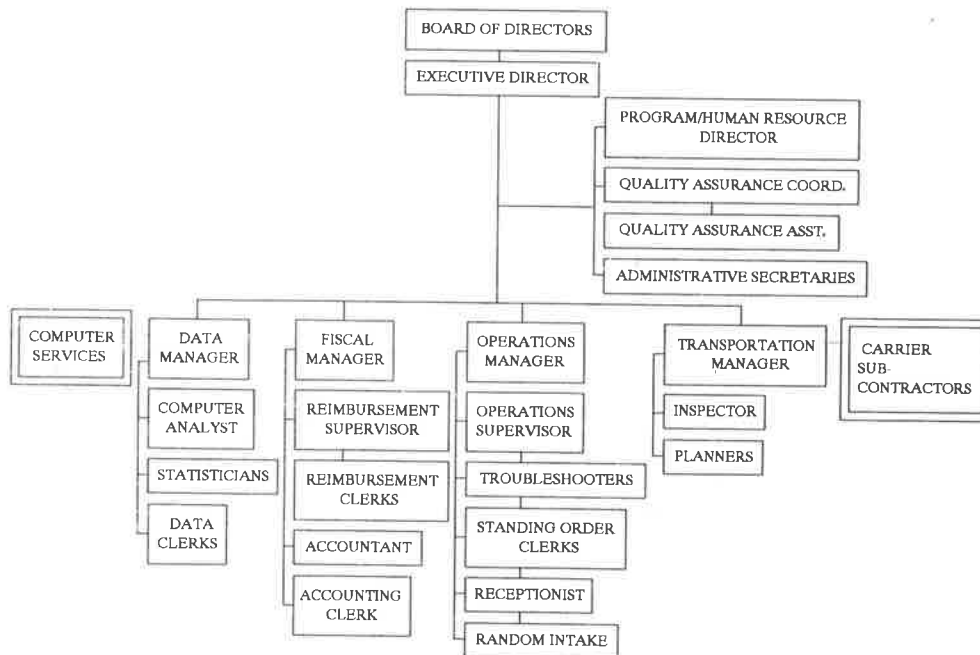


FIGURE 5 WHEELS organizational chart (MA division).

Other forms of transportation and computer system collaborations may better serve the needs of other programs. Whatever the arrangement, the WHEELS-SSI experience points out the rewards of making a joint effort to arrive at thorough understanding of the system's purposes and uses before the system is in place. Furthermore, the value of establishing a mechanism for continuing consultation and development of the system is highlighted.

## SSI AND RESPONSES TO WHEELS' CHALLENGES

### Outsourcing Service

The term outsourcing means contracting the responsibility for data processing and the associated resources and management to an outside firm that specializes in computerized technologies. The outside firm acquires and constantly upgrades the computer while also providing software design, vendor interface, control of power and the environment for the equipment, and communications systems. The outside firm provides the programming, maintenance, and enhancement of the applications themselves. With outsourcing, suppliers can also offer alternative arrangements that incorporate the client's own hardware but maintain the essential proactive, ongoing relationship with the client.

SSI recommended that WHEELS use SSI's outsourcing services on the premise that most organizations, especially smaller ones like WHEELS, cannot even come close to the level of experience required to perform all of the data processing tasks that are essential to a program as large as the MATP. The outsourcing approach allows WHEELS to manage specialized transportation while SSI does the computing. The outline of the approach used by SSI for WHEELS is depicted in Figure 6.

### Design and Operation of SSI's System for WHEELS

WHEELS required that SSI develop custom software. SSI designed computer programs that are specific to the WHEELS application, as well as the tool for managing the data. That

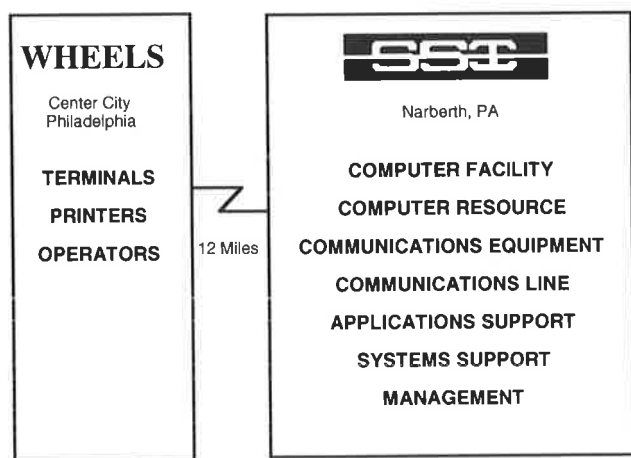


FIGURE 6 WHEELS-SSI outsourcing.

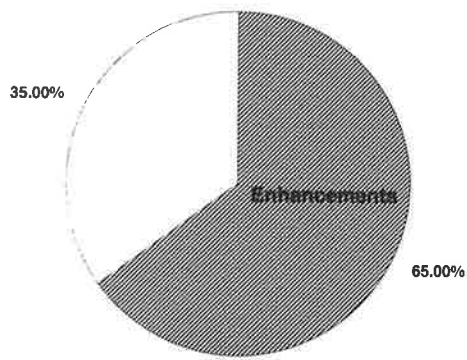
tool is Prime Information, which offers a dictionary-based file-management system and sophisticated techniques within an industry-standard system. Despite its complexities, the system is easy for WHEELS' managers to use because the data are immediately and readily accessed by WHEELS. SSI included an ongoing software warranty, which ensures that problems are corrected by SSI at no additional cost. WHEELS can report problems on line, and many can be corrected that day.

SSI saw that WHEELS needed a computer system powerful enough to ensure the storage and swift processing of a large volume of transportation data that are input by many users simultaneously performing various functions in the operation. SSI also saw that, beyond the requirements of efficient storage and processing of records, WHEELS needed a system with the flexibility to handle continuous fluctuation in the size of each of the many files. SSI saw that the data processing, which it could supply through outsourcing, would enable WHEELS to tap into a resource that had virtually no limitations. The WHEELS system is connected to SSI, where it operates on a Prime 6350 computer system. That system supports about 30 other SSI clients and up to 150 terminals and printers. For WHEELS and other clients, SSI is providing an invisible but highly flexible computing resource.

SSI responded to WHEELS' challenge of no down time by placing the systems for WHEELS in a complete computer environment. SSI provides hardware backup, uninterrupted power, redundant environmental systems, constant computer-room monitoring of power and temperature, and security against fire and water damage. This is the kind of computing environment usually enjoyed only by large companies. In the SSI application, WHEELS is sharing the resources with many other clients, each benefitting from all of the safeguards against down time.

SSI understood that WHEELS is constantly working to improve and enhance its management of the MATP. Therefore, SSI provides system upgrades—the resources to satisfy WHEELS' changing requirements. Upgrading systems is routine practice for SSI. WHEELS and other clients are not even aware of SSI's work on memory, processors, speed, and interface with vendors to accomplish enhanced systems. WHEELS' experience does not require added costs for equipment enhancements, because upgrades are built into the negotiated relationship. WHEELS benefits from improvements to computer facilities without planning, acquisition, and installation of new and different equipment. In addition, upgrades facilitate overall system growth: software applications are often enhanced as a result of hardware changes. To effect these enhancements, however, consistent interaction between WHEELS and SSI is required. As shown in Figure 7, SSI has upgraded the applications WHEELS uses by 65 percent since 1987.

SSI provides people backup as well as equipment backup for the WHEELS system. SSI assigned experienced staff to design the system and then to maintain and enhance it as it is used. The SSI staff becomes an ongoing consultant for WHEELS, where the data manager is the technical consultant who acts as the liaison with SSI. The SSI consultant works on each WHEELS requirement that arises—application design, system analysis, programming, documentation, training, and system monitoring. The relationships between SSI and WHEELS personnel are outlined in Figure 8.



Additional 31% Growth in System Capabilities

FIGURE 7 Percent of system enhanced in the last 3 years.

To design the system, WHEELS had already established its needs for a range of computer files, encompassing client, trip, provider, carrier, and reimbursement voucher information. By extensive consultation between WHEELS and SSI at the outset, SSI had the guidelines it needed to interpret WHEELS' needs, write the programs to be used, and install the full automation process. Following the design stage, the daily interaction between the two companies inherently fulfills WHEELS' requirements for immediate applicability, ongoing adaptability, and system flexibility. This proactive coordination of system implementation has resulted in growth for both WHEELS and SSI in data management of the MATP.

In both initial design and further development, the same basic procedures apply. WHEELS' requirements are closely defined, usually through face-to-face meetings using a preliminary analysis by the data manager at WHEELS. The technical consultant at SSI writes a synopsis of the project, which is reviewed by WHEELS. Each procedure is demonstrated as early as possible, results studied, and improvements incorporated in the final development. This process minimizes development time and costs. The final stage is issuance of an Authorization for Software Services, which documents the services, their costs, and the duration of the project development. In further development, many procedures can be accomplished by WHEELS itself. The interactions between

SSI and WHEELS for design and enhancement activities are depicted in Figure 9.

Overall, the WHEELS-SSI relationship enables both firms to view the computerization as a system that is never finished. Because the requirements of the MATP are in constant evolution—like those of all programs of specialized transportation—the relationship guarantees ongoing programming and support. WHEELS is not faced with the problem of growing out of the hardware or software in a short time. Rather, this collaboration supports ongoing development and improvement of the MATP.

RESULTS

The close, consistent interface just presented has resulted in a successful, efficient, and cost-effective data management facility for WHEELS. Its multiple-sided approach, which coordinates the computing hardware, the computing facility, communications, and especially the personnel to implement the software, has been successful—much more successful than a fragmented hardware-software consulting approach would have been.

WHEELS has consistently achieved some notable results in coordinating and managing the MATP. Before WHEELS became involved, the Department of Public Welfare paid \$20.00 or more for each medical assistance trip in Philadelphia. With WHEELS' coordination, the department's overall cost per trip has been reduced to between \$5.00 and \$6.00, including a paratransit cost per trip of only \$9.00 to \$11.00. Only 14 percent of the annual budget of \$12 to \$13 million is used by WHEELS for administrative expenses.

WHEELS does not owe its success solely to the computerized system. WHEELS' achievements in the MATP reflect the firm's overall experience with specialized transportation. WHEELS has provided and managed its own program of free medical trips for more than 30 years and has contracted services for more than 15 years. In previous conferences on specialized transportation, WHEELS has presented discussion of its brokerage methods and approaches in some detail (1). In undertaking coordination, WHEELS was ready to apply expertise, insights, and a skilled staff to design and carry out the program.

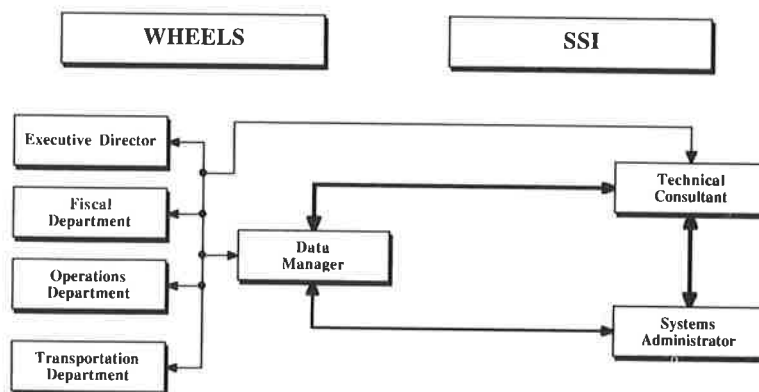
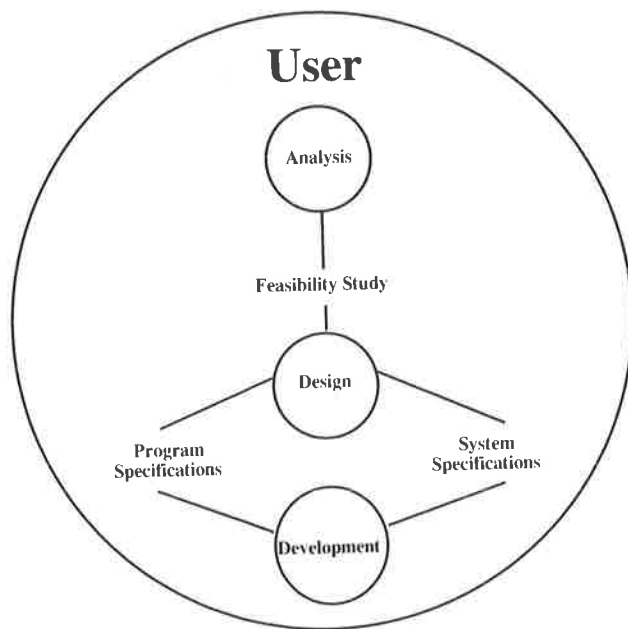


FIGURE 8 Flexibility within communication and design.



**FIGURE 9** Interactive design process.

SSI also brought extensive experience to bear upon design and development of the system for WHEELS. SSI was formed in 1981 to provide state-of-the-art computing to business and industry in the areas of custom data management systems and scientific and engineering applications. This goal has been satisfied by constantly updating computers, communication systems, data management system software, applications development, and attention to people—both internal technical consultants and clients.

Providing an outsourced resource for clients for all of their data processing requirements is the message of this experience. This can include the provision of hardware and software, along with the applications personnel needed to solve a myriad of data processing or data management problems in many different industries.

For WHEELS, SSI has provided access to significant computer resources, communications from WHEELS' center city office to SSI's suburban computer center, and, most importantly, the personnel to design, develop, maintain, and expand the software. In addition, SSI's delivery method also provides system maintenance, constant monitoring of communications, a backup facility with terminals and printers, and complete management of the data processing resource. This has enabled WHEELS' personnel and management to focus on their goal of providing specialized transportation.

It is hard to overstate the significance of the flexibility provided by the SSI system. Because of this highly effective technology, managers' energies are freed for thinking, planning, evaluating, and initiating program and service improvements to deal with the ever-changing challenges of the MATP. In turn, WHEELS has confidence in asking the system to accommodate revision, expansion, and new procedures while also dealing with the hour-by-hour, day-to-day changes in operating and managing the service—superior features in automation for specialized transportation.

#### ACKNOWLEDGMENT

Assistance with preparation and presentation of this paper was provided by Parker C. Thompson III, senior technical consultant at SSI, and by the following members of the staff of WHEELS, Inc.: Stephen M. Duffy, data manager; Shawn Kilgallon, computer systems analyst; and Deborah Harmon, lead administrative secretary.

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# Evaluation of Minivan Ramp Vehicles Versus Full-Size Lift Vans

JAMES J. McLARY

There are several new minivan conversions on the market, which could potentially reduce operating costs and still meet most of the demand for specialized transportation. Transportation Management Services, Inc. has considered the use of these vehicles for its turn-key operations and has recently purchased a used minivan for test purposes. The use of these vehicles in both rural and urban environments is evaluated in this paper. Primary focus is on operational issues such as ability to meet demand, passenger and driver acceptance, operating characteristics (fuel consumption, brake life, etc.), and productivity. The evaluation is conducted from a private operator's perspective and, therefore, is biased toward the financial considerations of low cost, low maintenance, high productivity, and good return for dollars invested. A subjective view is provided by the managers who used the vehicle.

The use of minivans with low-floor ramps is a relatively new technology that the author believes will help improve the efficiency of specialized paratransit services. Operating experience has shown that the number of times there are more than two wheelchairs in a vehicle is minimal. In addition, demand-responsive services most often have only one passenger per trip. For a private for-profit transportation provider, it is important that services be cost-effective to make a profit and still provide the service at competitive rates. With this in mind, Transportation Management Services, Inc., (TMSI) purchased a used minivan with a ramp in February 1990 to test the vehicle and evaluate it for applications companywide. TMSI not only wanted to study its cost-effectiveness, but also wanted to evaluate driver, management, and user reaction. The purpose of this paper is to present preliminary findings, suggest some places where the vehicle might work, and propose some changes in the specifications derived from TMSI's limited experience. The vehicle purchased was used and of older technology. Many of the managers' suggestions already have been incorporated into the design of newer vehicles.

## BACKGROUND OF RAMP VERSUS LIFT DEVICES

Historically the transportation of individuals confined to a wheelchair has been accomplished by transferring the person from the ground to a vehicle by the use of a mechanical, electrical, or hydraulic lift. Many companies entered the market to sell these lift devices. Most transit agencies have argued that the lift technology was inadequate and, capital costs aside,

maintaining the lifts for everyday use was difficult. The technology has improved and most paratransit operators are able to maintain lifts in service most of the time.

The actual van designs have included side lifts, rear lifts, raised roofs, double wheelchair to multiple wheelchair tie-downs, and various securement devices, some good and some bad. Van technology has emerged to the point where vehicle design is no longer a major issue. Vans with a capacity of 15 passengers, converted for wheelchair transportation, are here to stay and have many applications in the business. The large vans are good for group trips with standing-order schedules but are less applicable to demand-responsive single trips.

## NATIONAL EXPERIENCE

The use of ramp-equipped minivans in the United States has been limited. The most extensive use of these vehicles has been by Cook-DuPage Transportation in Chicago, Illinois. This agency boasts of 7 million miles of operation without any boarding or unloading accidents. In addition, the company was so enamored with the concept that they are now building and selling their own vehicle.

Ohio recently purchased three vans for test purposes. The test results, although not conclusive at this point, do offer some general observations:

1. The less "gingerbread" (frills and extras) on the van the better the performance;
2. Low floors are good;
3. Managers like the vehicles;
4. There is a concern that the vehicles may not be heavy duty and may have a short life expectancy; and
5. There is concern by the Ohio Department of Transportation (ODOT) about the cost per seated passenger.

TMSI purchased a used ramp van with the intent of evaluating its operational characteristics. The vehicle has been in service for 8 months and has been operated in a rural environment in South Carolina and also in an urban environment in Richmond, Virginia. From these operations, TMSI managers have developed a list of pros and cons regarding the vehicles. These will be discussed in the next section.

## MANAGERS' PERSPECTIVE ON MINIVAN PROS AND CONS

The true test of these vehicles is how they are used in day-to-day operations. As a private for-profit company, TMSI is

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interested not only in operational costs, but also in management, driver, and rider acceptance.

When the vehicle was delivered to South Carolina, there were a number of minor problems that immediately gained the disfavor of management and drivers. The first time the vehicle was used, the driver was unable to put the wheelchair on the ramp because the chair was too wide. This set the tone for drivers and management. The following comments were received during the 3 months the vehicle was in South Carolina:

1. Vehicle got good fuel mileage;
2. Passengers liked the level at which they were riding;
3. Drivers did not like the "lip" between the ramp and the floor (this has been corrected on new designs);
4. Management was reluctant to schedule the vehicle without specific knowledge of the user's wheelchair because of the initial experience; and
5. Drivers preferred lifts more than ramps because of the requirement to push wheelchairs up the ramp.

TMSI experience in Richmond was better because some of the initial problems had been corrected. In addition, the Richmond manager assigned the vehicle to a supervisor who was given direct responsibility for the van. This supervisor took an interest in the vehicle and provided observations as follows. On the positive side

1. The vehicle provides better maneuverability in tight urban areas and better accessibility when compared with lift vans;
2. The vehicle is more cost-effective than large-lift 15-passenger vans (fuel economy is almost 2½ times better);
3. The two wheelchair positions more closely match demand;
4. The users find it comfortable;
5. The vehicle appears to be safe;
6. The rear bench seat makes the vehicle versatile; and
7. The small size allows control of difficult clients.

On the other hand

1. The vehicle is a little underpowered;
2. The front end is light, which might be a problem in snow and ice;
3. The interior space is too tight;
4. Different size wheelchairs cause problems;
5. A swing door would be better than the slide door;
6. The ramp should be wider; and
7. The roof top should be higher.

Overall, TMSI managers thought that the operational effectiveness coupled with some design modification would make the vehicle very attractive.

## THE FUTURE

In the author's opinion the ramp-equipped minivan has a definite place in the future of specialized paratransit. Con-

siderations include maneuverability, operating costs, safety, and demand. Some of the specific situations where it should be considered include

1. In urban areas where maneuverability is an issue,
2. For special-purpose long distance trips such as medical treatments in hospitals or clinics,
3. For demand-responsive services with low demand and productivity, and
4. For use by supervisors for sweeps.

There are some suggestions that would help the minivan industry improve the vehicle and therefore increase acceptability by paratransit operators. These include

1. Making the roof raised and reinforced,
2. Making the floor flush with the ramp,
3. Providing quick-release seats in the center,
4. Offering a swing door rather than a sliding door,
5. Powering vehicles by a six-cylinder engine,
6. The stretch van should be strictly considered, and
7. Improving coordination with wheelchair manufacturers.

ODOT is in the process of preparing specifications that will allow recipients of funds provided under Section 16(b)2 of UMTA to purchase low-floor minivans. These specifications should set the tone for future vehicle purchases.

## SUMMARY

It is incumbent on the transportation community to find new ways to improve productivity and stabilize cost. The Americans with Disabilities Act places new demands on funding agencies and the industry must be ready to respond. Vehicle manufacturers have developed a new technology and operators must experiment and comment on how to improve it. The experiments in Ohio will go a long way toward this end. Operators such as TMSI will also work with manufacturers to improve the product. The final area of coordination that must be undertaken is among transportation operators, vehicle manufacturers, and wheelchair manufacturers. The final answer is not minivans with ramps alone, but the use of these vehicles where appropriate, as a part of the paratransit solution.

## EPILOGUE

During the presentation of this paper at the conference in Sarasota, Florida, a number of people expressed their support of the minivan concept. Some operators have converted their own vans and have had great success. This was particularly true in one operation in Minnesota. In addition, Metro Dade County in Miami, Florida, is running a demonstration with 15 of these vehicles. The results of the demonstration should be available in 1991. There were many people at the conference and most believed that the low-floor minivan has a place in the provision of specialized services.

# Program of Capital Assistance to Nonprofit Agencies for Transportation of the Elderly and Handicapped

GEORGE RUCKER AND MELANIE LACHS

A national profile of the active network of nonprofit agencies funded by Section 16(b)(2) of the Urban Mass Transportation Act is presented in this paper. The first part of this paper uses information collected from state managers on this program of capital assistance to nonprofit agencies for transportation of the elderly and handicapped. The profile covers such agency characteristics as principal purpose, service modes, fleet size, and number of vehicles funded by Section 16(b)(2). Data are analyzed by states, regions, and the nation, and will be compared with estimated elderly and handicapped population figures. A more detailed national profile of the program is presented in the second part of this paper. Ridership and operational information collected from a national sample of recipient agencies is used. Included are projections of size and characteristics of the fleet funded under the program, size and characteristics of ridership, and size and major sources of funding support for operating costs.

Section 16(b)(2) of the Urban Mass Transportation Act (UMTA) represents an early effort to provide special assistance to meet the transportation needs of the elderly and the handicapped. It was added to the Act in 1973, the same year that Congress barred discrimination against individuals with handicaps by any federally assisted program as part of the Rehabilitation Act of 1973. Under Section 16(b)(2), federal capital funding is offered to private nonprofit organizations to assist them in providing transportation to elderly and handicapped persons. First funded at a \$20 million level in fiscal year 1975, the program now distributes \$35 million annually among the states, who in turn provide funding to local agencies. An average of 1,004 grants a year are provided, largely to pay 80 percent of the costs for the 1,474 vehicles acquired yearly.

## THE NETWORK

Nearly 3,500 local nonprofit agencies are reported to have active vehicles originally acquired with assistance from Section 16(b)(2). As the data in Table 1 show, in three of the country's four major regions, the largest group of recipient organizations are elderly service agencies. In the Northeast, however, nearly half of the recipients are agencies that provide services to the disabled community. As a result of this, the disability agency category is the largest recipient category nationwide. Although the typical Section 16(b)(2) recipient

operates only one or two vehicles acquired through that program, two-thirds of all recipients have other vehicles as well, so that the total fleet operated by assisted agencies is nearly 21,000 vehicles. Note that the vehicles acquired with Section 16(b)(2) assistance represent a majority of the fleet—nationally and in all regions except the Northeast.

The predominance of small agencies is further underlined by the data presented in Table 2. Some 29 percent of all assisted agencies operate only a single vehicle. Nearly 65 percent operate less than five vehicles, and in the West that figure rises to 71 percent. Obviously, the larger agencies account for a disproportionate share of the total fleet. Those with ten or more vehicles represent only 17 percent of all assisted agencies but operate nearly half of the Section 16(b)(2) vehicles and more than half of all vehicles operated by assisted agencies.

The type of service most frequently reported is demand-response service. Eighty percent provide this form of service; nearly one out of every three of these also offers at least some fixed-route service. This latter mode is reported least frequently in the West. As one might expect, the agencies using both fixed-route and demand-response services tend to be the larger agencies. For state-by-state data on numbers of agencies, see Table 3.

Some 55 percent of the agencies in the Section 16(b)(2) network are located in rural areas, 34 percent located in the larger urbanized areas (those with a population of 200,000 or more), and 11 percent are located in small urbanized areas. In fact, a significant number of agencies in the Section 16(b)(2) network are also part of the Section 18 rural transportation network. (These agencies, who receive assistance from both programs, make up 7 percent of the total network and 13 percent of its rural component.)

The rural Section 16(b)(2) agencies tend to be smaller than their urban counterparts. Two-thirds operate less than three vehicles while the comparable figure in urban areas is only 62 percent. If the Section 18 agencies are excluded from the picture, the contrast is even more striking. The rural agencies receiving Section 16(b)(2) assistance are also more likely to be elderly service agencies than disability service agencies—the reverse of the situation in urban areas.

The rural agencies in the Section 16(b)(2) network are also more likely to be dependent on that program for their vehicles. As can be seen in the data in Table 4, vehicles acquired with Section 16(b)(2) assistance make up 61 percent of all vehicles operated by the rural agencies. In urban areas, the figure is only 45 percent. Finally, rural recipients of Section 16(b)(2) assistance are somewhat more likely to operate both

TABLE 1 SECTION 16(B)(2) AGENCIES IN THE UNITED STATES, 1989, BY TYPE AND REGION

	Agencies		All Vehicles Operated by Agency				16(b)(2) Vehicles Operated			
	Total	Distri- bution (%)	Vehicles		Average Size of Fleet		Vehicles		Average Size of Fleet	
			Total	Distri- bution (%)	Mean	Median	Total	Distri- bution (%)	Mean	Median
United States	3,490	100.0	20,986	100.0	6.0	3	11,005	100.0	3.2	2
All providers										
By agency type										
Multipurpose	685	19.6	5,503	26.2	8.0	4	2,710	24.6	4.0	2
Elderly agency	1,229	35.2	5,009	23.9	4.1	2	3,060	27.8	2.5	1
Disability agency	1,291	37.0	8,075	38.5	6.3	3	3,944	35.8	3.1	2
Other	285	8.2	2,399	11.4	8.4	3	1,291	11.7	4.5	2
Northeast	698	100.0	5,162	100.0	7.4	3	2,180	100.0	3.1	2
All providers										
By agency type										
Multipurpose	104	14.9	912	17.7	8.8	5	328	15.0	3.2	2
Elderly agency	176	25.2	711	13.8	4.0	2	406	18.6	2.3	1
Disability agency	332	47.6	2,883	55.9	8.7	4	1,076	49.4	3.2	2
Other	86	12.3	656	12.7	7.6	4	370	17.0	4.3	1
North Central	801	100.0	4,595	100.0	5.7	3	2,532	100.0	3.2	2
All providers										
By agency type										
Multipurpose	211	26.3	1,423	31.0	6.7	3	625	24.7	3.0	1
Elderly agency	277	34.6	1,070	23.3	3.9	2	715	28.2	2.6	1
Disability agency	268	33.5	1,444	31.4	5.4	3.5	827	32.7	3.1	2
Other	45	5.5	658	14.3	14.6	7	365	14.4	8.1	3
South	1,313	100.0	7,822	100.0	6.0	3	4,444	100.0	3.4	2
All providers										
By agency type										
Multipurpose	247	18.8	2,583	33.0	10.5	6	1,397	31.4	5.7	3
Elderly agency	529	40.3	2,314	29.6	4.4	2	1,383	31.1	2.6	1
Disability agency	469	35.7	2,562	32.8	5.5	3	1,407	31.7	3.0	2
Other	68	5.2	363	4.6	5.3	3	257	5.8	3.8	2
West	678	100.0	3,407	100.0	5.0	2	1,849	100.0	2.7	2
All providers										
By agency type										
Multipurpose	123	18.1	585	17.2	4.8	2	360	19.5	2.9	2
Elderly agency	247	36.4	914	26.8	3.7	2	556	30.1	2.3	1
Disability agency	222	32.7	1,186	34.8	5.3	3	634	34.3	2.9	2
Other	86	12.7	722	21.2	8.4	3	299	16.2	3.5	1

Source: Community Transportation Association of America database.

fixed route and demand-response service—probably a reflection of the frequency with which they are the only transportation resource in the area.

## THE FLEET

The network of Section 16(b)(2) recipients operates a total of 11,005 vehicles acquired with 16(b)(2) assistance. All but 14 percent of those have a capacity of less than 16 passengers and only 3 percent are larger than 25 passengers in size. As the data in Table 5 make clear, these large vehicles are to be found almost entirely in urban agencies operating fleets of five or more.

Overall, 44 percent of Section 16(b)(2) vehicles have lifts or ramps to provide wheelchair access. Among the smallest agencies (those operating a single vehicle), the figure rises to 64 percent. And nine out of ten large vehicles (those most likely to be used in conventional fixed-route service) are lift- or ramp-equipped. Fully accessible vehicles are slightly more prevalent among urban agencies than among rural Section 16(b)(2) recipients.

The leasing of Section 16(b)(2) vehicles to other agencies for their operation appears to be relatively limited. Only 4 percent of the network report any leasing of vehicles and these arrangements affect only 2 percent of all vehicles acquired with assistance under the program. They are more common among larger agencies and typically involve only one or two vehicles leased to a single agency.

## FUNDING SUPPORT

Funding under Section 16(b)(2) is limited to capital assistance. This means that recipients must rely on sources other than UMTA for their operating costs. Data in Table 6 indicate the pattern of funding support used by these recipient agencies to cover the costs of their transportation activities. The average (arithmetic mean) budget reported was only \$83,372 and the median (middle) figure was less than half that: \$36,200. The budget for an urbanized agency was on average twice that for a rural agency.

As can be seen, very little funding (less than 5 percent) comes from the riders (more in rural areas than in urban

TABLE 2 SECTION 16(B)(2) AGENCIES IN THE UNITED STATES, 1989, BY SIZE

	Agencies		All Vehicles Operated by Agency		16(b)(2) Vehicles Operated	
	Total	Percent	Total	Percent	Total	Percent
	Number	Dist'n	Number	Dist'n	Number	Dist'n
<b>UNITED STATES</b>						
All Providers	3,490	100.0	20,986	100.0	11,005	100.0
<b>BY AGENCY SIZE</b>						
One Vehicle	1,011	29.0	1,011	4.8	1,011	9.2
2-to-4 Vehicles	1,248	35.8	3,850	18.3	2,464	22.4
5-to-9 Vehicles	639	18.3	4,728	22.5	2,394	21.8
Ten or More Vehicles	592	17.0	11,397	54.3	5,136	46.7
<b>NORTHEAST</b>						
All Providers	698	100.0	5,162	100.0	2,180	100.0
<b>BY AGENCY SIZE</b>						
One Vehicle	196	28.1	196	3.8	196	9.0
2-to-4 Vehicles	224	32.1	620	12.0	428	19.6
5-to-9 Vehicles	112	16.0	749	14.5	386	17.7
Ten or More Vehicles	166	23.8	3,597	69.7	1,170	53.7
<b>NORTH CENTRAL</b>						
All Providers	801	100.0	4,595	100.0	2,532	100.0
<b>BY AGENCY SIZE</b>						
One Vehicle	223	27.8	223	4.9	223	8.8
2-to-4 Vehicles	306	38.2	852	18.5	584	23.1
5-to-9 Vehicles	153	19.1	1,001	21.8	550	21.7
Ten or More Vehicles	119	14.9	2,519	54.8	1,175	46.4
<b>SOUTH</b>						
All Providers	1,313	100.0	7,822	100.0	4,444	100.0
<b>BY AGENCY SIZE</b>						
One Vehicle	377	28.7	377	4.8	377	8.5
2-to-4 Vehicles	451	34.3	1,678	21.5	939	21.1
5-to-9 Vehicles	261	19.9	2,265	29.0	1,046	23.5
Ten or More Vehicles	224	17.1	3,502	44.8	2,082	46.8
<b>WEST</b>						
All Providers	678	100.0	3,407	100.0	1,849	100.0
<b>BY AGENCY SIZE</b>						
One Vehicle	215	31.7	215	6.3	215	11.6
2-to-4 Vehicles	267	39.4	700	20.5	513	27.7
5-to-9 Vehicles	113	16.7	713	20.9	412	22.3
Ten or More Vehicles	83	12.2	1,779	52.2	709	38.3

Source: Community Transportation Association of America database.

areas). Only half of the agencies indicated any funding from this source. Instead, social service programs—and particularly those in the field of mental health and rehabilitation—furnish nearly 57 percent of the transportation costs of these agencies. Another 24 percent comes from state and local governments, aside from this social service support, and the remaining 15 percent from miscellaneous other sources.

The picture for the smallest agencies is a good deal different, though. They get one-third of their transportation operating funds from general state and local government sources and report only 27 percent as coming from social service programs. The share of their budgets accounted for by their riders is twice that averaged in larger agencies, although still only 8 percent and still reported by only half of the agencies.

Rural-urban differences are not as marked, though Medicaid funding, like ridership support, is more important in rural than in urban areas. The rural agencies, at the same time, are somewhat less dependent on mental health program funding.

Note that although mental health-rehabilitation programs are the most important source of social service funding in dollar terms, elderly programs are twice as likely to be re-

ported as a support source. At the same time, Medicaid funding is less frequently reported by rural agencies but is larger in dollar terms than it is for urban agencies.

The use of volunteers to reduce operating costs is reported by one of every four Section 16(b)(2) recipients. Among the smallest agencies, the share using volunteers rises to 45 percent. Considering only at those operations in which volunteers are used, volunteers are said to account for an average of 35 percent of total workhours. The smallest agencies reporting use of volunteers indicate that they handle 45 percent of the total workload.

## SERVICE

Survey data show that the national network of agencies with vehicles acquired through the Section 16(b)(2) program provides a total of nearly 80 million trips a year, 61 percent of them in their Section 16(b)(2) vehicles. As data in Table 7 show, this works out to an average of 22,900 trips per agency. The larger number of vehicles purchased with other funds that the average urban recipient has enabled it to provide

TABLE 3 SECTION 16(B)(2) RECIPIENTS BY STATE

State	Total Number Providers	-----Vehicles-----			Share of Agencies w/Princ. Purp. of:		Share of Agencies	
		Total Number 16(b)(2)	No./10,000 E. and H. Popul'n	Median 16(b)(2) Fleet	Eld'y Svcs.	Disab'y Svcs.	With Only 1 Veh.	Prov'g Both DR & FR Svc.
Alabama	26	160	2.2	3	31%	4%	8%	42%
Alaska	33	95	33.2	1	48%	45%	39%	33%
Arizona	64	119	2.4	1	20%	19%	48%	3%
Arkansas	73	148	2.9	2	29%	44%	11%	29%
California	178	562	1.5	2	24%	43%	28%	20%
Colorado	28	101	2.5	2	32%	39%	11%	7%
Connecticut	77	172	3.5	2	5%	79%	47%	55%
Delaware	30	47	5.0	1	73%	20%	40%	10%
District of Columbia	21	94	7.7	2.5	29%	62%	5%	33%
Florida	110	465	2.0	2	17%	44%	21%	20%
Georgia	53	270	2.9	3	58%	26%	9%	79%
Hawaii	31	131	11.0	2	19%	48%	26%	0%
Idaho	36	59	3.9	1	50%	11%	47%	14%
Illinois	69	236	1.3	2	48%	29%	10%	32%
Indiana	76	240	2.7	2	32%	50%	13%	18%
Iowa	7	207	4.0	33	14%	0%	0%	43%
Kansas	76	252	6.0	2	34%	36%	34%	34%
Kentucky	54	400	5.6	2	50%	17%	26%	52%
Louisiana	91	268	3.8	2	56%	23%	10%	55%
Maine	8	94	4.4	11	0%	0%	0%	88%
Maryland	53	142	2.2	2	9%	62%	23%	8%
Massachusetts	59	207	2.1	2	36%	29%	34%	2%
Michigan	49	180	1.2	2	37%	37%	24%	8%
Minnesota	118	193	2.9	1	11%	24%	34%	43%
Mississippi	65	285	5.7	2	25%	48%	35%	40%
Missouri	71	387	4.1	2	32%	59%	24%	15%
Montana	43	87	6.8	1.0	63%	9%	44%	19%
Nebraska	60	109	4.0	1	62%	25%	60%	0%
Nevada	50	124	10.8	1	54%	14%	46%	0%
New Hampshire	22	69	4.6	2.5	14%	27%	5%	64%
New Jersey	94	171	1.4	1	18%	44%	27%	39%
New Mexico	53	123	6.3	2	26%	45%	32%	74%
New York	264	839	2.7	2	33%	42%	27%	32%
North Carolina	54	458	4.5	7	24%	19%	7%	52%
North Dakota	32	40	3.8	1	88%	3%	56%	25%
Ohio	116	245	1.3	1	27%	20%	23%	47%
Oklahoma	179	306	5.1	1	62%	25%	60%	38%
Oregon	70	189	3.9	2	34%	41%	27%	19%
Pennsylvania	118	446	2.0	2	14%	72%	23%	37%
Rhode Island	25	84	4.6	1	56%	28%	28%	0%
South Carolina	65	116	2.2	1	48%	34%	32%	48%
South Dakota	54	136	11.1	1.5	50%	41%	31%	0%
Tennessee	133	256	3.0	1	31%	65%	38%	11%
Texas	178	580	2.7	1	43%	31%	43%	12%
Utah	43	91	4.8	1	40%	37%	19%	14%
Vermont	31	98	11.2	2	39%	10%	29%	45%
Virginia	44	181	2.2	2	14%	45%	0%	32%
Washington	20	118	1.7	4.5	55%	10%	0%	45%
West Virginia	88	269	6.5	2	51%	28%	13%	1%
Wisconsin	73	307	4.0	2	22%	47%	18%	25%
Wyoming	30	51	8.8	1	77%	23%	27%	0%
United States	3,490	11,005	2.8	2	35%	37%	29%	28%

Source: CTA database, UMTA and Census materials.

more than twice as many trips as the average rural recipient, but only 52 percent of those urban trips are in Section 16(b)(2) vehicles.

The extent to which elderly and handicapped transportation involves regular service to places like senior centers, meal sites, and sheltered workshops is reflected in the surprising fact that almost 70 percent of the trips provided by the network are said to be in a fixed-route mode. Among the smallest agencies, however, a majority of all trips are in demand-response service. This type of service is also slightly more important among rural recipients than among urban ones.

And, it is worth noting, vehicles acquired with Section 16(b)(2) funds account for a substantially larger share of demand-responsive than of fixed-route trips.

The average trip provided by a Section 16(b)(2) recipient involves 3.2 vehicle-miles of operation, with those in fixed-route service averaging 2.8 vehicle miles and those in demand-response service averaging 4.1 vehicle miles. Trips provided by rural agencies required two-thirds more vehicle miles than those provided by urban agencies. And, again, the data indicate more intensive use of vehicles not acquired under the Section 16(b)(2) program.

TABLE 4 SECTION 16(B)(2) AGENCIES BY SIZE OF URBANIZED AREA AND AGENCY SIZE

	Agencies		All Vehicles Operated		16(b)(2) Veh's Operated	
	Total Number	Percent Dist'n	Total Number	Percent Dist'n	Total Number	Percent Dist'n
UNITED STATES: All Providers -	3,490	100.0	20,986	100.0	11,005	100.0
BY FLEET SIZE: One Vehicle -	1,011	29.0	1,011	4.8	1,011	9.2
2-to-4 Vehicles -	1,248	35.8	3,850	18.3	2,464	22.4
5-to-9 Vehicles -	639	18.3	4,728	22.5	2,394	21.8
Ten or More Vehicles -	592	17.0	11,397	54.3	5,136	46.7
LARGE UZAs: All Providers -	1,202	100.0	9,199	100.0	4,042	100.0
BY FLEET SIZE: One Vehicle -	371	30.9	371	4.0	371	9.2
2-to-4 Vehicles -	380	31.6	1,133	12.3	714	17.7
5-to-9 Vehicles -	195	16.2	1,552	16.9	746	18.5
Ten or More Vehicles -	256	21.3	6,143	66.8	2,211	54.7
SMALL UZAs: All Providers -	368	100.0	2,247	100.0	1,136	100.0
BY FLEET SIZE: One Vehicle -	105	28.5	105	4.7	105	9.2
2-to-4 Vehicles -	120	32.6	380	16.9	226	19.9
5-to-9 Vehicles -	65	17.7	540	24.0	195	17.2
Ten or More Vehicles -	78	21.2	1,222	54.4	610	53.7
NON-URBANIZED: All Providers -	1,920	100.0	9,540	100.0	5,827	100.0
BY FLEET SIZE: One Vehicle -	535	27.9	535	5.6	535	9.2
2-to-4 Vehicles -	748	39.0	2,337	24.5	1,524	26.2
5-to-9 Vehicles -	379	19.7	2,636	27.6	1,453	24.9
Ten or More Vehicles -	258	13.4	4,032	42.3	2,315	39.7

Source: Community Transportation Association of America database (projected from sample; n=547).

TABLE 5 VEHICLES OPERATED BY SECTION 16(B)(2) RECIPIENTS, BY AGENCY SIZE AND URBAN-RURAL LOCATION

	SMALL (1 Vehicle)	MEDIUM (2-4 Veh's)	LARGE (5+ Veh's)	URBAN	RURAL	UNITED STATES
Total No. 16(b)(2) Vehicles	1,011	2,464	7,530	5,178	5,827	11,005
Share Lift/Ramp-Equipped	64%	36%	44%	53%	35%	44%
Under 16-Passenger Capacity:						
Number	827	2,228	6,415	4,458	5,012	9,470
As Percent of All	82%	90%	85%	86%	86%	86%
Share Lift/Ramp-Equipped	63%	34%	41%	51%	32%	41%
16-to-25 Passenger Capacity:						
Number	184	220	827	443	788	1,231
As Percent of All	18%	9%	11%	9%	14%	11%
Share Lift/Ramp-Equipped	67%	50%	52%	48%	57%	54%
Over 25-Passenger Capacity:						
Number	0	16	288	277	27	304
As Percent of All	0%	1%	4%	5%	.5%	3%
Share Lift/Ramp-Equipped	0%	100%	90%	99%	7%	90%
Contractor-Operated Vehicles						
Included In Above Listings:						
(All Under 16-Passenger)						
Number	0	63	171	164	70	234
As Percent of All	0%	2.6%	2.3%	3.2%	1.2%	2.1%
As Percent of Size Category	0%	2.8%	2.7%	3.7%	1.4%	2.5%
Share Lift/Ramp-Equipped	0%	0%	50%	49%	9%	37%

Source: Projected from sample data; n=140 (33+62+45; 56+84).

TABLE 6 FUNDING PATTERNS IN SECTION 16(B)(2) PROGRAM, BY AGENCY SIZE AND URBAN-RURAL LOCATION

	SMALL (1 Vehicle)	MEDIUM (2-4 Veh's)	LARGE (5+ Veh's)	URBANIZED AREAS	RURAL AREAS	UNITED STATES
Number Sec. 16(b)(2) Providers:	1,011	1,248	1,231	1,570	1,920	3,490
Average Transportation Operating Budget:						
Arithmetic Mean	\$10,961	\$43,742	\$183,020	\$117,948	\$55,100	\$83,372
Median	\$24,797	\$30,628	\$71,240	\$38,677	\$28,060	\$36,215
Shares Provided By:						
Farebox/Rider Contrib'n's	8.3%	3.8%	4.4%	3.2%	6.6%	4.5%
State-Local Government	33.1%	31.8%	21.8%	23.2%	25.4%	24.0%
Social Service Programs	27.3%	50.8%	59.8%	57.4%	56.0%	56.9%
(Elderly)	(18.4%)	(15.3%)	( 8.9%)	( 9.8%)	(11.6%)	(10.5%)
(Mental Health/Rehabilitation)	( .0%)	(24.1%)	(24.4%)	(27.3%)	(16.6%)	(23.4%)
(Medicaid)	( 8.6%)	( 4.6%)	(11.9%)	( 5.4%)	(19.1%)	(10.4%)
(Other Social Service Prog's)	( .2%)	( 6.9%)	(14.7%)	(15.0%)	( 8.7%)	(12.7%)
All Other Sources	31.2%	14.1%	13.9%	16.1%	12.1%	14.6%
Share of Agencies Reporting						
Funds From:						
Farebox/Rider Contrib'n's	49%	51%	56%	36%	65%	52%
State-Local Government	52%	61%	62%	50%	66%	59%
Social Service Programs:						
Elderly	31%	34%	46%	34%	41%	38%
Mental Health/Rehabilitation	0%	29%	24%	19%	19%	19%
Medicaid	7%	9%	17%	16%	8%	11%
Other Social Service Prog's	4%	17%	25%	18%	14%	16%
All Other Sources	55%	39%	58%	55%	46%	50%

Source: Sample data; n=140 (33+62+45; 56+84).

TABLE 7 TRIPS PROVIDED BY SECTION 16(B)(2) RECIPIENTS, BY AGENCY SIZE AND URBAN-RURAL LOCATION

	SMALL (1 Vehicle)	MEDIUM (2-4 Veh's)	LARGE (5+ Veh's)	URBANIZED AREAS	RURAL AREAS	UNITED STATES
Total Sec. 16(B)(2) Providers	1,011	1,248	1,231	1,570	1,920	3,490
Total No. Trips (000s)	5,442.7	20,922.1	53,557.9	49,379.5	30,543.3	79,922.8
Total No. 16(b)(2) Trips (000s)	5,442.7	12,949.2	30,643.3	25,829.8	23,205.4	49,035.2
Average No. Trips per Provider:						
Mean -	5,384	16,765	43,508	31,452	15,908	22,901
Median -	3,600	7,180	25,235	8,771	9,752	9,311
Average No. 16(b)(2) Trips per Provider:						
Mean -	5,304	10,376	24,893	16,452	12,086	14,050
Median -	3,600	6,350	13,067	6,100	6,350	6,238
Share of Trips by Mode:						
Fixed Route -	32.1%	76.7%	71.5%	74.7%	62.8%	70.2%
Demand-Response -	57.2%	18.3%	23.3%	20.2%	30.9%	24.3%
Other -	10.7%	4.9%	5.2%	5.0%	6.3%	5.5%
Share Provided Using 16(b)(2) Vehicles:						
All Trips -	100.0%	61.9%	57.2%	52.3%	76.0%	61.4%
Fixed Route Trips -	100.0%	59.8%	53.4%	48.2%	73.0%	56.7%
Demand-Response Trips -	100.0%	75.3%	65.8%	60.2%	86.9%	73.1%

Source: Projected from sample data; n=140 (33+62+45; 56+84).



## RIDERSHIP CHARACTERISTICS

Sixty percent of the people riding vehicles operated by the Section 16(b)(2) network are women. This is consistent with their relative numbers in the population. Women make up 59 percent of the total population 62 and older and they make up 70 percent of those 85 and older. While less than half of all people reported to have some sort of work disability are women, more than half of those with a disability so serious as to prevent their working are women. As can be seen in Table 7, the smallest agencies in the Section 16(b)(2) network report that women account for more than four-fifths of their ridership. There seems to be no significant difference between urban and rural agencies on this score.

The elderly are said to make up 43 percent of their ridership by agencies assisted under Section 16(b)(2). Since seniors make up an estimated 62 percent of the total elderly and handicapped population, it appears that the elderly are a less important part of the Section 16(b)(2) ridership than would be expected. This is particularly true in urbanized areas. Again, however, the smallest agencies (those operating a single vehicle) indicate an extremely high rate of elderly ridership. And there does appear to be an urban-rural difference here, with urban agencies reporting only 39 percent of their riders as women.

Finally, 9 percent of the network's ridership is said to use wheelchairs or some other mobility aid. Because most figures

on wheelchair use indicate that no more than 5 percent of the disabled are in this group (and the disabled are only half of the Section 16(b)(2) constituency), the ridership rate reported is surprisingly high. It appears to be greatest in urbanized areas and for the larger agencies.

Data presented in Table 8 reflect the reported pattern of trip purposes. (Although most agencies do not keep complete information on this aspect of operations, those surveyed were asked to provide their "best estimate" of the pattern for their service.) Over all, the largest share of trips are to job or training sites (including sheltered workshops). Senior centers and nutrition sites are the next most frequently reported type of destination. Medical care is said to be the purpose for 12 percent of all trips in Section 16(b)(2) vehicles. As is true in other aspects of the profile, the one-vehicle agencies reflect a strikingly different pattern. Nearly half of their trips are to senior centers or nutrition sites and only a very small share to work or training sites.

## METHODOLOGY

This profile is based on two types of information. The first category is information gathered about all Section 16(b)(2) providers from the state departments of transportation that administer the program. This category included, in addition to the numbers of providers, the types of agencies, their prin-

TABLE 8 RIDERSHIP CHARACTERISTICS FOR 16(B)(2) AGENCIES, BY AGENCY SIZE AND URBAN-RURAL LOCATION

	SMALL (1 Veh)	MEDIUM (2-4 Vehs)	LARGE (5+ Vehs)	URBANIZED AREAS	RURAL AREAS	UNITED STATES
<b>ALL TRIPS PROVIDED:</b>						
Total Number of Trips (000s)	5,443	20,922	53,558	49,380	30,543	79,923
Share of Riders Who Are:						
Women -	82%	50%	62%	60%	60%	60%
Elderly -	88%	25%	46%	39%	50%	43%
Mobility-Impaired <sup>a</sup> -	7%	5%	12%	12%	6%	10%
Distribution of Trips by Destination:						
To or From Work -	6%	40%	40%	39%	36%	38%
To or From Senior Center or Nutrition Site -	47%	11%	21%	16%	27%	20%
To or From Other Social Service Activities -	19%	8%	19%	17%	14%	16%
To or From Medical Care -	12%	7%	12%	11%	10%	11%
For Other Purposes -	17%	33%	9%	17%	12%	16%
<b>16(B)(2) TRIPS PROVIDED:</b>						
Total Number of Trips (000s)	5,443	12,949	30,643	25,830	23,205	49,035
Share of Riders Who Are:						
Women -	82%	47%	56%	55%	58%	56%
Elderly -	88%	30%	46%	41%	53%	47%
Mobility-Impaired <sup>a</sup> -	7%	5%	11%	12%	5%	9%
Distribution of Trips by Destination:						
To or From Work -	6%	51%	42%	44%	36%	40%
To or From Senior Center Or Nutrition Site -	47%	13%	22%	19%	27%	22%
To or From Other Social Service Activities -	19%	12%	12%	12%	13%	12%
To or From Medical Care -	12%	6%	15%	14%	9%	12%
For Other Purposes -	17%	18%	10%	12%	15%	13%

Source: Sample data; n=140 (33+62+45; 56+84)

<sup>a</sup>Utilizes a wheelchair or similar mobility-aid.

TABLE 9 SAMPLE COMPARED WITH SECTION 16(B)(2) UNIVERSE

		All Sec. 16's		Sample	
		Number	Percent	Number	Percent
REGION:	Northeast -	698	20	25	18
	North Central -	801	23	35	25
	South -	1,313	38	53	38
	West -	678	19	27	19
SIZE:	1 Vehicle -	1,011	29	33	24
	2-to-4 Vehicles -	1,248	36	62	44
	5 or More Vehicles -	1,231	35	45	32
SERVICE:	Both FR & DR -	974	28	39	28
	DR, No FR -	1,831	52	72	51
	No DR -	685	20	29	21
PURPOSE:	Elderly -	1,229	35	57	41
	Handicapped -	1,291	37	55	39
	Multipurpose & Other -	970	28	28	20
LOCATION:	Large UZAs -	1,202	34	39	28
	Small UZAs -	368	11	15	11
	Non-Urbanized Areas -	1,920	55	84	60

cial purposes, the numbers of Section 16(b)(2) and other vehicles in operation, the types of service provided, and the counties in which the programs operate. These characteristics, in other words, were collected for the full universe of Section 16(b)(2) recipients and are largely reflected in the first section of the profile.

The second category of information was that collected for a sample of providers. This category includes information on funding (both size of operating budget and sources from which obtained), size of vehicles and whether lift- or ramp-equipped, leasing of vehicles, use of volunteers, trips provided, vehicle miles operated, and characteristics of riders and trip purposes. The sample for which information on these aspects was gathered totaled 140 providers. This was a random sample stratified by region, fleet size, and mix of service provided.

As data in Table 9 indicate, the characteristics of the sample respondents were reasonably close to those of the network as a whole.

# Care-A-Van and SAINT: Addition of Volunteer Division to Model System

MARJ WALSH

Since 1972 CARE-A-VAN has been a pioneer in coordinating transportation services, combining more than two dozen funding sources to avoid duplication of administration, personnel, and equipment. Twenty-seven vehicles provide about 155,000 trips annually. SAINT was established as a pilot project for the city of Fort Collins, Colorado, in 1983 to recruit volunteers who used their own cars to provide economical transportation for senior or disabled residents. Administrative costs caused the volunteer system to operate at a significantly higher cost per trip than the private nonprofit CARE-A-VAN system. Disappointed supporters withdrew dollars shifted to SAINT without restoring them to the professional system. In January 1988, SAINT became a volunteer division of CARE-A-VAN. Cooperation replaced competition. In the first year, rides increased by 26 percent (to 10,464), donations increased, emphasis shifted from survival to quality of service and the benefits of coordination were demonstrated.

In 1984 Senior Alternatives in Transportation (SAINT) received a national Technology Achievement Award from Public Technology, Inc. This news was received by CARE-A-VAN with mixed emotions. SAINT was established as a pilot transportation project that involved volunteers who provided transportation to senior or disabled citizens using their own cars. Because of its talk of building community, bridging generations, and providing friends as well as rides, SAINT seemed an unlikely candidate for anything associated with advanced technology.

CARE-A-VAN had been considered the model transportation program for Fort Collins, for the rest of Larimer County, and even for the State of Colorado. It was not exactly ready to share either the spotlight or any available transportation dollars with the SAINT program. Within four years, the two systems were sharing much more—including administration, space, publicity, and funding. This is the story of how that came about.

## BACKGROUND

CARE-A-VAN was incorporated as a private nonprofit organization in 1970 and began providing specialized door-to-door transportation service in October 1972. It started with one van and took about eight passengers a day to a sheltered workshop in Fort Collins. In 1973 service was expanded to Loveland and several smaller communities, transporting clients of the new Foothills-Gateway Rehabilitation Center, which served developmentally disabled residents from several areas

of the county. In 1974 CARE-A-VAN expanded service to include passengers aged 60 and over and persons with low incomes. Since 1985, with the advent of Section 18 funding, some "open-door" service has been available for the general public outside the Fort Collins urban area.

CARE-A-VAN coordinates as many funding sources as possible to provide the widest variety of specialized transportation. It facilitates programs, quality of life, and self-sufficiency for targeted groups by providing access. In 1987 its efforts were recognized by receipt of an Outstanding Public Service Award (UMTA Administrator's Award) from the U.S. Department of Transportation as one of four outstanding systems in the United States.

CARE-A-VAN now has a fleet of 27 buses and air-conditioned minibuses, most of which are equipped for wheelchairs. CARE-A-VAN provided 162,033 trips during 1989.

## VOLUNTEER TRANSPORTATION

During the 1970s a multipurpose volunteer program called FISH ended its transportation segment because research into answering service records revealed that the system was being abused. Several people were requesting rides many days each week for nonessential trips, often riding in CARE-A-VAN on other days of the same week. FISH volunteers were diverted to other services.

About 1982 talk began of developing a new volunteer transportation service, and SAINT was born. Begun in 1983 under the wing of the city of Fort Collins, with the support of the city's Senior Advisory Board and the county's Area Agency on Aging, SAINT recruited volunteers to provide door-to-door transportation for elderly or disabled residents of Fort Collins. Since the beginning, transportation has been available daily, from 9 a.m. to 9 p.m., for any reason.

## BARRIERS TO COORDINATION

While coordination of CARE-A-VAN and SAINT might have been possible (and logical) from the beginning, there were personal and political reasons why it did not happen. A competitive atmosphere developed for the following reasons.

First, some SAINT supporters believed the volunteer service would be less costly than the professional paratransit service. They also believed that volunteer services could have been able to meet the bulk of the specialized transportation needs. They wanted to operate separately and maintain control. On the other hand, CARE-A-VAN's board and staff,

grantee for the county's Retired Senior Volunteer Program since 1973, had directly experienced the effort involved in maintaining an adequate volunteer corps. They worried that high administrative costs for SAINT would draw upon scarce transit dollars. As it turned out, new financing sources that had been anticipated to fund SAINT did not materialize, and SAINT approached CARE-A-VAN's funding sources. In at least two instances, funding went to SAINT that had previously gone or could have gone to CARE-A-VAN. Corporations began to call CARE-A-VAN to ask why they were being requested to contribute to both systems.

At about the same time, CARE-A-VAN's contract to administer the city's fixed-route system had just ended after CARE-A-VAN had initiated more than \$6,000,000 in grants for a new Transit Center, new buses for both systems, and technical grants, among other things. There were some hard feelings, with CARE-A-VAN distrusting the city and some city staff somewhat envious of CARE-A-VAN's record. The opportunity to develop a competitive system was attractive to some of those persons who worked behind the scenes.

To secure a place in the funding arena, some perhaps overzealous representatives of SAINT began to spread misinformation about SAINT costs (ignoring many expenses) and about CARE-A-VAN service (i.e., mistaken notions that CARE-A-VAN served only fixed routes, required 3-days' notice, was not as kind to or as understanding of riders, etc.).

In the long run, early efforts to use volunteers, community service workers, RSVP volunteers, and so on for most staff work did not provide enough support for SAINT. The SAINT staff grew to include a full-time administrator, a half-time dispatcher-scheduler, and a half-time volunteer coordinator. Costs soared, although the city provided space, equipment, and administrative support at no recorded cost. At first, the providers of funds had split transportation dollars between the two systems and they expected the volunteer system to be less costly. When disappointed, providers began to withdraw dollars from SAINT without restoring them or contributing money to CARE-A-VAN. Despite so many barriers, the thought persisted that coordination of the two systems would be in the best interests of the community and the clients, and certain things happened to ease the way.

### ON THE WAY TO COORDINATION

In 1986, SAINTS' best year, \$34,457 was spent to provide only 7,401 trips. Funding providers were disturbed by the high cost per trip and began to encourage a merger. Changes at the city included the resignation of one problem staff member and the transfer of SAINT to the Senior Center. The Senior Center Director began exploratory talks with CARE-A-VAN and hired a CARE-A-VAN driver to fill a vacancy for the SAINT Director position. To reduce costs, the SAINT Director was soon reduced to a 0.4 full-time equivalent (FTE) position and the other 0.6 FTE changed to grants administration for the fixed-route system. The SAINT Director's goals became the completion of a merger and working full-time with the fixed-route system. Both turf and staff issues began to fade.

Members of the SAINT Advisory Council and the CARE-A-VAN Board of Directors began to meet to explore the

possibility of mutually acceptable goals for a combined operation. Goals were recommended and approved by the City. A charter member of the driving force and a member of the SAINT Advisory Council agreed to become members of the CARE-A-VAN Board of Directors. Meanwhile, on the front-line, call-forwarding technology allowed the SAINT Dispatcher-Scheduler to be stationed in the CARE-A-VAN dispatch center for a two-week simulation of a merger. The simulation was a big success and one major "what if" was laid to rest. Finally, the Community Development Block Grant Program provided \$5,000 to pay the start-up costs of a merger.

### COORDINATION

On January 1, 1988 SAINT became a volunteer division of CARE-A-VAN. Maintaining its identity, it became "SAINT at CARE-A-VAN."

What has happened after the merger is this. A half-time Dispatcher-Scheduler takes requests only from 8:00 a.m. to noon, the same hours as before. An answering machine takes calls at other times. Drivers also have the support of CARE-A-VAN between 6:30 a.m. and 6:30 p.m., if necessary. SAINT and CARE-A-VAN share a dispatch center and often help each other to fill requests that might otherwise have to be turned away. At the same time, clients are introduced to the other system, which might be more appropriate for their needs.

A half-time volunteer coordinator, also based at the transit center, recruits, trains, and provides recognition for a volunteer force of 47 to 52 drivers. A volunteer packet has been developed and includes orientation materials. Volunteers receive a monthly newsletter. The volunteer coordinator carries materials and makes presentations for both SAINT and CARE-A-VAN, and SAINT is always mentioned in CARE-A-VAN presentations.

Administration has been absorbed by CARE-A-VAN, which can integrate the activity more easily than the city because the services are so similar. The city continues to provide volunteer insurance in excess of the personal limits of volunteers, who must provide proof that they meet state limits. Mileage payments are made to those drivers requesting reimbursement. About half of all drivers request reimbursement (20 cents/mile), with perhaps some increase due to rising fuel costs.

All donations go to SAINT at CARE-A-VAN. SAINT now has access to city, United Way, Area Agency on Aging, and Human Resources Committee funding through channels already established by CARE-A-VAN. SAINT receives greater exposure through the publicity and facility tours connected with these funding sources. Donation envelopes, Christmas letters, no-show door hangers, and other printed materials are designed to serve both systems, although each has a separate informational brochure.

Although it has taken some time for long-term CARE-A-VAN employees to think of SAINT as "we" instead of "they," the change has come about. There has been turnover in both SAINT positions, and CARE-A-VAN has been there to provide continuity for the system. Employees are cross-trained sufficiently to help out when either system is affected by illness or absences.

For CARE-A-VAN administration, the greatest pleasure during the transition period came from the grateful letters

sent by SAINT clients who love the service and the volunteers who drive them. Their comments were quick to replace any residual negative memories. SAINT clients tend to be 75 and older, from a little higher economic level, and may be more comfortable both physically and psychologically when traveling in a personal car. For many elderly, transportation may be the first help they have requested and they may be more comfortable with the familiar. The newly retired gentleman in his Buick is a welcome sight for the group of widows in search of groceries! The young mother with her toddler along fills in for distant grandchildren. Without the turf issues of separate systems, clients may move easily between systems as their needs change.

## RESULTS

These are the operational changes, but what are the results? In the first year, SAINT rides increased by 26 percent (to

10,464) and out-of-pocket expenses were cut more than one-third (to \$2.04). Donations increased and emphasis could move from survival to quality of service. Once again, on another front, the benefits of coordination have been demonstrated and have been profiled in the U.S. Departments of Transportation and Health and Human Services joint publication, *Best Practices in Specialized and Human Services Transportation Coordination*, in which CARE-A-VAN and SAINT happily share the same spotlight (1).

## REFERENCE

1. *Best Practices in Specialized and Human Services Transportation Coordination*. Report DOT-T-89-20. U.S. Department of Transportation and U.S. Department of Health and Human Services, 1989.

# Significance of Specialized Transportation Services to the Elderly Urban Population: Case Study of Houston, Texas

LALITA SEN AND ARTUR V. RADHAKRISHNA

The role played by specialized public transportation services compared with other modes in transporting the elderly is investigated in this paper. The study ascertained the degree to which this type of service is used, service characteristics most preferred by the elderly population, and characteristics least acceptable to that population. The diverse ethnic characteristics of the urban elderly population were examined to determine their role in the demand for specialized transportation. Data on Houston, from both primary and secondary sources, were examined to determine the use of and demand for such service. In addition, the implications and implementation of the proposed changes on the existing specialized transportation services in Houston were evaluated by using information on existing ridership and service characteristics. The research findings should enable transit planners to better anticipate the future needs of the elderly and provide the services that are in demand. Because Houston is representative of the large urban environment, transportation planners in metropolitan areas should be interested in both its problems and solutions.

Specialized transportation for the elderly and handicapped has been in existence for more than a decade. It has gone through many transformations, which began with one to two bus operations run by volunteers and developed into larger operations run by a combination of paid and volunteer staff. Current systems can range from computerized scheduling of door-to-door services that are paid for by users and subsidized by public funds to the smaller operations that can include subcontracting to local taxi companies (1).

The urban elderly population was studied in this paper. That population is faced with many problems: social isolation, decreased purchasing power, increasing physical disability, and an increasing lack of transportation to access their service needs (2). While early research in this area has ranged from descriptive studies of systems and their service provisions to their financing mechanisms (3), more recent work has focused on issues of increased productivity, efficient management, and coordination of different types of public transit services (4). The push for coordination of services resulted from management concerns about decreased government subsidies, spiraling costs of special transportation, and the impact of various acts (e.g., Section 504), which reflect a growing demand by the handicapped for increased accessibility to public places by using public carriers (5).

The focus of this paper is on the role and significance of specialized transportation in a large urban area that exhibits many of the problems endemic to transportation for the el-

derly. Houston was selected as an appropriate city for this research. Here a substantial number of elderly individuals live within the city limits. They exhibit the typical characteristics of a growing elderly population: ethnic and cultural diversity, physical and social isolation, and decreasing purchasing power.

Houston's public transit service provisions including specialized transportation is examined. The findings are compared with data collected from a survey of the elderly in the city to evaluate their knowledge, use, and preferences for specialized and regular transit services.

## EXISTING SPECIALIZED SERVICES

Several North American cities are retrofitting their entire fleet to provide access to all but the wheelchair-bound and physically handicapped individuals. Houston is an example of such a system. Its special services (Metrolift) are available only to handicapped individuals. The elderly must use regular bus transport, although with a discount fare. To qualify for Metrolift service, a certificate of eligibility must be completed and signed by a physician. Those eligible must be permanently wheelchair bound, use crutches or a walker, be legally blind, or have ailments or treatments that severely affect ambulation. Exclusions are clearly stated on the eligibility card and range from conditions that can be treated with medication to any conditions of a passenger that are harmful to other riders. As a result of these eligibility criteria for Metrolift, an elderly rider may not necessarily have access to the Metrolift special services. The Metrolift Subsidy Program (MSP) for transportation by taxi is available as a substitute transport when Metrolift is not available, when the demand is outside the Metrolift service area but within the Houston city limits, or when both of these conditions are met. The Metrolift service is a door-to-door service with vehicles equipped with wheelchair lifts, serving 375 square miles within Harris County. The service provided an average of 53,000 one-way trips per month to a registered clientele of 24,000 individuals between October 1989 and March 1990 (6). The demand for service is increasing: an average of 150 reduced-fare card holders are registered each month. Demand is high among younger disabled people for various trip purposes, especially for work trips.

Although the eligibility criteria appear to be constant, some major changes have occurred in the area of advanced scheduling. In 1985, 6-day advanced scheduling of rides was required with vans dispatched from dispersed points. From May 1988 the advance time required was reduced to 24 hours and

resulted in a 22 percent increase in ridership. Current services include a door-to-door Metrolift service that requires 24-hour advance notice, mixed with 25 to 26 fixed-route paratransit services using Metrolift vehicles to specific major destinations such as the Texas Medical Center. The rides requested and provided show a distinct morning and evening peak, during which 710 disabled workers and dialysis patients use the Metrolift service.

### USER EVALUATION OF METROLIFT SERVICES

An evaluation of Metrolift services included an internal telephone survey of a sample of registered riders conducted during July and August 1987 (7). Survey results indicated an average of 2.2 rides per person per month. This was a decrease from the previous year, which may have resulted from a decrease in the number of persons who had purchased advance tickets.

Of the riders interviewed and carried by Metrolift, 21 percent were under age 55 and the remaining 79 percent were older. Thirty-five percent of the participants older than 55 were over age 75. Among the respondents, 23 percent had severe mobility problems and 38 percent had limited walking ability. Problems faced by Metrolift users were revealed in the survey results. Two examples are having to (a) make at least three telephone calls to connect with Metrolift telephone lines and (b) wait an average of 6 to 7 minutes before a telephone operator serviced calls. In addition, 50 percent of the riders were denied their first preference in ride schedule time. A lack of timeliness of pickups, late arrivals for appointments, and "no shows" of Metrolift vehicles appear to be recurring problem areas.

Of those who were interviewed, 43 percent were MSP riders, and the majority of them (86 percent) were satisfied with the service.

The findings indicated that a significant majority of handicapped workers use this service. The remaining capacity was being used by elderly handicapped persons primarily for medical trips, with some trips for recreation and shopping.

Although this review provided information on the registered riders, it did not provide any information on those who do not use or are not eligible for the Metrolift or MSP services. To complete the evaluation on specialized services available to the elderly in Houston, data on use, needs, and transportation preferences among the elderly that attend senior activity centers around the city were collected and analyzed.

### TRAVEL BEHAVIOR OF THE ELDERLY

A survey was undertaken in fall 1988 using a structured questionnaire. It included questions on current mode or modes of transport, users' perceptions and attitudes about alternative public transport modes, and service areas that need to be improved. A self-selected cluster sample of 224 individuals completed the questionnaire. The elderly individuals involved in the survey included the dominant minority ethnic groups represented in this city.

There were 97 male and 137 female respondents age 60 years or older (Table 1). Of the 224 total respondents, only 23 percent were handicapped (Table 2). Excluding physical disabilities, a majority of the handicapped respondents suffered from heart problems or high blood pressure, which alone would not make them eligible for Metrolift or MSP services. On the basis of eligibility requirements for Metrolift and MSP services, only about 50 percent of these individuals would qualify for special services.

Among the respondents, 79 percent lived inside the city limits and could access the special services if they qualified. In the sample, 37 percent had driver's licenses, 25 percent owned cars, and 17 percent had access to a car. Clearly, more than 60 percent of the sample were dependent on some form of public transportation. What is perhaps a significant problem affecting their need for travel is their occupational status. Only 15 percent worked full or part time and an even smaller percentage depended on the job for financial support (9 percent). Living arrangements and income level also help to explain their primary mode of travel apart from their occupational status. The majority of the sample have annual incomes below \$5,000 (58 percent) and 75 percent lived with someone. These two factors together help to explain why 45 percent used rides provided by others as the primary mode of transport (Table 3).

Although only a minority of the sample used any form of public transport, most were aware of the public transit systems. Hence responses to questions on levels of satisfaction with these services and on the service areas that need to be improved were surprising.

### EVALUATION OF EXISTING TRANSIT SERVICES BY THE ELDERLY

The most surprising response was to the question on the level of satisfaction to the existing transit services (Table 4). Of those responding to this question, only a small percentage

TABLE 1 DISTRIBUTION OF RESPONDENTS BY AGE AND SEX

Sex	Age (years)			No Reply*	Total
	60-69	70-79	80+		
Male	56	31	8	2	97
Female	72	43	12	0	137
Total	128	74	20	2	224

\*Two individuals did not respond to the question on age.

TABLE 2 TYPE OF HANDICAP BY SEX

Type of Handicap	Sex		Total
	Male	Female	
Heart/blood pressure	11	15	26
Hearing impairment	0	2	2
Physical disability	9	11	20
Eyes	0	0	0
Mental	0	1	1
<b>Total</b>	<b>20</b>	<b>29</b>	<b>49</b>

TABLE 3 PRIMARY MODE OF TRANSPORT

	Percent
Own Car	27
Taxi	1
Driven by others	45
Regular Transit	19
Metrolift	4
Walking and others	4
<b>Total</b>	<b>100</b>

expressed dissatisfaction. A detailed series of questions on which areas of service needed improvement produced strong responses in 30 to 40 percent of the sample. The areas believed to need improvement were door-to-door service, expansion of the neighborhoods covered, cheaper fares, and more frequent service. What is significant is the apparently low level of concern about security and safety on the buses and at the bus stops. Issues of language barriers and assistance to embark and disembark from buses appear to be even less important. Perhaps these results are biased because of the low use of existing transit services and hence are reflected by the relatively mild responses to questions on areas requiring improvements. Perhaps more meaningful are responses to the question on whether the existing transportation services restricted their mobility. Twenty-five percent of the respondents indicated that their mobility was restricted and 20 percent of these indicated a very strong restriction (Table 5).

If frequency of trips outside the home is analyzed, the elderly who live with someone appear to be more active outside the home; similarly, those with lower incomes make more trips. In general, the elderly as a whole make few trips and the greatest percentage get rides (Table 6). A possible explanation for this is the presence of a higher percentage of ethnic minority elderly individuals in the sample who live with their children. From the data in Table 6, it is clear that as the number of trips increases, a greater proportion of those trips are made by cars owned or driven by friends or relatives. When the data are grouped by trip number, taxi use shows up in a high frequency category because of either the use of illegal jitneys in the Hispanic neighborhoods or the presence of high income elderly individuals who can afford taxis. An anomaly is the limited use of Metrolift by this sample. This may result from the limited capacity available in Metrolift as well as the need for 24-hour advanced scheduling.

Information on use of existing transit did not yield much data in part because of the way the questions were formulated and in part because of a lack of information on these services.

The Metrolift service was known to 47 percent of this sample, and out of this group only 38 percent knew that it served only handicapped individuals. Other details such as the fare or the advanced booking requirement were known to just 20 percent of the respondents. Information on the MSP service was even more obscure, known by only 23 percent of the sample.

## LATENT DEMAND

A more useful response was to a question about how frequently and for what trips a door-to-door service would be used, if such a service was made available to all the elderly.

Most of the latent demand is for shopping, medical, and social trips. (See Table 7.) The most frequent latent demand is for medical trips up to 4 times a month. If this response is representative of the elderly in Houston, then clearly even if a door-to-door service were to be open and available to all the elderly, the demand per person would not very high and hence any fears of very high levels of government subsidies for this type of service may be exaggerated.

Latent trip demand for door-to-door services might be related to questions about dissatisfaction with the existing services. The responses showed that a significant minority avoided transit services because of infrequent service, too far a distance to walk to the bus stop, a lack of information on service, unsuitable routes, the long travel time, and the option of getting rides from someone or driving. Perhaps it is significant that the greatest demand for door-to-door trips occurs amongst the younger groups of the elderly, as expected, since they are likely to be physically more active and hence have the greatest desire to go out.

If the type of living arrangements of the elderly is evaluated against latent trip demand, it appears that those living with someone appear to generate the highest demand for door-to-door service. Single elderly people do have the next highest demand for this type of service, followed by a very small

TABLE 4 LEVEL OF SATISFACTION WITH TRANSIT SERVICES

	Percent
Very Satisfied	14.3
Satisfied	21.0
All right	21.2
Dissatisfied	13.4
Very Dissatisfied	1.8
<b>No Response</b>	<b>22.3</b>
<b>Total</b>	<b>100.0</b>

TABLE 5 PERCEIVED RESTRICTION OF MOBILITY

	Percent
Very Much	19.6
Somewhat	24.6
Not at all	4.0
<b>No Response</b>	<b>51.8</b>
<b>Total</b>	<b>100.0</b>



TABLE 6 TYPE OF MODE BY NUMBER OF TRIPS

Trips	Mode					
	Own Car	Rides	Taxi	Reg. Tran.	Metro-lift	Walk and Others
0-24	15.2	33.9	0	8.9	2.7	1.8
25-74	9.4	8.9	0	8.9	1.3	1.8
75-149	1.3	1.8	4	0	0	0
150+	1.3	0.4	0	1.3	0	0

TABLE 7 FUTURE DEMAND FOR TRIP TYPE BY DOOR-TO-DOOR SERVICE

Expected Frequency of Trips/ Months	Type					
	Shopping	Medical	Recreation	Social	Work	N/A
0-4	13.4	22.3	3.6	6.7	1.3	3.6
5-14	3.6	6.7	4.0	11.2	3.6	1.8
15-29	2.7	2.2	0.9	2.2	0.9	0
30-44	3.6	1.3	0	0.4	1.3	0
45+	0.4	0	1.3	0.4	0	0.4

TABLE 8 TRIP DEMAND BY OCCUPATIONAL STATUS

Number of Latent Trips	Occupational Status				
	Full Time	Retired	Part Time	Work at Home	No Response <sup>a</sup>
0-4	2.7	32.6	3.1	12.5	0
5-14	0.9	14.3	3.1	11.2	1.3
15-29	1.8	4.9	0	1.8	0.4
30-44	0.4	4.0	1.3	0.9	0
45+	0.9	0.9	0.4	0.4	0

<sup>a</sup>The percentage who did not respond to the question on occupation.

demand by the elderly who live in old age homes. A reason for the latter is the existence of other transport from these homes and a reduced need to go outside. For among the elderly, a significant percentage have alternative modes.

This trend is repeated and reflected in the data relating potential trips by a door-to-door service with occupational status (Table 8). The demand for door-to-door service by occupational status is not high in general. Among those who make use of such service, the greatest demand is from retired individuals or housewives or those who work at home and make only social or recreational trips. If income level is compared with latent trip demand, it can be seen that the lower the income, the greater the demand for a door-to-door service. The correlation is similar among the higher income elderly, who show the lowest demand for a door-to-door service. They are able to afford alternative modes such as taxis or to have goods delivered (Table 9).

A final evaluation of latent demand was made by comparing the primary transportation mode used by the elderly with their latent demand for a door-to-door service. Table 10 shows that the highest latent demand for door-to-door service comes from those who are driven, followed by a lower level of demand from those who drive or ride the transit service. This

demand may be for essential trip purposes, like medical appointments, for which a long bus ride or problems of parking a car may be a problem.

## SUMMARY AND CONCLUSIONS

Results from the Metrolift internal survey and the general survey of the elderly cannot be directly compared because of different methodologies for data collection and different sample populations. The internal survey combines responses from the elderly and those from young handicapped individuals. The Houston survey of the elderly conducted by the authors selected a different sample of elderly individuals. However, some of the findings can be combined to provide an overall assessment of the existing specialized services in Houston.

The existing Metrolift and MSP services do play a valuable role in providing transport for some of the elderly. However, because of the eligibility criteria, many elderly who would like to use this type service are unable to do so.

Regular transit services appear to be used by a very small percentage of the elderly because of several factors, including a lack of information, the distance to the bus stop, and frequency of service (i.e., long waits at bus stops).

TABLE 9 TRIP DEMAND BY INCOME CATEGORY

Number of Latent Trips	Income Category (\$1,000s)							N/A*
	<5	5-<10	10-<15	15-<20	20-<25	25-<30	30+	
0-4	28.6	11.6	4.5	2.2	0.4	1.3	0.9	1.3
5-14	20.5	5.4	1.8	0.9	0.9	0	0.9	0.4
15-29	3.6	2.2	1.3	1.8	0	0	0	0
30-44	4.0	1.8	0.4	0.4	0	0	0	0
45+	1.3	0	0.9	0.4	0	0	0	0

\*No response to the question on income category.

TABLE 10 TRIP DEMAND BY PRIMARY MODE OF TRANSPORT

Number of Latent Trips	Transport Mode						
	Own Car	Driver	Taxi	Reg. Bus	Metro- lift	Walk Other	No Response*
0-4	15.6	19.6	0	12.1	1.8	1.3	0.4
5-14	6.3	18.8	0.4	2.7	0.9	1.8	0
15-29	2.7	2.7	0	2.2	1.3	0	0
30-45	1.3	2.7	0	2.2	0	0.4	0
45+	1.3	1.3	0	0	0	0	0

\*No response to the question on primary mode used.

In general the demand for a door-to-door service exists primarily for essential trips by the lower income elderly, who are either retired, work at home, or are housewives.

As a result of the findings of both surveys, several recommendations can be made about the special services available in Houston, Texas. They are as follows:

- Alter eligibility criteria to include elderly, especially low-income elderly;
- Expand service area;
- Increase marketing of the service and provide detailed information targeted for the elderly;
- Improve telephone-ride reservation system; and
- Decrease "no shows" or delays of Metrolift vehicles.

These recommendations also have some direct bearing on the other public transport modes:

- **Retrofitting** of buses may not lead to higher use of regular buses by the elderly and hence may not be justified.
- The added cost of more open eligibility criteria for Metrolift and MSP services could be offset by savings from not retrofitting the regular buses.
- Contract use of taxis may be a cost-effective method of expanding the specialized transport services both in the number of people served and the area covered, especially in an expansive low-density city such as Houston.

In general the findings of this study clearly point to a need to evaluate the restrictive criteria for special services and the tradeoffs between retrofitting regular buses and expanding services to the elderly and handicapped urban population.

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# Regional Specialized Transportation: Assessment and Recommendations

SINA ZARIFI

Public transportation in the Puget Sound region of Washington State is provided for by seven transit agencies and the state ferry system. Through the Puget Sound Council of Governments, these providers cooperate to improve the regional public transportation system and to encourage intersystem use. This regional cooperation has not yet extended to providing for specialized transportation services. The Puget Sound Council of Governments formed a committee to study regional travel for specialized transportation users to appraise policies affecting specialized transportation and to promote service parity. The existing conditions, assessment findings, recommended policy direction, and implementation actions developed by the study group are reported in this paper. This study included the six-county area of Jefferson, King, Kitsap, Pierce, Snohomish, and Thurston counties, Washington.

Public Transportation in the Puget Sound region is provided for by seven transit agencies and the state ferry system. Through the Puget Sound Council of Governments (PSCOG), these providers encourage intersystem use. This regional cooperation in providing intercounty travel has not yet been reflected in the provision of specialized transportation services. It is difficult for the users of specialized transportation (elderly, disabled, or elderly and disabled) who need to cross county lines to receive service from local transportation service providers. Defined service areas of each transportation property have resulted in service denial to many of those who are crossing from one service area to another. Specialized transportation services, however, are not denied to most fixed-route users.

## BACKGROUND

The Transportation Operators Committee of the PSCOG formed a special task force to address the state of specialized transportation services in the Puget Sound Region. The task force also was to develop methods to facilitate the operation and administration of these services regionwide. The objective was to develop a regional system to provide specialized transportation services and, thereby, establish accessible regional travel for the user.

This report resulted from six months of assessment and includes specific findings, recommended policy direction, and implementation actions. The assessment covered specialized transportation services provided in the PSCOG's four coun-

ties—King, Kitsap, Pierce, and Snohomish—plus the adjacent counties of Thurston and Jefferson. (See Figure 1.)

## Approach

Several interagency issues were identified to develop alternatives and formulate recommendations for a regionally coordinated specialized transportation system. The task force selected eligibility criteria, trip reservation, and service delivery as priority issues.

For each issue, the task force developed several alternatives for regional coordination and cooperation and evaluated them on the basis of the following operational and administrative criteria:

- Customer responsiveness: Ability to ensure customer satisfaction with service quality, timeliness, ease of use, understanding of service, and service delivery.
- Regional marketability: Ease of presentation to the public; degree to which message and materials can be standardized, accepted, and understood.
- Cost investment: Additional investment required to implement alternatives.
  - Staff: Staffing requirements to support alternative.
  - Capital: Initial developments and implementation costs associated with alternative.
  - Operating: Ongoing service operating costs.
- Regional cost-effectiveness: Comparative estimates of the degree to which the benefits of development, implementation, ongoing operation offset the cost.
- Feasibility: Degree to which the present system can support the specific alternative.
- Ease of implementation: Overall practicality of choosing and implementing a specific alternative.
- Special consideration: Issues that will need to be addressed and resolved before a specific alternative can be recommended.

The alternatives generally ranged from autonomous administration to consolidated regional administrative responsibilities, including

- Status quo: Seven autonomous programs, informal cooperation, minimal coordination.
- Cooperation: Increased communication, information sharing, and consultation. May formalize cooperative activities through PSCOG or Washington State Department of Transportation. Maintain separate agency identity and policy-setting function.

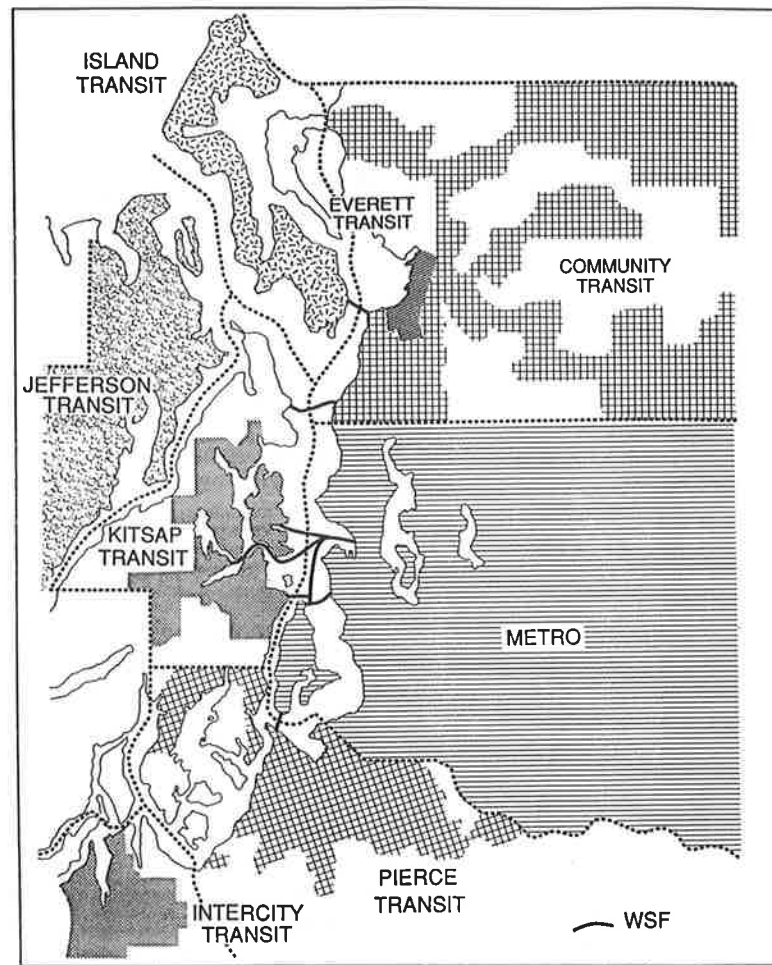


FIGURE 1 Public Transportation Operators Service Areas, Puget Sound Region.

- Formal coordination: Formal cooperation including inter-agency agreements to coordinate some services. All services remain independently administered.
- Standard regulations and policies: Formal agreement among agencies to establish regional and standard operational policies and regulations. Agencies will maintain separate identity and services will be administered independently.
- Single regional program: Centralized administration of services through a single local or regional agency or organization, which could be public, private nonprofit, or private sector.

## Results

Task force results included specific policy recommendations and implementation actions. The evaluation took a qualitative approach and the findings are derived on the basis of the collective experience and perspectives of the task force members. This paper is a report on the state of specialized transportation and its problems. Findings and recommendations for the establishment of a regionally coordinated program are also reported.

## OVERALL ASSESSMENT

### Definition

Specialized transportation in the Puget Sound region is defined as those transportation services provided to elderly or disabled persons. These services are provided by public transportation agencies directly or through contracts with private transportation providers. Specialized transportation services include the following: regional reduced-fare permit, accessible wheelchair lift-equipped service, and transportation by appointment (e.g., dial-a-ride, dial-a-van, and door-to-door van service).

### Existing Conditions

#### *Public Operating Programs*

Public transportation in the Puget Sound area of Jefferson, King, Kitsap, Pierce, Snohomish, and Thurston Counties is provided by seven transit agencies and the Washington State ferries. Specialized transportation services are provided as

TABLE 1 REGIONAL COMPARISON OF PUBLIC TRANSPORTATION SYSTEM

Agency	Service Area (Square Miles)	Population Served	Fleet Size (Fixed Route)	Annual Ridership (Millions)	Operating Budget (Millions)
Community Transit	1400	288,900	152	4.0	17.5
Everett Transit	30	70,000	33	1.3	4.0
Intercity Transit	91	94,000	40	2.2	6.3
Jefferson Transit	18	20,000	14	0.19	0.82
Kitsap Transit	132	144,200	101	2.4	6.1
Metro	2128	1,400,000	1,096	70.5	154.0
Pierce Transit	275	561,000	149	10.5	32.8

part of the public transit agencies' overall public transportation programs. (A directory of public and private specialized transportation providers within the six counties of Puget Sound area is available from the Information Center of the Puget Sound Council of Governments.)

The region's public transit systems vary in scale of operation and services. Table 1 shows the variations in service areas, ridership volumes, fleet sizes, and operating budgets. Each system operates independently under the governance of its respective board. As a result of this, policies and procedures such as eligibility criteria and service delivery vary widely. Table 2 provides a regional comparison of specialized transportation programs.

#### *Private Transportation Providers*

Specialized transportation services offered by the region's public transit agencies are provided primarily through contracts with private transportation operators. Throughout the Puget Sound region, several private operators provide a wide range of services, such as door-to-door or wheel-chair accessible services to those elderly or disabled persons unable to use fixed-route public transit.

#### *Need for Regional Coordination*

The existing public transit agencies' policies and regulations governing the provision of specialized transportation services make intercounty travel very difficult. The topography and growth pattern of the region require service providers to take many daily trips to cross several jurisdictions served by various transit systems (see Figure 1). These public transportation providers operate independently under the governance of their

respective boards. Each agency has its own procedures, eligibility criteria, and services. No formal authority exists to dictate coordinated services. Nonetheless, there is a strong commitment toward voluntary interagency cooperation. Through the PSCOG the region's public transportation agencies cooperate to accommodate intercounty travel. As fixed-route transit services are becoming increasingly available to cross-county travelers, regional specialized transportation services are not being provided for.

#### **Evaluation of Alternatives**

Several issues needed to be addressed to make recommendations for future regional specialized transportation service. Because each agency had its own eligibility criteria, different service hours, and requirements, extensive evaluation of potential complications and eventual compliance was necessitated. Confounding these issues was the reality that the extent of need or desire for regional specialized transportation services is unknown. For instance, although King County boasts a more extensive medical community than other counties, no provider knew the actual number of trips individuals from other counties would require for visits to these medical facilities. Since the service has not been offered, statistics were not available.

Each of the agencies, however, has on occasion arranged a regional specialized transportation trip. In most cases, this arrangement has occurred through numerous phone calls and exceptional consideration. At no time has this service been promoted; customers are encouraged to find other options.

Several interagency issues were identified for the development of alternatives and formulation of recommendations. Eligibility criteria, trip reservation, and service delivery were selected by the task force as priority issues that needed to be

TABLE 2 REGIONAL COMPARISON OF SPECIALIZED TRANSPORTATION PROGRAMS

AGENCY	SERVICE AREA	MAINLINE SERVICE			PARA-TRANSIT ELIGIBILITY REQUIREMENTS					PARA-TRANSIT TRIP RESERVATION				
		Accessible	% of Routes Accessible	% of Weekday Service Accessible	Minimum Qualifying Age	Senior Citizen Qualifying Age	Dr. Certification for All Registrants	Resident of County	Low Income Requirements	Trip Restrictions Based on Purpose	Limitation on the Number of Pre-Scheduled Trips	Hours Available for Reservation	Max. Advance Reservation	Min. Notice Required (hours)
Everett Transit	City of Everett	Yes	33.3%	17%	NA	NA	No	No, rider must be within the service area	No	Yes	1/2 hour for standing reservation	M-F 9am-3pm	72 hours	None
Jefferson Transit Authority	Port Townsend Eastern Jefferson Co.	Yes	50%	63.6%	NA	60	Yes	No	No	No	No	24 hours	1 week	1 hour
Metro	King County	Yes	64%	88.6%	18	65	For Disabled, Yes	Yes	70% of the State median income	No	Yes	M-F 9am-3pm	1 weeks	24 hours
Kitsap Transit	Kitsap County	Yes	15%	30%	NA	60	No	No	No	No	No	24 hours	24 hours	24 hours
Pierce Transit	Pierce PTBA	Yes	60% Weekday 100% Weekends	50%	NA	NA	Yes	No	No	No	To some extent - by % of total trips	M-F 6am-12am Sat-Sun 8am-12am	24 hours	NA
Community Transit	Snohomish County PTBA	Yes	52%	26.6%	< 6 years old must be accompanied by adult	65	No	No	No	No	No	M-F 6am-8pm	24 hours	No policy depends on availability
Intercity Transit	Thurston Co. Urban Area Olympia, Lacey, Tumwater	Yes	100%	99%	NA	60	For Disabled Only	No	No	Yes	No	M-F 7:30am-5:30pm Sat 10am-6pm	2 weeks	24 hours or same day
Washington State Ferries	King Co. Kitsap Co. Snohomish Co. Pierce Co. Island Co.	Yes	100%	100%	5 Years	65	Yes	No	No	No	No	No	NA	NA

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addressed and resolved. Various alternatives were examined to see which would best meet the goals of increasing customer responsiveness, marketability, and ease of implementation while not causing undue cost investment. Tables 3-5 provide the detailed evaluation for each issue area.

Examination of alternatives has resulted in the following options:

- Status quo: Limited options for direct intercounty specialized transportation services. Informal (albeit extremely infrequent) agency cooperation for intercounty trips. No real responsibility for coordination of intercounty trips although the resident transit agency takes on the responsibility when the customer cannot be persuaded to use another option.

- Voluntary cooperation: More formalized communication between transit agencies concerning intercounty travel needs. Intercounty trips continue to be provided by the existing agencies. Each agency maintains its own policy-setting function. Trips provided on a case-by-case basis. No marketing. Responsibility for coordinating trips rests with the resident transit agency.

- Formal coordination: Agencies enter into formalized agreements with neighboring agencies to clarify the type and

level of service to be provided. Intercounty trips continue to be provided by existing agencies. Each agency maintains its own policy setting function. Some marketing done by each agency. Responsibility for coordinating trips remains with the resident transit agency but could be shared with the customer.

- Standard policies and regulations: Formal agreement among agencies to establish regional standard operating policies and procedures for intercounty specialized transportation trips. Trips continue to be provided by the existing agencies that still maintain separate identities. Policy setting function might transfer to regional body. Marketing opportunities enhanced. Responsibility for scheduling intercounty trips could transfer to the customer.

- Single regional program: Centralized administration of intercounty specialized transportation services. Could function as direct provider, information broker, or a combination. Responsibility for coordination would rest with the regional agency.

**Regional Assessment Findings**

- Customer need and market potential for regional specialized transportation service exist; the volume is unknown

TABLE 2 (continued)

AGENCY	PARA-TRANSIT SERVICE DELIVERY							PARA-TRANSIT STATISTICS (1989)			
	Days of the Week	Hours of Service	On-Time Performance			Transit Fare Structure	% of Weekday Service Accessible	Coordination with Other Providers	Annual Riderships (One Way)	Annual Dollars Spent	Annual Wheelchair Trips
			Destination Drop-off	Return Pick-Up	How Measured						
Everett Transit	All	M-F 8a-5p S-S 9a-4p	Yes	Yes	By provider 16-30 min. 31-45 min. 46-60 min. 60 and more	Voluntary Donations	100%	Occasionally with DART and CT	37,475 (1988)	211,761 (1988 operation expenditure)	NA
Jefferson Transit Authority	M-F	M-F 10a-6p	NA	NA	On Complaint Basis	Pt. Townsend DAR \$ .60 Happy Bus Service \$3 RT	100%	Greyhound-Kitsap Transit DAR with para services	10,100	\$51,000	1212
Metro	M-F	7:30a to 5:30p	Yes	Yes	16-30 min. 31-45 min. 46-60 min.	\$.25 with regional reduced fare per unit	50%	Very limited	147,000	\$1,231,000	NA
Kitsap Transit	All	M-F 5:30a-9p S-S 9a-7p	30 min.	15 min.	Trip Sheets	\$.25 off peak \$.50 peak	61%	Clallam Tr. Jefferson Tr. Pierce Tr. WSF.	329,190	\$2,450,000	55,960
Pierce Transit	All	M-F 6a-12a S-S 8a-12a	0 minutes late for app/arrival time	Within 45 min. of ready-to-return	Large sample of all types of trips	Same as transit \$ .30 all times	100%	Very little other than with contractors	203,547 in 1988	\$1,850,179 (1988)	40,546 (1988)
Community Transit	M-F	M-F 8a-5p	30 min.	30 min.	Trip sheets	None (Donations)	87%	Contract with local taxi. None with other transit agencies	50,000	\$595,000	5,840
Intercity Transit	M-F	M-F 7a-5:30p Sat 10a-6p	0 Minutes Late For App/Arrival	Within 45 min. of ready-to-return	NA	Free/Donations	89%	Mason-Lewis-Thurston Area Agency on Aging	24,906 (8/88-7/89)	\$222,559 (8/88-7/89)	3,750 (8/88-7/89)
Washington State Ferries	All	9am to 2am	NA	NA	NA	Walk-on \$3.10 RT	100%	Metro on board in schedule coordination PT, CT, Metro	41,347	NA	NA

\*1 - Number of routes in system designated as accessible  
 \*2 - Office hours  
 \*3 - Guide lines  
 \*4 - Includes service to rural Thurston County and Mason County in cooperation with Area Agency on Aging

but expected to grow as the trend toward suburban and rural dwelling continues to expand.

- Regionally, specialized transportation services are not adequately or effectively responding to customer needs.

- Lack of consistent eligibility criteria, procedures, and service provision hinders ease of providing specialized transportation services between counties.

- Agencies need to resolve differences in eligibility criteria. These criteria differ for age, residency, income, and doctor certification.

- Agencies need to resolve the differences in trip reservation procedures. Agencies have differing restrictions for subscription trips, advance reservation notice, and hours when reservations will be taken.

- Agencies need to resolve the differences in service provision. Hours of service, fare structure, and wheelchair accessibility differ among the agencies.

- The Americans with Disabilities Act (ADA) will influence service provision throughout the Puget Sound region. (A summary of the ADA's sections pertaining to provision of public transportation is available from the Puget Sound Council of Governments.)

- With the passage of the ADA, agencies will be required to offer service comparable to fixed-route services. (Definition of "comparability" must be determined.)

- Some of the limiting factors included in eligibility criteria for specialized transportation services will no longer be valid.

**RECOMMENDATIONS**

**Recommended Policy Direction**

After careful consideration and evaluation of the various service options, formal coordination was selected as the preferred option. The task force determined that this option would provide a significant improvement in service over what is now available to specialized transportation customers. It would require clearly stated, standardized information about available service that would be useful, understandable, and marketable to customers. This option would be feasible and comparatively easy to implement because it balances cost-funding issues with the customer's need for service and recognizes local operational decisions and approaches, which

TABLE 3 ELIGIBILITY CRITERIA: REGIONAL EVALUATION

RANGE OF BASIC ALTERNATIVES	MINIMUM QUALIFYING AGE	SENIOR CITIZEN QUALIFYING AGE	DOCTOR CERTIFICATION	RESIDENT OF COUNTY	INCOME REQUIREMENT
Status Quo	*Partial consistency. *Independent minimum qualifying age: - Metro: Min. 18 - WSF: Min. 5 - CT: Min. 5, must be accompanied by adult.	*Minimum consistency. *Independent qualifying senior citizen age: - PT: Disabled Only.	*Minimum consistency. *Independent requirement.	*High level of consistency. - Metro requires within King County.	*High level of consistency. - Metro requires low income status
Cooperation	*Allow use if met other agency requirements.	*Allow use if met other agency requirements.	*Allow use of other agency services if met resident agency certification.		
Formal Coordination	*Letter of agreement to allow use and/or transfer without meeting other agency's age requirement. *No registration by other agencies required (case-by-case basis).	*Letter of agreement to allow use and/or transfer without meeting other agency's age requirements. *No registration by other agencies required (case-by-case basis).	*Resident agencies will register if person has already been certified by another agency. *Meets resident agency registration requirements, can use service.	*Letter of agreement to allow use of service by a non-resident	*Letter of agreement to allow use of service, regardless of income.
Standard Regulations & Policies	ALL AGENCIES	AGREE TO FOLLOW	SAME	POLICY AND	PROCEDURE
Single Regional Program	*No minimum age requirement. Same as fixed route.	*One senior citizen qualifying age.	*Certification will be required from disabled applicants only, using a standard regional criteria.	*No residency will be required.	*No income requirements.
ADA Requirements	None	None	None	None	None

TABLE 4 TRIP RESERVATION: REGIONAL EVALUATION

RANGE OF BASIC ALTERNATIVES	TRIP PURPOSE RESTRICTIONS	SUBSCRIPTION TRIPS	HOURS AVAILABLE FOR RESERVATIONS	MAXIMUM ADVANCE RESERVATION	MINIMUM NOTICE REQUIRED (HOUR)
Status Quo	* No restrictions; high level of consistency.	* High level of consistency with some limitation. * EF & PT with limitations based on % of total trips.	* Minimum consistency. * Each agency sets their own hours.	* Minimum consistency. * Each agency sets their own range.	* Minimum consistency. * Each agency sets their own hours.
Cooperation					
Formal Coordination	* Letter of agreement to provide service with no trip restrictions.	* Agreement among agencies to provide subscription trips, which access county lines.			
Standard Regulations & Policies	* All agencies agree to have the same policy & regulations.	* All agencies are to have the same policy and regulations.	* All agencies agree to have the same range.	* All agencies agree to have the same range	* All agencies agree to have the same range.
Single Regional Program	* No restrictions. Allow use for all purposes.	* Subscription trips limited to an agreed % of total service.	* Same hours and Days region wide.	* Same reservation notice across region.	* No minimum notice required.
ADA Requirements	* No restrictions. Allow use for all purposes.	None Specified	None Specified	None Specified	* Undetermined - 24, 6, 2 or not to exceed headways for applicable fixed route.



TABLE 5 SERVICE DELIVERY: REGIONAL EVALUATION

RANGE OF BASIC ALTERNATIVES	HOURS OF SERVICE	FARE STRUCTURE	PERCENT VEHICLES WHEELCHAIR ACCESSIBLE	COORDINATION WITH OTHER PROVIDERS
Status Quo	*Partial consistency. *Services available, for most part, during business hours (8-5). *50% of agencies offer service on weekends.	*No consistency.	*Partial consistencies.	*Minimum coordination, mainly within the county services.
Cooperation			*Provide accessible service as needed.	*Letter of agreement to allow travel within other counties, on case-by-case basis.
Formal Coordination	*Letter of agreement to provide service through a contract provider after regular service hours.	*Allow transfer with customer paying the difference. *Letter of agreement to accept the use of agency transfers, and set fare reimbursement system.	*Provide accessible service as needed.	
Standard Regulations & Policies	*Same policies and regulations.	*Same policies and regulations.	*Same policies and regulations.	*Same policies and regulations.
Single Regional Program	*Hours of service to be compatible with regular transit service.	*One single regional fare structure.	*All vehicles, new and refurbished, must be accessible.	*No coordination required due to availability of regional system.
ADA Requirements	*Comparable to fixed route.	*Either comparable to fixed route or not more than fixed route.	*All vehicles, new and refurbished, must be accessible.	*Transit agencies ultimately responsible for implementation whether administered singularly or jointly with other agencies

may differ among areas. Upon initiation of coordinated specialized transportation services, it would be easier to revise agreements to reflect unanticipated situations or changing conditions than it would be under a more aggressive policy alternative. It provides greater flexibility.

- Maintain individual agency commitment to specialized transportation services, including intercounty trips.
- Adopt formal coordination among agencies through the development and establishment of interagency agreements.
- Interagency agreements would address intercounty trips only.
- Agencies could maintain eligibility criteria, procedures, and service provision desired for nonintercounty trips.
- Develop equitable cost sharing arrangements for all intercounty trips.
- Determine the feasibility of developing a policy for equitable use of vehicles that have made an intercounty trip and are waiting for a return trip.
- Seek funding opportunities to support and develop regional specialized transportation services.

Note that the task force believes that this option should be looked at as a test (or a stepping stone) toward exploring an alternative that may be even more customer responsive, such as the standard regulations or single agency options. Formal coordination may allow for a test of the waters so that agencies

will know exactly what the market is and which of the options will best and most cost-effectively serve that market.

**Recommended Actions**

Establish a regional task force to develop formal coordination policies and agreements, which will ultimately provide intercounty specialized transportation services.

1. Determine the effect of the ADA upon specialized transportation services currently offered by each agency.
2. Evaluate eligibility criteria, procedures, and service provision and determine which levels of each are acceptable on a regional basis.
3. Evaluate effect of high capacity transit and privatization issues on specialized transportation.
4. Assess and evaluate the feasibility of direct service versus transfer service.
5. Develop an interagency agreement for provision of specialized transportation services that cross county lines.
6. Propose to providers a pilot project for provision of specialized transportation services.
7. Seek funding to help defray the costs associated with the provision of these services.
8. Create and implement a marketing plan that can be used by each individual agency to promote the pilot project.

9. Evaluate the effectiveness of the pilot project and recommend further action.

## GLOSSARY

**Americans with Disabilities Act (ADA)**—Signed into law in July 1990, the ADA is a comprehensive national mandate to end discrimination against individuals with disabilities. It was established to provide enforceable standards addressing discrimination against individuals with disabilities and to ensure that the Federal Government plays a central role in enforcing these standards on behalf of individuals with disabilities.

**Community Transit**—A public transportation provider operating within Snohomish County Public Transit Benefit Area (PTBA).

**Door-to-door service**—Transportation service between the precise trip origin and destination points, without interchange or the use of other modes.

**Dial-a-ride**—A demand-responsive system providing radio controlled dispatched door-to-door or point-to-point service.

**Disabled**—Any individual who, by reason of a medically determinable physical or mental impairment that can be expected to last for a continuous period of not less than three months, is unable without special facilities, planning, or design to utilize mass transportation facilities and services as effectively as persons who are not so affected.

**Elderly**—Persons age 65 and older.

**Everett Transit**—A public transit agency operating in the city of Everett, Washington.

**Intercity Transit**—A public transportation provider operating within Thurston County, PTBA.

**Jefferson Transit**—A public transportation provider operating within Jefferson County, PTBA.

**Kitsap Transit**—A public transportation provider operating within Kitsap County, PTBA.

**Municipality of Metropolitan Seattle (Metro)**—A public transportation provider for the city of Seattle and King County, Washington.

**Pierce Transit**—A public transportation provider operating within Pierce County, PTBA.

**Puget Sound Council of Governments (PSCOG)**—Metropolitan planning organization for the four county region of King, Kitsap, Pierce, and Snohomish.

**Puget Sound Region**—Includes the counties of Jefferson, King, Kitsap, Pierce, Snohomish, Thurston, and the operational service area of the Washington State Ferry System.

**Specialized Transportation**—Transportation services provided to elderly or disabled persons such as dial-a-ride, dial-a-van, and door-to-door wheelchair accessible service.

**Standing Committee on Transportation**—The transportation policy committee of the PSCOG, composed of local elected officials, representing the four county region.

**Transportation Operators Committee**—A technical committee of the PSCOG, composed of the region's public transportation providers, which addresses public transportation issues, explores, and implements opportunities for intersystem coordination and cooperation.

**Trip Purpose**—The primary reason for making a trip, such as work, shopping, and medical appointment.