Procedures and Experiences in Evaluation of Rural Highway Public Transportation Demonstration Program

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The Rural Highway Public Transportation Demonstration Program projects funded under section 147 of the Federal-Aid Highway Act of 1973 are being evaluated on the basis of an extensive reporting procedure. Three categories of information—statistical, narrative, and detailed passenger survey data—are being collected. Statistical data on project operating characteristics are collected monthly, and narrative reports are submitted each quarter, at the end of the first year, and as a final report. After Federal Highway Administration analysis, the monthly statistical data are summarized quarterly in computer-tabulation form and distributed back through the field offices and the states to the project personnel. One year (January-December 1977) of statistical data have been reported back to the projects by this mechanism. Peer groups have been established that contain projects that, based on population density and size of vehicle fleets, are similar. Although all projects are required to be able to meet the service needs of elderly and handicapped riders, some projects have been more successful than others. The predominant one-way trip purposes were work, shopping, and school and education. Data for the fourth quarter of 1977 showed that drivers' wages account for more than half of the operating costs. Eighty percent of the funding comes from federal sources, the states contribute 13 percent, and local and private agencies contribute 7 percent. The statistical-evaluation results were remarkably steady throughout 1977; no significant fluctuations were identified.

The evaluation of the Rural Highway Public Transportation Demonstration Program projects funded under section 147 of the Federal-Aid Highway Act of 1973 is based on an extensive reporting procedure. Computer-keyed data-collection forms are used to document the administrative and operating histories of the 2-year demonstration projects. Through this process, three categories of information—statistical, narrative, and detailed passenger survey data—are being collected and reported by the project staffs, transmitted through the states and the Federal Highway Administration (FHWA) field offices, and analyzed by FHWA staff.

EVALUATION REPORTING

Statistical data on project operating characteristics are collected monthly. Narrative reports are submitted that include a quarterly report, an annual narrative at the end of the first year, and a final report at the end of the demonstration period. These reports describe the progress of the project, and its management, problems, and solutions and all other relevant information. The survey of passengers is taken once during the life of each demonstration project at a time when ridership has stabilized and there is a high probability that a representative sample of operation exists.

After FHWA analysis, the monthly statistical data are summarized quarterly in computer-tabulation form and distributed through the FHWA field offices and the states to the project personnel.

Computer Tabulations

Statistical data for one year [or four quarters (January through December 1977)] of operations have been reported back to the projects by this mechanism. In the first quarter of 1977, statistics from eight projects were tabulated and, as expected, more and more projects were added as the year went on—the second quarter had 18, the third 26, and the fourth and latest 36. The processed data based on the last quarter of 1977 (October, November, and December) was the first to be separated into peer groups. Peer groups contain projects that, based on population density and size of vehicle fleets, are similar. Four major peer groups were established in this manner to include all the possible combinations of high and low density and high and low numbers of vehicles [where high-density projects have service-area densities of more than 19 persons/km^2 (50 persons/mile^2) and low-density projects have service-area densities of less than 19 persons/km^2 and high-number-of-vehicle projects operated more than four vehicles and low-number-of-vehicle projects operated four or fewer vehicles]. Three computer tabulations—trip statistics, cost and revenues, and performance measures—are provided for each project. Each tabulation has three headings for individual projects, peer groups, and national data comparisons. The national heading-line items contain data from all projects across the country that have reported usable data for that quarter. This format makes it possible for project personnel to compare their project-line-item averages, to possibly improve the efficiency of their internal management, or to contact, discuss, and exchange information with other rural transit managers who have projects in the same peer group or, for that matter, in other peer groups.

Evaluation Results

As described above, the most recent processed statistical data that have been distributed to the FHWA field offices, the states, and the project sponsors are based on the operating data reported to FHWA from the projects for the last quarter of 1977. The significant results and conclusions drawn from those data are described below.

Ridership

The number of passenger trips per quarter for this period ranged from a low of 365 (for a project that operates two vehicles) to a high of 53 347 (for a project that operates 31 vehicles). For the 36 projects, elderly riders made, on the average, 28 percent of the trips and handicapped riders made 19 percent of the trips. [The total percentage of elderly and handicapped riders is not the sum of these numbers (or 47) but somewhat lower because a person who is both elderly and handicapped is counted twice.] Although all projects are required to be able to meet the service needs of elderly and handicapped riders, some projects have been more successful than others.

If to-home trips are excluded, the predominant trip purposes were work, shopping, and school and education; these three made up about one-half of all trips, and the remainder includes trips to nutrition sites and for social and recreational, medical and dental, and other miscellaneous purposes. The results of the ridership survey are summarized below.

Parameter	Range	National Avg. (%)	Remarks
No. of passenger trips per quarter	365-55 347		
No. of elderly riders	0.0-85	28	
No. of handicapped riders	0.0-77	19	
Trip purpose			Work, shopping, and school and education

The 1972 study of transportation of the rural disadvantaged by Burkhardt (1) showed that the predominant trip purposes in the five states studied were also work, shopping, and school.

Costs and Revenues

Drivers' wages account for a little more than half the operating costs. Fuel, repairs, insurance, and dispatching are the other significant items and make up almost all of the remainder. Administrative costs, which are calculated separately, are predominant for supervisory labor (65 percent); office expenses (25 percent) are the other significant cost item in this category.

Operating revenue comes from a variety of sources, but the predominant ones are contracts (47 percent) and fares, passes, and contributions (48 percent). Revenues for the 36 projects averaged $0.52/passenger and covered about 17 percent of the operating and administrative costs.

Grants for the rural projects came from federal sources (80 percent), the states (13 percent), and local and private agencies (7 percent). These results are summarized below.

	Cause or Source			
	Predominant		Significant	
Parameter	Factor	Amount (%)	Factor	Amount (%)
Operating costs	Drivers' wages	50		
Administrative costs	Supervisory labor	65	Office expenses	25
Operating revenue	Contracts	47		
	Fares, passes, and contributions	48		
Grants	Federal funds	80	State funds	13
			Local and private funds	7

PERFORMANCE MEASURES

Performance or productivity measurements provide meaningful comparisons between projects and useful national rural transportation indicators. Several different performance measures (e.g., per vehicle travel, per vehicle time of service, per passenger trip, and per passenger travel) have been used to evaluate transit systems. All were used in these evaluations, and the results were compared with those of various other studies.

The average trip length found in these evaluations was 15.7 km (9.8 miles). This reflects the longer trips made on rural systems; on urban public transportation, the average work-trip length is 13.3 km (8.3 miles), and trip lengths for other purposes are lower.

The average vehicle capacity was 14.5, and the average amount of passenger travel per vehicle travel was only 2.1; thus, the load factors averaged 14.7 percent.

Operating cost measures varied considerably. Operating and administrative costs (i.e., all noncapital costs) averaged $3.16/passenger trip for the 36 projects. For comparison, Revis (2) has reported operating costs for van-type service for the transportation disadvantaged in rural areas that ranged from $3.50 to $7.50/passenger trip. For special services in urban areas, Revis estimated costs of $1.20 to $1.50/passenger trip. Operating costs per bus passenger for conventional urban transit averaged $0.54 in 1976 (3).

Operating costs (including administrative costs) averaged only $0.42/vehicle-km (0.68/vehicle mile) for the 36 projects. Costs reported by Revis (2) for rural projects were $0.31-0.43/vehicle-km ($0.50-$0.70/vehicle mile). Bruton and others in 1972 (4) reported similar costs for rural projects, i.e., $0.20-$0.37/vehicle-km ($0.33-$0.60/vehicle mile). McKelvey (5) has also reported similar costs. In 1976, operating costs for urban systems were $1.18/vehicle-km ($1.90/vehicle mile) (3). This reflects factors such as higher labor costs, lower speeds, and larger vehicles for urban operations.

For the 36 rural projects, operating costs averaged $0.20/passenger-km ($0.33/passenger mile). This is an important measure of performance but, unfortunately, few other programs or systems have collected similar information.

Fuel efficiency for the 36 projects averaged 7.4 passenger-km/L (17.1 passenger miles/gal), which divided by 2.1, gives 3.5 km/L (8.1 miles/gal). This is about as expected for a minibus or van (6) operating at an average speed of about 24 km/h (15 miles/h). Typical urban transit bus fuel efficiency is about 1.8 km/L (4.3 miles/gal) (7). These results are summarized in Table 1.

PEER-GROUP COMPARISON

Interestingly, there is a correlation between the operating data for the peer-group parameters and what all of us would intuitively think should be true. An analysis of the two parameters of population density and size of vehicle fleet for each of the groups indicates that, in higher density areas, operating and administrative costs tend to be lower, particularly for the larger vehicle fleets; the trip lengths, as expected, are shorter in the higher density areas and the shortest occur on projects that have the largest vehicle fleets; the number of work trips is noticeably higher in higher density areas.

REPORTING FORMS

As mentioned above, statistical information consisting of trip statistics, trip purposes, and costs and revenues are reported monthly by each project. The source document for the operating data (trip statistics and purposes) is the daily trip-sheet form that is filled out by the drivers at the end of each day. This is an optional form; i.e., its use is encouraged because it can supply all the data required by FHWA, but projects are also given the option of modifying the forms to suit their own individual operations. Many projects have taken this option, and it has worked out very well. From the daily trip forms, the project managers prepare monthly summaries of trip statistics and purposes and, from their cost-accounting records, they complete the FHWA cost-reporting (operating, administrative, and capital costs) and revenue (such items as fares, contracts, and contributions) forms. The information from these forms is used to make up

Table 1. Summary of performance measures.

Measure		Comparison		
Description	Value	Description	Value ($)	Reference
Trip length, km	15.7	Urban work-trip length, km	13.3	
Vehicle capacity, persons per vehicle	14.5			
Passenger travel per vehicle travel	2.1			
Load factor, %	14.7			
Noncapital cost, $/passenger trip	3.16	Rural operations for transportation disadvantaged, $/passenger trip	3.50-7.50	(2)
		Special services in urban areas, $/passenger trip	1.20-1.50	(2)
		Conventional urban transit, $/passenger trip (1976)	0.54	
Noncapital cost, $/vehicle-km	0.42	Rural operations for transportation disadvantaged, $/vehicle-km	0.31-0.43	(2)
		Rural projects, $/vehicle-km	0.20-0.37	(4)
		Rural projects	Similar	(5)
		Urban systems, $/vehicle-km	1.18	(3)
Operating cost, $/passenger-km	0.20			
Fuel efficiency, passenger-km/L	7.4			
Vehicle fuel efficiency, km/L	3.5	Urban bus fuel efficiency, km/L	1.8	(7)

Note: 1 km = 0.62 mile and 1 km/L = 2.4 miles/gal.

the computer tabulations. The computer is programmed to use an averaging technique to group similar projects and establish national quantities. It also performs mathematical functions such as division to calculate the performance measures.

RECORD KEEPING

Projects were selected based on information contained in proposals. Major areas that had to be addressed in these documents included planned routing and scheduling information, funding-source commitments and estimated budgets that identified line items for capital, administrative, and operating costs.

Once projects were given final approval by FHWA, the day-to-day details of the technical monitoring and contract administration were turned over to field offices. There is one FHWA division office in each state (they are all in the capital city of the state except the Iowa and Maryland offices, which are in Ames and Baltimore respectively).

From the viewpoint of FHWA, the organizational arrangement has generally worked well. Their local people are close to the scene for technical assistance, fund reimbursement, and field reviews. The strength of the local and state involvement has determined, in most cases, the role these local people have played. For example, state auditors have assisted project managers in establishing acceptable bookkeeping and record keeping systems. This is particularly important for federal auditing sanction of funds reimbursement.

The FHWA division office personnel did request that they be informed of project changes from the approved proposals. However, they were very flexible about this and, for the most part, evaluated only major changes (usually based on project and state recommendations) and left minor decisions for the projects to make.

The projects also sent monthly progress requests for payment through the states to the FHWA division offices, which have had full authority to approve the requests.

CONCLUSION

It is encouraging and reassuring that the results of the statistical evaluations were remarkably steady throughout 1977, and no significant fluctuations were identified.

REFERENCES

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