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Guidebook: Managing Operating Costs for Rural and Small Urban Public Transit Systems

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About This Guidebook

This guidebook is a resource for rural and small urban transit agency managers to use in better understanding, predicting, and managing operational costs. Doing so can improve the efficiency, effectiveness, and sustainability of public transit in the community served. The guide is a framework for assessing current transit agency operating costs and tools to predict future costs and is presented in three parts.

Part 1 introduces the fundamentals of transit operating costs and discusses what drives them.

Using real-world examples, part 2 looks at the impact of component costs on an agency's bottom line to help managers prioritize where to optimize spending to get the biggest bang for their buck. Part 3 provides practical tools to help managers allocate costs by service type and conduct market analyses to improve services offered consumers.

Part 1 Understanding Transit Cost Fundamentals	Part 2 Strategies for Optimizing Transit Costs	Part 3 Tools and Resources
Fundamentals of Transit Costs Calculating Transit Cost Drivers	Staff: Managing Shifts, Manage Costs Maintenance: Vehicles and State of Good Repair Buying Fuel and Managing Consumption Contracting for Transit Services No-Shows: Minimizing No-shows and Late Cancellations Future Trends and Forward Thinking Approaches	Allocating Costs by Service Type Leveraging What You Know Peer Comparison and Benchmarking Appendix: Sources by Cost Area

Why This Guidebook Now?

The national economy is tight in all sectors, public and private. Transit agencies, like everyone else, are trying to do more with less.

Ironically, demand for transit services in rural and small urban communities has never been higher. Individuals are relying more on transit to get where they're going. One example comes from the fact there is a larger share of individuals age 65 plus living in rural areas. More senior citizens living farther away from services typically means more demand on rural transit to get to necessary destinations—from the grocery store to the family doctor. More generally speaking, transit services are vital for many Americans to have access to jobs, education, services, health care, and recreation. Yet, as demand is rising, the gap between the cost for providing transit services and the dollars available to fund them is also widening.

Obviously, transit agency managers must balance their decisions for how to deliver needed services to consumers with the costs for delivering those services. Service delivery options can include fixed-route, flex-route, commuter service, demand-response, and options such as van pools; influencers on costs include demographics, constructed and natural environments, road configurations, and economic trends. All these factors impact the cost effectiveness of

providing transit services. Having a good understanding of what drives costs and market demand can help managers make better decisions when it comes to balancing finite resources with providing the best services possible to their consumers.

To develop the contents of the guidebook, the authors researched existing literature and analyzed Texas transit district operating costs by line item, function, and cost driver.

To determine lessons learned for containing transit operating costs, the authors queried representatives from more than 13 transit agencies across Texas in both rural and state-funded urban transit agencies. The current guide's organization reflects the priorities identified by these agencies. The guide presents real-world examples derived from respondents' anecdotes to illustrate best practices for the reader.

PART I

Understanding Transit Cost Fundamentals

Chapter 1.
Fundamentals of Transit Costs

Management Steps for Establishing Good Cost Reporting

1. **Agree on an overall approach and accounting structure**
2. **Create standardized definitions and data collection procedures**
3. **Apply a common chart of accounts**

(*1*)

To provide efficient, effective services to consumers, transit agency staff need to first understand what they're doing well and where they need improvement. Gathering this information in the form of data is the first step. Complete, reliable cost data—reported consistently—can be the basis for positive organizational change.

Setting standards to achieve high-quality reporting enables managers to understand, predict, and better manage program operations.

Establishing a framework for reporting service costs can help with:

- **Analysis.** Highlight low-performing and high-performing areas, thus aiding in day-to-day decision making.
- **Assessment.** Use your analysis results to guide short- and long-term planning when determining service delivery and operating strategies.
- **Accountability.** Accurately and consistently report your agency's performance to stakeholders, demonstrating the efficient use of funds

and justifying budget requests for maintenance, development, and enhancement of public transit in your community.

Complete, reliable cost data—reported consistently—can be the basis for positive organizational change.

Consistency is key to generating reliable data about your agency's operations. Achieving consistency requires a uniform approach to gathering data, the kind of data gathered, and the way in which they're reported. A lack of uniform reporting standards often results in incomplete or inconsistent statements of a program's costs and services (*1*). Once you've established a good framework for reporting costs, you can consistently review costs, identify cost trends, compare costs, predict cost changes, and provide accountability, all of which can lead to cost-effective transit services for your community.

The following elements comprise an effective cost-reporting and management framework:

- Report **all expenses** to identify the total cost to provide transit services.
- Report service **passengers, miles,** and **hours** to match the same time period costs. Matching costs to services enables managers to calculate accurate cost-effectiveness measures such as cost per passenger, cost per mile, and cost per hour.
- Create standardized and agreed-upon **definitions** and **data collection procedures** to record and report on a consistent basis.
- Report costs using a **standard chart of accounts** provided in the Uniform System of Accounts (USOA), the public transportation industry standard for the Federal Transit Administration (FTA) National Transit Database (NTD).
- Report costs using the **accrual method of accounting** (as required by the USOA).
- **Separate capital costs** from program operating costs.
- **Assign costs to functions** (e.g., transit operations, maintenance, administration) and **modes** (e.g., fixed-route, demand response).
- Calculate overhead and indirect cost rates.

Resources

The Uniform System of Accounts (USOA)
http://www.ntdprogram.gov/ntdprogram/pubs/reference/USOA.pdf

NCHRP Research Results Digest 373
http://www.trb.org/Publications/PubsNCHRPResearchResultsDigestsAll.aspx

The National Cooperative Highway Research Program (NCHRP) Research Results Digest 373, *A Toolkit for Reporting Rural and Specialized Transit Data – Making Transit Count*, is a good source of standardized definitions and data collection procedures. The toolkit provides detailed definitions and data collection procedures

for reporting both operating and financial data, as well as collection examples and common reporting errors.

Accounting Practices in Transit Agencies

Reporting accurate, complete operational expenses can show you the *true cost* of doing business on a daily basis. This might seem obvious, but many agencies are used to only reporting those expenses allowable for grant reimbursement.

Recipients of grant funds are required to follow certain rules and procedures and understand the difference between capturing allowable costs for grant reimbursement and total costs. Allowable and unallowable expenses can be found in the National Archives and Records Administration, Office of Management and Budget Guidance for Grants and Agreements, which consolidates all circulars relating to financial and audit guidance for any federal grants into Title 2 of the Code of Federal Regulations.

Reporting accurate, complete operational expenses can show you the *true cost* of doing business on a daily basis.

Resources

Electronic Code of Federal Regulations
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl

OMB Circulars A-87, Cost Principles for State, Local and Indian Tribal Governments
http://www.whitehouse.gov/omb/circulars_a087_2004

However, operational decisions based on these limited data can lead to inefficient operations. Reporting the full cost means capturing all resources used to provide transit services. Examples include:

- All expenses, not just direct, out-of pocket expenses (e.g., wages, fuel, maintenance).
- Any in-kind goods or services.
- Overhead and indirect costs, including costs shared with a parent organization (e.g., the county or city), and costs like legal services, administrative support, data processing, billing, and purchasing.

Not including all expenses yields incomplete data for analyzing your cost of doing business. Any performance measure—such as cost per passenger board, cost per mile, or cost per hour—aimed at capturing agency expenses will, therefore, be inaccurate. Failing to capture your real cost of doing business can also result in negotiating inaccurate rates for purchased transportation agreements, as well as result in severe financial shortfalls.

Two Methods of Recording Expenses

There are two accounting methods for transit agencies to use in recording expenses: *cash-basis accounting* and *accrual accounting*. The key difference between them is how and when financial transactions are recorded. NTD requires accrual accounting to ensure that revenues and expenses are properly matched to the services provided and passengers served.

Cash-Basis Accounting

Record expenses when the cash is actually paid out; record revenue when the cash is actually on-hand or in a bank account.

Accrual Accounting

Record expenses when incurred, even if services or supplies have not yet been paid for. For example, under accrual accounting, a fuel expense is booked in the accounting period in which the fuel is used (matching the time-period when the service is performed), not in a future period when the bill is actually paid (see chapter example).

Note: The USOA requires accrual accounting; or, in the case of transit agencies using cash-basis or encumbrance-basis accounting in whole or in part, that the agencies make work sheet adjustments to record the data on the accrual basis as described in the USOA (see chapter resource).

Operating vs. Capital Expenses

Operating costs refer to costs typically consumed within the year to operate services. Capital costs are associated with long-term transit agency assets.

Operating Expenses

These expenses include labor, fringe benefits, materials and supplies (e.g., fuel), maintenance, office space, equipment, and administrative costs. Administrative costs support the performance of a program's basic function of providing transit service but can be more difficult to quantify if your agency is a part of a larger organization.

Capital Expenses

These expenses apply to long-term acquisitions and leases of physical assets such as buses, garages, and maintenance facilities. NTD defines capital expenses as costs exceeding $5,000 or any capitalization value established by local government.

Example: Accrual Accounting

Your transit agency uses 1,000 gallons of fuel worth $4,000 to provide services in June. You record $4,000 in expenses for fuel in June, whether or not actual payment or reimbursement occurred in the same month.

Note: An *operating* expense eligible for reimbursement as a *capital* expense rate for grant purposes is still reported as an operating expense.

Common Chart of Accounts

Establishing a common *chart of accounts* (COA) is necessary to effectively track costs. The NTD requires the agencies to use the USOA COA. The USOA contains the accounting structure required by federal transit laws, as mentioned, and requires the accrual method of accounting.

A COA brings uniformity to expense tracking for a transit agency. A COA's key strength lies in establishing expense classes, typically in line with USOA classes. Detailed operating expense classes typically include the following:

- Labor.
- Fringe benefits.
- Services.
- Materials and supplies.
- General administrative expenses (allocated central services, if applicable).
- Utilities.
- Casualty and liability costs.
- Taxes.
- Purchased transportation.
- Miscellaneous expenses.
- Interest expenses.
- Leases and rentals.

Each expense class may contain detailed subcategories. For example, the category "labor" could have separate entries for drivers, administrators, dispatchers, and mechanics. Some transportation agencies have separate expense categories for salaries paid for training or overtime. Other useful expense categories include indirect expenses (for multi-service agencies providing transportation and other services), expense transfers, and interest expenses (*1*).

> Establishing a common *chart of accounts* is necessary for effectively tracking costs.

Example Chart of Accounts

Use the COA as a baseline to analyze, budget, and compare costs to other transit agency peer groups. Doing so provides a real-world context in which to evaluate the effectiveness of your own operations.

Using the USOA expense class categories, Table 1-1 illustrates a COA with line-item operating costs for the fictional Anytown Transit Agency. Line-item costs are categorized into major class categories such as labor, fringe benefits, and services. The percentage of each line item can be calculated to identify how the agency is spending its budget. Evaluating current operating costs by line item and comparing that information to historical trends is helpful in explaining budget needs to stakeholders and identifying where costs are changing (and, potentially, why).

Table 1-1. Anytown Transit Agency Chart of Accounts.

USOA Object Class Expenses	Total	% of Total
Total Operating Costs	**$1,318,000**	**100.0%**
501. LABOR		
01. Operator Salaries and Wages	$400,000	30.5%
02. Other Salaries and Wages		
Dispatch Salaries and Wages	$60,000	4.6%
Operations Supervision Salaries and Wages	$30,000	2.3%
Maintenance Salaries and Wages	$35,000	2.7%
Administration Salaries and Wages	$110,000	8.4%
502. FRINGE BENEFITS		
Fringe Benefits	$70,500	5.4%
13. Uniform and Work Clothing Allowance	$1,000	0.1%
503. SERVICES		
03. Professional and Technical Services	$40,000	3.0%
05. Contract Maintenance Services		
Vehicle Maintenance	$100,000	7.6%
Building Maintenance	$21,000	1.6%
99. Other Services		
Training	$6,000	0.5%
Drug and Alcohol Testing	$3,000	0.2%
Background Checks	$1,000	0.1%
504. MATERIALS AND SUPPLIES CONSUMED		
01. Fuel and Lubricants	$250,000	19.1%
02. Tires and Tubes	$15,000	1.1%
99. Other Materials and Supplies		
Vehicle Equip. and Parts Supplies	$10,000	0.8%
Other Equipment and Supplies	$3,000	0.2%
Office Equipment	$10,000	0.8%
Admin. Supplies	$3,000	0.2%
505. UTILITIES		
Telecommunication	$20,000	1.5%
Utilities	$25,000	1.9%
506. CASUALTY AND LIABILITY COSTS		
General Liability	$2,000	0.2%
Auto Liability	$34,000	2.6%
Physical Damage	$5,000	0.4%
507. TAXES		
05. Fuel and Lubricant Taxes	$37,500	2.9%
508. PURCHASED TRANSPORTATION SERVICE		
Purchased Transportation	$0	0.0%
509. MISCELLANEOUS EXPENSES		
02. Travel and Meetings	$2,000	0.2%
08. Advertising/Promotion Media	$10,000	0.8%
99. Other Miscellaneous Expenses	$2,000	0.2%
512. LEASES AND RENTALS		
03. Passenger Parking Facilities	$6,000	0.5%
12. Other General Administration Facilities	$6,000	0.5%

Percentage of Operating Costs by Selected Line Item

Understanding the largest drivers of line-item operating costs is a necessary first step in managing overall costs. Table 1-2 provides a sample of rural transit districts and a summary of Texas transit districts that directly operate transportation (i.e., do not purchase transportation) reported to NTD in FY 2010. The table compares costs for directly operated agencies, which have lower labor costs due to the inclusion of labor expenses in the purchased transportation category.

The four largest line-item categories for the transit agencies are summarized here and represent approximately 70 to 90 percent of a transit agency's budget.

- **Salaries and wages.** Since transit is so labor intensive, this category is the most significant driver of a transit agency's operating budget.
- **Fringe benefits.** This category (which includes health insurance) is usually the second highest drivers of costs. Rural transit districts appear to provide a lower amount of benefits, which accounts for the relatively low percentage of fringe benefit costs in these districts.
- **Services**. Services include contract maintenance costs and often reflect the amount of maintenance conducted outside the district. As shown in the table, limited eligibility and rural providers have a lower percentage of service costs.
- **Fuel and lubricants**. These expenses represent a higher proportion of overall costs for rural transit districts, reflecting the longer distances traveled by agency vehicles.

Table 1-2. Line-Item Cost for Texas Transit Agencies That Directly Operate All Service (Sample of Rural and FY10 NTD Urban Transit Districts in Texas)

Operating Expense Category	State-Funded Urban (10 Agencies)	Dual Rural/Urban (5 Agencies)	Limited Eligibility Providers (2 Agencies)	Rural (10 Agencies)*
% Operating Expense	**100%**	**100%**	**100%**	**100%**
Operator's salaries/wages	26.9%	27.0%	44.6%	39.0%
Other salaries and wages	17.5%	16.6%	12.5%	13.0%
Sub-total salaries and wages	**44.4%**	**34.6%**	**57.1%**	**52.0%**
Fringe benefits	19.5%	16.0%	20.2%	14.0%
Services	10.7%	12.6%	1.8%	2.0%
Fuel and lubricants	10.4%	12.3%	12.7%	17.0%
Tires and tubes	0.7%	0.9%	1.8%	2.0%
Other materials/supplies	9.0%	4.1%	4.2%	3.0%
Utilities	1.5%	1.4%	0.7%	2.0%
Casualty and Liability Costs	2.5%	2.3%	1.3%	4.0%
Purchased Transportation	0.0%	0.0%	0.0%	0.0%
Miscellaneous Expenses	1.2%	6.9%	0.2%	4.0%
Leases and Rentals	0.1%	0.1%	0.0%	0.0%

*Based on 13 rural transit district respondents

Chapter 1: What to Remember

Complete, reliable cost data—reported consistently—can help you create positive organizational change by helping you understand how you're spending your agency budget. Tracking costs empowers you to analyze, assess, and provide accountability for your services to staff, consumers, and funding sponsors alike. Reporting accurate, complete agency expenses can show you the *true cost* of doing business on a daily basis.

Recording cost information consistently is key to creating positive change. Achieving consistency in recording your agency's information requires a uniform approach to gathering data, the kind of data gathered, and the way in which they're reported. Federal regulations prefer the accrual accounting method and require that recipients of grant funding follow certain rules and procedures when reporting information. This requires that you understand the difference between capturing allowable costs for grant reimbursement and total costs.

Establish a common *chart of accounts* (COA) to effectively categorize and track agency costs. *Operating costs* are typically consumed within the year to operate services; *capital costs* cover expenditures for long-term agency assets (e.g., a bus). By categorizing costs, you can analyze how

different aspects of your agency expenses (e.g., staff payroll, fuel purchases, bus purchases) impact your overall budget. You can also use the COA as a baseline to analyze, budget, and compare costs to other transit agency peer groups. Doing so provides a real-world context in which to evaluate the effectiveness of your own operations.

References

1. J. Burkhardt, R. Garrity, K. McGehee, S. Hamme, K. Burkhardt, C. Johnson, D. Koffman. TCRP Report 144 - *Sharing the Costs of Human Service Transportation.* Transportation Research Board, Washington, D.C., 2011.

Chapter 2.
Calculating Transit Cost Drivers

Breaking expenses down into manageable categories can help you understand what drives operating costs. This is done through a series of steps using your agency's chart of accounts (COA). Using the formulas presented in this chapter, you can then use the costs captured in the COA to help you fine tune how you manage your agency's budget.

Steps to Determine Driver Costs	Process
1. Assign Costs to Functions	Use COA categories to assign costs for each transit function (e.g., operating, maintenance, administration, purchased transportation, and planning)
2. Categorize Variable and Fixed Costs	Decide which costs are variable and fixed; then determine a variable-plus-fixed-cost formula to evaluate the cost implications of changing service levels or to set pricing for new services
3. Determining the Agency Cost Formula	Determine your agency's cost formula; then run scenarios using values from your COA to determine how changing service levels will affect your budget

Assigning Costs to Functions

You can assign costs from the COA to functional areas like operating, maintenance, administration, purchased transportation, and planning. Functional areas represent a set of line item expenses and cost drivers. Transit staff supervisors are often held accountable for costs by functional area.

Table 2-1 shows the assignment of operating costs by function for Anytown Transit Agency (ATA). Note that simply classifying these costs for ATA has already identified 501.01 (Operator Salaries and Wages) as the single highest line-item expense for the agency. Breaking 501.02 (Other Salaries and Wages) into subcategories gives you even more insight into how you're spending funds. For example, you might decide that more maintenance funding is needed and that, potentially, you could reallocate some funding for dispatch salaries to cover that need. Assigning costs to functions can help in creating more realistic budgets by enabling you to compare actual costs against projected costs in your budget.

Table 2-1. Assigning Costs to Functions.

USOA Object Class Expenses	Total	Operating	Maint.	Admin.	Purch. Transp.	Planning
Total Operating Costs	**$1,318,000**	**$892,500**	**$176,500**	**$236,000**	**$0**	**$13,000**
501. LABOR						
01. Operator Salaries and Wages	$400,000	$400,000				
02. Other Salaries and Wages						
Dispatch	$60,000	$60,000				
Operations Supervision	$30,000	$30,000				
Maintenance	$35,000		$35,000			
Administration	$110,000			$100,000		$10,000
502. FRINGE BENEFITS						
Fringe Benefits	$70,500	$27,000	$10,500	$30,000	$0	$3,000
13. Uniform and Work Clothing Allowance	$1,000	$1,000				
503. SERVICES						
03. Professional and Technical Services	$40,000			$40,000		
05. Contract Maintenance Services						
Vehicle Maintenance	$100,000		$100,000			
Building Maintenance	$21,000		$21,000			
99. Other Services						
Training	$6,000	$5,000		$1,000		
Drug and Alcohol Testing	$3,000	$3,000				
Background Checks	$1,000	$1,000				
504. MATERIALS AND SUPPLIES CONSUMED						
01. Fuel and Lubricants	$250,000	$250,000				
02. Tires and Tubes	$15,000	$15,000				
99. Other Materials and Supplies						
Vehicle Equip. and Parts Supplies	$10,000		$10,000			
Other Equipment and Supplies	$3,000	$3,000				

USOA Object Class Expenses	Total	Operating	Maint.	Admin.	Purch. Transp.	Planning
Office Equipment	$10,000			$10,000		
Admin. Supplies	$3,000			$3,000		
505. UTILITIES						
Telecommunication	$20,000			$20,000		
Utilities	$25,000	$15,000		$10,000		
506. CASUALTY AND LIABILITY COSTS						
General Liability	$2,000			$2,000		
Auto Liability	$34,000	$34,000				
Physical Damage	$5,000	$5,000				
507. TAXES						
05. Fuel and Lubricant Taxes	$37,500	$37,500				
508. PURCHASED TRANSPORTATION SERVICE						
Purchased Transportation	$0					
509. MISCELLANEOUS EXPENSES						
02. Travel and Meetings	$2,000			$2,000		
08. Advertising/Promotion Media	$10,000			$10,000		
99. Other Miscellaneous Expenses	$2,000			$2,000		
512. LEASES AND RENTALS						
03. Passenger Parking Facilities	$6,000	$6,000				
12. Other General Administration Facilities	$6,000			$6,000		

Categorizing Variable and Fixed Costs

This section provides steps to follow in assigning dollar values to variable and fixed costs in order to develop a cost formula.

Assigning Variable and Fixed Costs

Variable costs change when services change (e.g., driver wages, fuel costs, and maintenance costs). **Fixed costs** do not vary when services change (e.g., administrative salaries, insurance, and professional services).

A cost formula is useful to:

- Estimate the price of a service expansion.
- Estimate the savings resulting from a service reduction.
- Determine the overhead rate of a service.

To determine a cost formula, first determine if the COA line-item costs are fixed or variable costs. There are no mandatory rules for assigning dollar values to variable and fixed costs, but as a general rule, administrative costs are almost always fixed. The key is to be consistent and logical, understanding the basis of each cost item and assigning them accordingly.

Two Primary Drivers of Costs: Hours Driven and Miles Driven

You can use cost allocation methodology to determine costs by service types. Specifically, a methodology based on hours and miles of service (rather than passengers) captures the trip length cost difference, which is useful to have when running scenarios related to increasing or decreasing service levels to determine impacts on your budget. Variable costs can be linked to either one of two service variables: *hours driven* or *miles driven* (*1*). These two service variables are the two primary drivers of transit costs. Variable costs can be assigned to either of these variables. Miles-driven costs are typically maintenance and fuel/lubricant expenditures because they correlate with the number of miles driven by transit vehicles. Hours-driven costs typically involve operating expenditures excluding fuel/lubricants. The majority of hours-driven costs are driver labor costs. Hours-driven costs are closely associated with hours of labor to provide service.

> The two primary drivers of transit costs are the variable costs *hours driven* and *miles driven*.

To assign allocation variables, determine how and why expense items vary. For example, driver salaries and wages increase as service hours increase; maintenance expenses, on the other hand, depend on the amount of miles driven.

Table 2-2 shows the assignment of line-item costs for ATA in terms of variable or fixed costs. The table classifies the variable costs as either mile driven or hours driven. Once costs are assigned, a fixed-cost overhead rate, cost per mile, and cost per hour can be calculated. These are the three factors in the cost formula that forms the basis for calculating agency expenses.

Table 2-2. ATA's Assignment of Fixed and Variable Costs.

USOA Object Class Expenses	Total	Fixed Cost	Variable Costs	
			Miles-Driven Costs	Hours-Driven Costs
Total Operating Costs	**$1,318,000**	**$276,000**	**$500,000**	**$542,000**
501. LABOR				
01. Operator Salaries and Wages	$400,000			$400,000
02. Other Salaries and Wages				
Dispatch	$60,000			$60,000
Operations Supervision	$30,000			$30,000
Maintenance	$35,000		$35,000	
Administration	$110,000	$110,000		
502. FRINGE BENEFITS				
Fringe Benefits	$70,500	$33,000	$10,500	$27,000
13. Uniform and Work Clothing Allowance	$1,000			$1,000

USOA Object Class Expenses	Total	Fixed Cost	Variable Costs	
			Miles-Driven Costs	Hours-Driven Costs
503. SERVICES				
03. Professional and Technical Services	$40,000	$40,000		
05. Contract Maintenance Services				
Vehicle Maintenance	$100,000		$100,000	
Building Maintenance	$21,000	$21,000		
99. Other Services				
Training	$6,000	$1,000		$5,000
Drug and Alcohol Testing	$3,000			$3,000
Background Checks	$1,000			$1,000
504. MATERIALS AND SUPPLIES CONSUMED				
01. Fuel and Lubricants	$250,000		$250,000	
02. Tires and Tubes	$15,000		$15,000	
99. Other Materials and Supplies				
Vehicle Equip. and Parts Supplies	$10,000		$10,000	
Other Equipment and Supplies	$3,000		$3,000	
Office Equipment	$10,000	$10,000		
Admin. Supplies	$3,000	$3,000		
505. UTILITIES				
Telecommunication	$20,000	$20,000		
Utilities	$25,000	$10,000		$15,000
506. CASUALTY AND LIABILITY COSTS				
General Liability	$2,000	$2,000		
Auto Liability	$34,000		$34,000	
Physical Damage	$5,000		$5,000	
507. TAXES				
05. Fuel and Lubricant Taxes	$37,500		$37,500	
508. PURCHASED TRANSPORTATION SERVICE				
Purchased Transportation	$0			$0
509. MISCELLANEOUS EXPENSES				
02. Travel and Meetings	$2,000	$2,000		
08. Advertising/Promotion Media	$10,000	$10,000		
99. Other Miscellaneous Expenses	$2,000	$2,000		
512. LEASES AND RENTALS				
03. Passenger Parking Facilities	$6,000	$6,000		
12. Other General Administration Facilities	$6,000	$6,000		

Determining the Agency Cost Formula

To evaluate how changing your allocation of funds can affect your bottom line, you first have to determine your agency's cost formula. The first step in creating that formula is to calculate a *unit cost per mile* and a *unit cost per hour*.

Unit Cost per Mile and Unit Cost per Hour Calculations

Example: As shown in Table 2-2, Anytown Transit Agency has a total of $500,000 in miles-driven costs and $542,000 in hours-driven costs. Assuming that ATA operates a total of 500,000 revenue miles and 33,000 revenue hours, calculate the unit cost per mile and unit cost per hour.

Unit cost per mile = miles driven variable cost / actual vehicle revenue miles

Unit cost per mile = $500,000 / 500,000 = $1.00

Unit cost per hour = hours driven variable cost / actual vehicle revenue hours

Unit cost per hour = $542,000 / 33,000 = $16.42

Next, calculate the fixed-cost overhead rate. The fixed-cost overhead rate can be calculated as an additive or a *multiplier* rate. For the purposes of this cost formula, use the fixed-cost overhead multiplier rate.

Fixed-Cost Overhead Rate Calculation (Multiplier Option)

Example: As shown in Table 2-2, Anytown Transit Agency has total operating costs of $1,312,000 and total variable costs of $1,042,000. Calculate the fixed-cost overhead multiplier rate.

Overhead rate (multiplier) = total costs / variable costs

Overhead rate (multiplier) = $1,318,000 / $1,042,000 = 1.2649

The cost formula combines the variable unit costs and overhead rate to provide a cost formula. Determine the cost formula using the resulting variable-unit cost and fixed-cost overhead rate.

Cost Formula Calculation

Cost Formula =

[(unit cost per mile × ____revenue miles) + (unit cost per hour × ____revenue hours)]
× fixed cost overhead rate

To determine the cost formula, insert the unit costs and fixed-cost overhead rate into the cost allocation formula.

Using the Formula to Determine Costs Associated with Service Changes

The formulas presented in this chapter can help you estimate the appropriate price of a proposed new service. Include overhead costs in the proposed service price to capture the fair share of the fixed cost.

Estimating the Cost of a New Service

For example, Anytown Transit Agency wants to offer a weekday service to add an additional 10 hours and 200 miles of service per day for 250 days. Table 2-3 shows the estimated total annual hours and miles involved (see Table 2-3).

You can use the cost formula to determine your agency's total annual cost. For Anytown Transit Agency, calculate the estimated proposed service based on the assumptions in Table 2-3.

Table 2-3. Estimated New Hours and Miles of ATA's Proposed Service Enhancement.

Proposed New Service Estimated Cost =

[($1.00 × 50,000 revenue miles) + ($16.42 × 2,500 revenue hours)] × 1.2649 =
($50,000 + $41,000)] × 1.2649 = **$115,106**

Annual Estimated Service			Hours	Miles
Proposed Additional Service per Day			10	200
Number of Days per Year	250	250		
Estimated Annual Service	2,500	50,000		

Estimating the Price of New Services

Determine the price of the proposed service by dividing the estimated cost by the unit desired as shown in Table 2-4.

Estimating the Cost of Extending Existing Services

You can also use the cost formula to determine your agency's total cost for extending a service, which is calculated without including overhead costs. This is because we're assuming that extending the extension does not change fixed costs. Use the cost-formula variable unit costs to calculate these values.

For example, Anytown Transit Agency is extending a route by 2 hours per day for an estimated 24 miles per day for 60 days. Table 2-5 shows estimated total hours and miles.

Calculate ATA's estimated proposed service extension based on the assumptions in Table 2-5.

Table 2-4. Pricing for ATA's Proposed New Service.

Annual Estimates	Annual Total
Service Cost	**$115,106**
Total Miles	50,000
Pricing New Service @ Cost per Mile	**$2.30**
Total Hours	2,500
Pricing New Service @ Cost per Hour	**$46.04**
Total Estimated Passenger Boardings	5,000
Pricing New Service @ Cost per Boarding	**$23.02**

Table 2-5. Estimated Hours and Miles of ATA's Proposed Service Extension.

Estimated Service			Hours	Miles
Proposed Service Extension per Day			2	24
Number of Days			60	60
Estimated Annual Service	120	1,440		

Proposed Service Extension Estimated Cost =
[($1.00 × 1,440 revenue miles) + ($16.42 × 120 revenue hours)] =
($1,440 + $1,970)] = **$3,410**

Estimating the Savings of a Service Reduction

Finally, you can use the cost formula to determine your agency's total savings resulting from a service reduction.

For example, due to a reduction in funding, Anytown Transit Agency is reducing the number of trips per week provided between cities. Currently ATA provides services for 2 hours and 50 miles per day for 5 days a week. ATA is reducing services from 5 to 3 days per week. Table 2-6 provides the estimated reduction in annual hours and miles.

Calculate ATA's estimated hour and mile savings based on the assumptions for the proposed service reduction values in Table 2-6. **Note:** Since these figures represent a decrease in service hours and miles, input them as negative values in the formula.

Table 2-6. Estimated Service Hours and Miles Resulting from ATA's Service Reduction.

Proposed Service Reduction Estimated Cost Savings =
[($1.00 × -5,200 revenue miles) + ($16.42 × -208 revenue hours)] =
($5,200 + $3,415)] = **-$8,615**

Service	Hours	Miles
Current:		
Service per Day	2	50
× Days per Week	5	5
= Service per Week	10	250
Proposed Service Change:		
Service per Day	2	50
× Days per Week	2	2
= Service per Week	4	100
Change in Service per Week	6	750
× Weeks per Year	**52**	**52**
= Annual Savings	**208**	**5,200**

Chapter 2: What to Remember

Establish a good system of accounting for your agency costs to help you understand the true cost of operational cost drivers. A chart of accounts (COA) based on the USOA provides a good basis for comparing transit costs across the transit industry. Using the COA, you can assign costs to functions, categorize variable and fixed costs, and determine your agency's cost formula.

Assign costs from the COA to functional areas like operations, maintenance, administration, purchased transportation, and planning. You can also differentiate between *variable* costs (e.g., driver wages, fuel costs, and maintenance costs) and *fixed* costs (e.g., administrative salaries, insurance, and professional services). Doing so enables you to individually track and analyze cost drivers.

Your agency cost formula is used to run what-if scenarios aimed at optimizing agency operations. Using the formula, you can estimate, for example, the price of a service expansion, the savings from a service reduction, or the overhead rate of a specific service. The first step in creating your cost formula is to calculate a *unit cost per mile* (e.g., maintenance and fuel/lubricant expenditures) and a *unit cost per hour* (operating expenses exclusive of fuel and lubricants). Note that both of these are variable costs.

The formulas presented in this chapter can help you estimate agency expenses using your cost formula. Remember to include *overhead costs* in your calculations to capture the fair share of the fixed cost associated with a given service. By looking at your agency costs from different angles, you can identify areas for potentially increasing efficiency and reducing waste in your agency's daily operations.

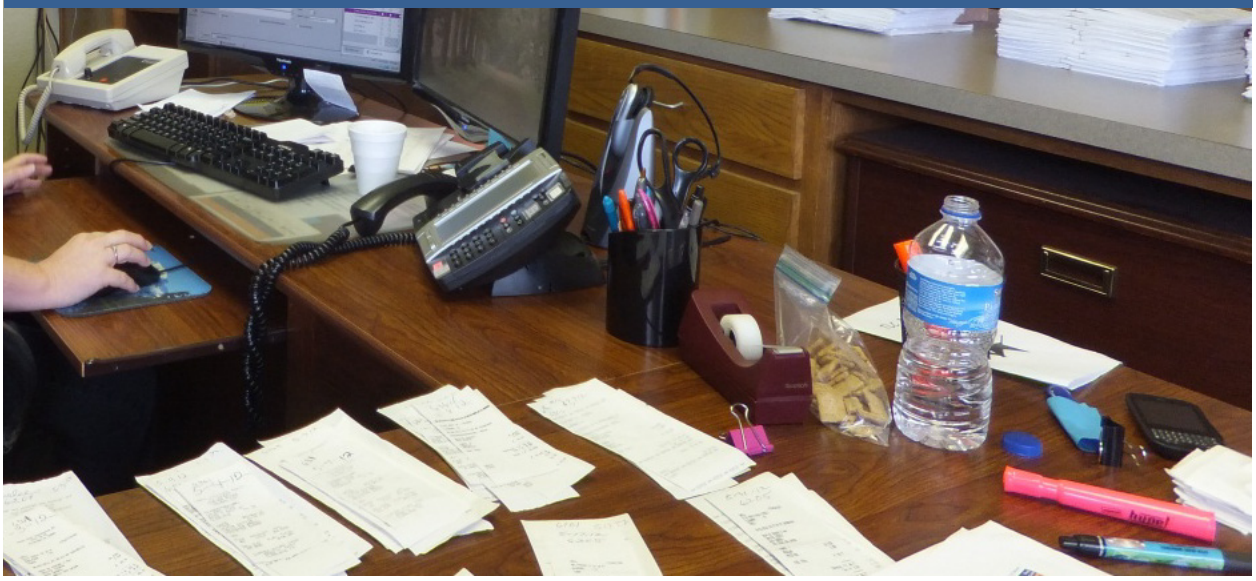
References

1. J. Burkhardt, R. Garrity, K. McGehee, S. Hamme, K. Burkhardt, C. Johnson, D. Koffman. TCRP Report 144 - *Sharing the Costs of Human Service Transportation.* Transportation Research Board, Washington, D.C., 2011.

PART 2

Strategies for Optimizing Transit Costs

Chapter 3.
Staff: Managing Shifts, Managing Costs



This chapter provides transit operations managers and administrators with strategies necessary to effectively manage staff duty shifts, specifically operator and dispatch shifts. Even if you think your agency already manages its staff costs well, you can still benefit from reviewing the concepts presented here. The chapter is generically designed, so you can adapt the concepts you find useful to meet your agency's individual needs.

Salaries and wages, followed by fringe benefits, are the two largest categories of operating expenses for all types of transit agencies in Texas.

With rising costs, limited state and local revenues, and growing service demands, many transit agencies are looking for ways to reduce costs and increase revenue. To stretch their dollars further, transit agencies are increasing fares, cutting services, dipping into contingency funds, making administrative staff cuts, and deferring capital replacements (*1*).

- Many factors influence how a transit agency provides services; indeed, no two agencies operate exactly alike. Yet, every transit agency employs staff to operate vehicles, dispatch operations, maintain equipment, or manage services. Salaries and wages, followed by fringe benefits, represent the largest categories of operating expenses for all types of transit agencies in Texas (see 3-1). Learning to more effectively manage staff shifts is one way to better manage operating costs. Topics associated with better managing operating costs via staffing considerations include:
- The pros and cons of full-time versus part-time employees.

Table 3-1. Percent Distribution of Costs for Transit Agencies Directly Operating All Services (FY10 NTD Urban and Sample of Rural).

Operating Expense Category	Transit Agency Types in Texas			
	State-Funded Urban (10 Agencies)	Dual Rural/Urban (5 Agencies)	LEP (2 Agencies)	Rural (10 Agencies)
Salaries and wages	44%	44%	57%	52%
Fringe benefits	20%	16%	20%	14%
Services	11%	13%	2%	2%
Fuel and lubricants	10%	12%	13%	17%
Tires and tubes	1%	1%	2%	2%
Other materials/supplies	9%	4%	4%	3%
Utilities	2%	1%	1%	2%
Casualty and Liability Costs	3%	2%	1%	4%
Purchased Transportation	0%	0%	0%	0%
Miscellaneous Expenses	1%	7%	0.2%	4%
Leases and Rentals	0.1%	0.1%	0%	0%
Total Operating Expense	**100%**	**100%**	**100%**	**100%**

- The cost-benefit of hiring a new employee versus retaining existing employees.
- Policies for operator breaks and pre- and post-run time.

Identify Current Staff Management Practices

Chances are you already strive to efficiently manage agency staff, but even great practices can usually be improved. Here is a list of questions to get you started on self-assessment regarding how well you're currently managing your staffing costs.

Note: All questions might not apply to your particular agency.

Question	*Yes*	*No*
Does your agency have key performance indicators to monitor operator performance?	☐	☐
Does your agency have key performance indicators to rate dispatcher performance?	☐	☐
Does your agency ever compare performance with peer agencies?	☐	☐
Do you strategically manage the amount of full- and part-time staff to control labor costs?	☐	☐
Do you cross-train operators to cover routes other than their own when needed?	☐	☐
Do you cross-train supervisors or operators to adequately back up dispatchers when needed?	☐	☐
Do you have policies for staff tardiness, absences, vacations, holidays, and lunch or other breaks?	☐	☐
Do operators and dispatchers understand and comply with policies most of the time?	☐	☐
Do managers consistently hold staff appropriately accountable for following internal policies?	☐	☐

Answer "No" to any of the above questions? There may be opportunities for you to improve efficiency and control operating costs by managing staff more effectively. Answer "Yes" to every question above? You've got the right system in place for properly managing staff, but there might still be opportunities for improvement.

By better understanding the factors influencing your staffing costs, you can increase operational efficiencies related to **productivity**. Ensuring your agency is operating at optimum productivity levels can produce cost savings.

What Does Productivity Really Mean?

Productivity is a measure of service effectiveness when referring to transit agencies. Typically, productivity is defined as the number of passenger trips per hour or mile that revenue vehicles handle ("revenue vehicle hour" or "revenue vehicle mile"). Passenger trips per revenue vehicle hour are often considered to be the most important measure of demand-response transit productivity. "Productivity captures the ability of demand response transit systems to schedule and serve passenger trips with similar origins, destinations, and time parameters, using the least number of in-service vehicles and revenue hours" (*2*).

Typically, productivity is defined as the number of passenger trips per hour or mile that revenue vehicles handle ("revenue vehicle hour" or "revenue vehicle mile").

How Can Dispatch Affect Productivity and Operator Shifts?

A transit dispatch center staffed effectively and that fully leverages technology can maintain operational efficiency by making appropriate routing decisions to begin with and responding proactively when necessary service changes occur. A modest improvement in service productivity can significantly impact the cost effectiveness of your agency's demand-response transit service.

Impact of Increased Productivity on Resources and Services

- **Decrease resources needed to provide service –** Increasing the number of passengers carried per service hour means fewer service hours are needed to serve the same number of passengers. Thus, fewer vehicle and driver resources are used to serve the same number of consumers.
- **Increase the level of service using the same resources** – The efficient use of resources can free up capacity for serving additional consumers during existing service hours, thus generating increased revenue without the need for applying additional resources.

Table 3-2 provides an example of a typical rural Texas transit agency that provides 125,000 passenger trips per year with 62,500 revenue hours at a cost of $2,250,000 annually. Increasing productivity by a modest 3 percent—for example, from 2.00 to 2.06

Table 3-2. Increased Productivity Scenarios.

	Scenario "A" or "B"	Annual Revenue Hours	Annual Passenger Trips	Passengers per Revenue Hour	Operating Cost for Revenue Hours	Operating Cost per Revenue Hour	Operating Cost per Passenger Trip
	Existing Service and Productivity	62,500	125,000	2.00	$ 2,250,000	$ 36.00	$ 18.00
				Increased Productivity			
A	**Save Money**	- 1,820		*+ 0.06*	- $65,534		- $0.52
	↑ Productivity) =↓ Revenue Hrs)	**60,680**	125,000	**2.06**	**$ 2,184,466**	$ 36.00	$ 17.48
B	**Serve More Passengers**		+ 3,750	*+0.06*			- $0.52
	↑ Productivity) =↑ Pass Trips)	62,500	**128,750**	**2.06**	**$ 2,250,000**	$ 36.00	$ 17.48

passengers per revenue hour—would provide the following options:

A. Save money: A productivity increase of 3 percent would allow the agency to achieve the same number of passenger trips (125,000) in 1,820 fewer service hours, saving $65,534 in operating costs (see Table 3-2, Scenario A). The operating cost per passenger trip would decrease from $18.00 to $17.48.

B. Serve more passengers: A productivity increase of 3 percent would allow the agency to increase the number of passenger trips annually by 3,750 within the existing service hours of 62,500 and operating costs of $2,250,000 (see Table 3-2, Scenario B). The operating cost per passenger trip would decrease from $18.00 to $17.48

How to Gather and Use Information to Manage Staff Shifts

Transit agencies are data rich but time constrained. State and federal requirements often require performance measurement be part of their reporting processes.

Gather Staff and Service-Related Information

Establishing a routine process to collect data and periodically monitor performance can help you evaluate service levels and identify problems before serious consequences occur. The first step in determining performance is to understand what data to collect.

The data needed to calculate performance is usually readily available since transit agencies already use these data for driver manifests and in scheduling software. The following are common data useful in monitoring performance and managing staff shifts:

- Passenger trips (boardings).
- Revenue hours.
- Revenue miles.
- On-time performance.
- Missed trips.
- Late trips.
- Excessive ride times.
- No shows/late cancellations.
- Denied reservations.
- Accidents.
- Roadcalls/service interruptions.
- Passenger complaints.

- Calls into call center(s) [dispatch, reservations, customer feedback].
- Operating expenditures.

> Requiring vehicle operators to turn in manifest information *daily* is highly recommended.

Consider developing a standard form that incorporates these data elements and use it to record data on a monthly basis. (Data collection does not require a computer system, although spreadsheet software is helpful.) Requiring vehicle operators to turn in manifest information *daily* is highly recommended. This provides timely information that can be quickly checked for accuracy while still fresh in the memories of the operators and dispatchers. Frequent (daily or weekly) verification of trip manifests helps promote data accuracy.

Productivity can be affected when passengers and drivers are unable to get through to dispatch. Trip cancellations can be missed, lost drivers cannot get directions, and drivers cannot call in no-shows before receiving authorization to move on. Gathering call system statistics can help avoid downtime caused by these problems. These statistics are necessary to manage dispatcher and reservationist shifts. You can analyze these data to minimize labor costs and increase your quality of service for consumers.

Recording and tracking dispatch, reservation, and passenger-service call-center data can help you determine how to staff call centers appropriately, as well as provide an indicator of service quality.

Note: If your agency has an advanced phone system, sometimes referred to as an "ACD System," then you might be able to obtain detailed reports about calls from the system. If your agency does not have an advanced phone systems, you can request a report about call load, etc., from your phone-service provider based on a sample of calls over a period of time. The information collected that will aid in evaluating the quality of service and timeliness in responding to passenger and driver calls includes:

- Average daily calls into each call center.
- Maximum call delay (queue time) in each day.
- Average call delay.
- Average call processing time.

Service Productivity Performance Measures

The most common productivity measure in transit is passenger trips per revenue hour (or revenue mile). Calculate productivity using functional blocks such as by month, driver, service type, day of the week, or season.

Table 3-3 shows a hypothetical example of how to calculate productivity by driver.

$$\text{Productivity} = \frac{\text{Number of passenger trips}}{\text{Number of revenue hours or miles}}$$

Table 3-3. Example of Productivity by Driver.

Driver	Revenue Hours	Passenger Trips	Productivity
Driver A	19	59	3.1
Driver B	18	30	1.7
Driver C	13	31	2.4
Driver D	13	47	3.6

By comparison to the other drivers, productivity for Driver B appears very low. Consider investigating further to determine why. Productivity will vary from day to day and depends upon a variety of factors both within and outside the driver's control. These factors include:

- Vehicle breakdowns.
- Ill passengers.
- No-shows.
- Dispatcher decisions.
- Driver route decisions.
- Lost drivers.
- Drivers not remaining in communication with dispatch (disappearing).
- Roadway conditions.
- Long distances between trips.

Measure manifest productivity over time to determine if the dispatcher can aid the driver in being more productive, if retraining is needed, or if you should revise the schedule or fleet distribution to increase productivity, improve how staff are utilized, or reduce costs.

Understanding Factors Influencing Transit Staff Shifts

Transit Cooperative Research Program (TCRP) Report 124 discusses both controllable and uncontrollable factors that affect a transit agency's overall performance (*2*). Factors that influence productivity include:

- Environmental factors.
- Service design factors.
- Policies/procedures.
- Service delivery strategies.

Since they have minimal control over environmental factors, those factors are particularly challenging to rural and small-urban transit agencies. These factors include:

- Size and geography of the service area.
- Population size and demographics.
- Population density.
- Roadway and sidewalk networks.
- Major generators of service demand (e.g., proximal cities, hospitals, educational institutions).
- The economy (*2*).

In Texas, the average service area of rural-transit agencies exceeds 6,000 square miles, with one transit agency having a 44,000 square-mile service area. Small urban-transit agencies do not typically face challenges related to the sheer size of their service area. They more often face issues associated with providing service to areas with varying population density, employment density, and street connectivity. Agencies with long service routes or that have low-density service areas and indirect routes face a special challenge to ensure service demands are met through the reasonable application of available resources and staff.

Key policies that assist agencies in optimizing the management of staff shifts and employment levels include:

- Attendance and on-time arrival to work standards.
- Dispatcher backup and driver backup, commonly referred to as "extra-board."
- Responsibilities and skills of the dispatcher/scheduler.
- Dispatch calls processed by time of day, average call time, and average hold times.
- Setup of the dispatch office and equipment.
- Staffing according to demand (dispatch call volume, trip requests, and distribution).
- Individual driver productivity.
- The amount of "slack" (or downtime that can be potentially productive) in the schedule.

Managing Operations Staff

Delivering public transportation is a team effort. The dispatcher, scheduler, reservationist, driver, and passenger must each understand his or her responsibilities in making the overall system work efficiently.

Communicate expectations and delineating responsibilities through, for example, well-written job descriptions and a rider's guide. Dispatch staff have the most impact on a transit agency's productivity, followed closely by the impact of drivers. The following sections provide some basic tactics for how to manage dispatcher and driver shifts to provide more efficient services and better manage labor costs.

Staffing Dispatch by Call Volume

The dispatcher position is responsible for the on-time delivery of service. The dispatcher must maximize productivity while being responsible for all communications responding to passenger and driver requests, balancing vehicle and driver resources, and maintaining on-time performance. In order to maximize productivity while maintaining quality of service standards, the dispatcher/scheduler must be well organized. The dispatch office must have necessary information readily available, electronically or through posted information (or a combination of both).

Responsible for on-time delivery of service, dispatch staff have the most impact on a transit agency's productivity.

Staffing in dispatch is the key indicator of productivity in the overall system. A passenger's inability to get through to cancel a trip, check on a driver, or let the dispatcher know the driver is late can push back the entire day's schedule. When drivers cannot get through to dispatch to help find a passenger, authorize a no-show, help with directions, or call in a detour, scheduling can suffer, thereby adversely impacting productivity as well. Determining a cost-effective staffing level that provides quality service and responds quickly when these incidents occur can result in a highly productive transit system.

What Call Information Is Needed to Determine Staffing Levels?

Dispatch staffing levels should ensure that clients and operators are answered within reasonable queue times (as defined by your agency).

To determine what a reasonable queue time is for your agency, you need (at a minimum) the number of calls answered and the average talk time per call. Ideally you should capture the following information in half-hour increments throughout the day:

- Number of abandoned calls (call drops before dispatch answers).
- Number of calls answered.
- Average delay time before a call is answered (queue time).
- Average hold time during a call (dispatcher puts the call on hold).
- Average talk time.

Note: If your agency has an advanced phone system, sometimes referred to as an "ACD System," then you might be able to obtain detailed reports about calls from the system. If your agency does not have an advanced phone systems, you can request a report about call load, etc., from your phone-service provider based on a sample of calls over a period of time. Because many rural and small-urban dispatchers are also reservationists, this section will discuss both reservation call volumes and dispatch call volumes in relation to determining staffing levels.

How Do I Use Call Volume Information to Determine Dispatch Staffing Levels?

After obtaining the call load information from your phone system or phone service provider (they might provide the data free of charge), determine staffing levels by time of day using the process and formulas shown in Activity 2.

Activity 2. "How many dispatchers do we need?"

Find a partner or two and do the math to fill-in wherever a ? exists.

Part A. PATRON PHONE CALLS

Step One. Answered Patron Calls (A + B) ✖ C = X | *Step Two. Unanswered Patron Calls* A ✖ B = Y | *Total of Steps 1 & 2* X + Y = P

Time of Day	Average Talk Time per Call (minutes)	Average Hold Time during Call (minutes)	Total Answered Calls	Patron Call Processing Time (minutes)	Average Call Processing Time (minutes)	Number of Abandoned Calls	Additional Call Processing Time Needed (minutes)	Total Patron Call Processing Time Needed (minutes)
8:00 to 10:00 am	1.26	0.11	154	211.11	1.37	8	10.97	222.08
10:00 to 12:00 noon	1.38	0.20	92	145.16	1.58	6	9.47	154.62
12:00 to 2:00 pm	1.33	0.25	104	?	1.57	7	?	?
2:00 to 4:00 pm	1.43	0.28	136	?	1.71	11	?	?
4:00 pm to 5:00 pm	1.46	0.34	90	?	1.80	3	?	?

Part B. OPERATOR PHONE/RADIO CALLS

(A + B) ✖ C = U

Time of Day	Average Queue Time (minutes)	Average Talk Time (minutes)	Number of Phone / Radio Calls	Total Operator Call Processing Time (minutes)
8:00 to 10:00 am	0.50	1.00	120	180.00
10:00 to 12:00 noon	0.75	0.80	80	124.00
12:00 to 2:00 pm	?	?	110	?
2:00 to 4:00 pm	?	?	140	?
4:00 pm to 5:00 pm	?	?	70	?

For A, use your experience to make an assumption about how long it takes to respond to operator's requests - queue time. We provided two examples for you.

For B, use your experience to make an assumption about how long each operator phone/radio call lasts - average talk time. We provided two examples for you.

Now do the math!

Part C. TOTAL TO DETERMINE DISPATCH STAFF NEEDS

(P + U) ÷ Time = # Staff

Time of Day	Total Patron Call Process Time Needed (minutes)	Total Operator Call Processing Time (minutes)	Minutes in Time Period	Staffing Level Based on Call Processing Time (# of dispatchers)
8:00 to 10:00 am	222.08	180.00	120	3.35
10:00 to 12:00 noon	154.62	124.00	120	2.32
12:00 to 2:00 pm	?	?	120	?
2:00 to 4:00 pm	?	?	120	?
4:00 pm to 5:00 pm	?	?	60	?

Steps after the math:

Compare agency dispatch staffing for each time period "Staffing Level Based on Call Processing Time (dispatchers)"
Take into account breaks, inefficiencies caused by shift changes, and other routine disruptions.
Redistribute dispatch work shifts to match work load.
Establish and use quality of service performance measures to monitor load and make adjustments.
(Measures may include "Average Queue Time per Call (Minutes)" or "Number of Abandoned Calls.")

Use this staffing level to:

- Determine if existing staffing levels are too high or too low.
- Determine if dispatch quality of service levels change by time of day (e.g., during shift changes or during service peaks).
- Justify annual operating budgets for dispatch labor costs and equipment needs.

What Is "Slack Time"?

Slack time is commonly used by the transit industry to refer to periods in a driver

manifest or schedule where productivity is lacking. Inevitably, some slack time is unrecoverable; bathroom breaks for drivers, for example.

However, some slack time can be put to good use. For example, a driver might have 15 to 20 minutes between pickups when he or she can update the driver's log while the information is still fresh. (This improves the reliability of these data when used later to determine performance measures.)

Case Study: The East Texas Council of Governments (ETCOG)

ETCOG provides public transportation service, called GoBUS, in 14 counties in East Texas. Table 3-4 shows the statistics gathered during the week of March 5–9 (Monday thru Friday) for analysis.

> This analysis of ETCOG is based on one week of manifest data from March 2012. Your agency might not have the time necessary to duplicate the full analysis the authors conducted; but you should consider how slack time analysis can help you refine your agency's operations.

Figures 3-1 and 3-2 below show, respectively, the use of one ETCOG vehicle each. Both vehicles were in operation Monday–Friday. The maps are included as context for the geographic distribution of the trips. Please note that the charts are based on 15-minute blocks of time but only labeled as hours for visual clarity.

Table 3-4. Statistics Gathered for ETCOG Analysis.

Counties Covered	# of vehicles	# unlinked passenger trips	# unique riders	Avg. rider age	Avg. ride time (mins)	Avg. trip length (miles)	Peak Service Times	Low Demand Point
14	44	2,429	561	54*	38	15	7:30 to 9:00 a.m. 2:30 to 5:00 p.m.	1:00 to 2:00 p.m.

*35 percent of riders were age 65 or older

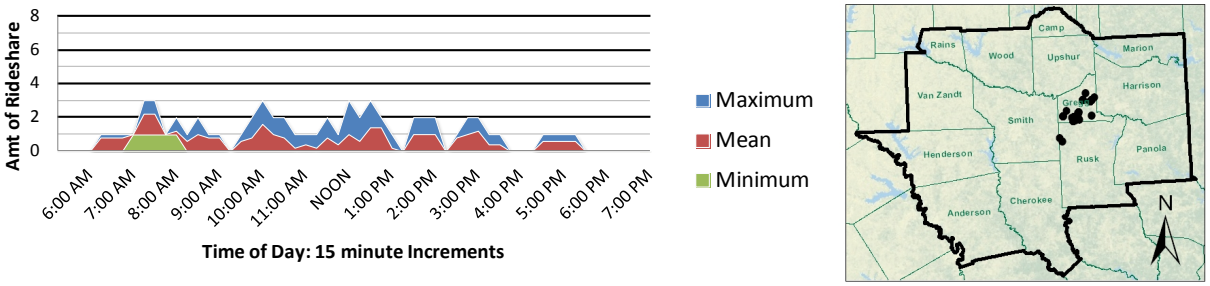


Figure 3-1. Vehicle A. Lower Effectiveness.

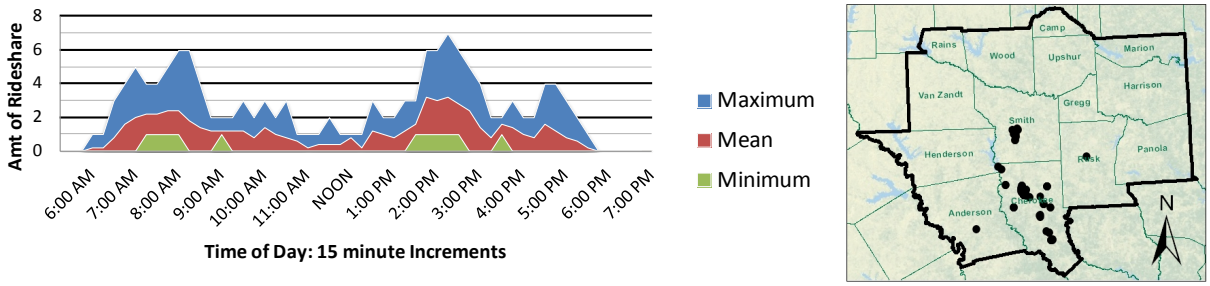


Figure 3-2. Vehicle B. Higher Effectiveness.

What Do the Charts Illustrate about Slack Time and Rideshare?

Vehicle A's manifests for the sample week had more slack because, except from 7 to 8 a.m., there was one or more days where no passenger was onboard the vehicle in each other 15-minute time block (green indicates the minimum, so where green does not exist there was slack at least one day); indeed, the overall amount of rideshare is lower than Vehicle B's.

Where it's possible, the industry recommends designing manifests that require a shared-ride (i.e., more than one passenger) experience to increase trip efficiency. If agencies regularly dispatch shared rides and consistently have spare vehicles, then the agency can reduce operating and capital costs via fleet and staff reduction or increase services provided by going after new ridership.

Note: In the figures above, the more geographically dispersed origins and destinations (shown by the black dots on the maps) correlated with the more efficient manifest. Dispatchers can build effective manifests regardless of geographic dispersion. Transit managers must learn to identify where dispatchers and drivers are working efficiently and where to make improvements.

What Do Other Sources Say about Slack Time and Rideshare?

TCRP Synthesis 60's survey indicates that agencies actively pursuing the use of slack time engage in the following activities:

- Reassigning trips or allowing drivers to catch up (55 percent).
- Using time same-day service, wait list trips, or unscheduled trips (29 percent).
- Taking breaks, reassigning passengers from taxi service, assisting other services in the system (11 percent).
- Using late cancellation time (but not no-show time) to reassign trips (5 percent) (*3*).

TCRP Synthesis 60 indicates that one agency performs a second batch of routing at 11 a.m. every day (after the majority of no-shows and cancellations occur) to capture slack in the system.

As mentioned earlier, dispatch impacts system productivity more than any other single function. Thus, management oversight focused on dispatch results during the day of service delivery, rather than as a review effort regarding the prior day's

scheduling, is advised. Dispatch supervision will enable better real-time decisions to positively impact productivity on the existing demand-response service.

In small agencies, dispatch and/or scheduling staff may be responsible for creating driver schedules, assigning drivers to manifests and vehicles, and determining vehicle fleet needs. Tailoring the number of drivers and vehicles needed to cover service adequately depending on the time of day (e.g., rush hour) provides for a more cost-effective, productive system.

Operator Shifts: Staff Shifts Based on Service Demand

Most agencies have peak times of service (e.g., lunch time). Unless service demands do not fluctuate throughout the day, using a combination of full- and part-time drivers is most cost-effective.

Schedule drivers based on the service demand throughout the day. If service demand is low during certain times of the day, staffing part-time drivers can yield higher productivity by minimizing slack time. Consider monitoring the productivity or number of passengers carried per hour of service for each driver manifest to determine if each manifest is at its peak productivity level.

Figure 3-3 shows average manifest effectiveness per vehicle in ETCOG for a week of manifests in March 2012.

What Does Figure 4-3 Indicate Regarding Staffing Strategies for ETCOG?

Per Table 3-4, ETCOG service has two peaks: 7:30 to 9:00 a.m. and 2:30 to 5:00 p.m. The low-demand point is from 1:00 to 2:00 p.m. This indicates ETCOG should begin the day with full-time drivers coming on duty around 5:30 a.m., then change to part-time drivers around 1:00 p.m.

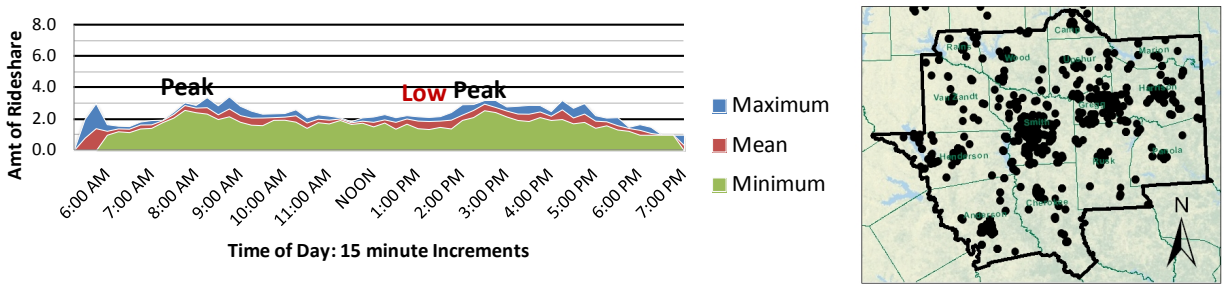


Figure 3-3. System-Wide: Average Effectiveness per Vehicle.

Figure 3-4 shows trip origins for four vehicles dispatched to provide service in or around Henderson County. Henderson County is on the western side of the ETCOG service area southeast of Dallas and immediately west of Tyler (both urbanized areas). Each vehicle's trips are represented by a partially transparent blue shape: overlap between the vehicle manifested origins indicates potential efficiency gains once services are reevaluated and adjusted. Maps such as this one can aid conceptually in showing the nexus between dispatch, operators, manifests, and productivity.

Table 3-5 illustrates the peak number of passengers onboard each of the four ETCOG vehicles by each 15-minute block throughout the day (based on the March 5–9 manifest data).

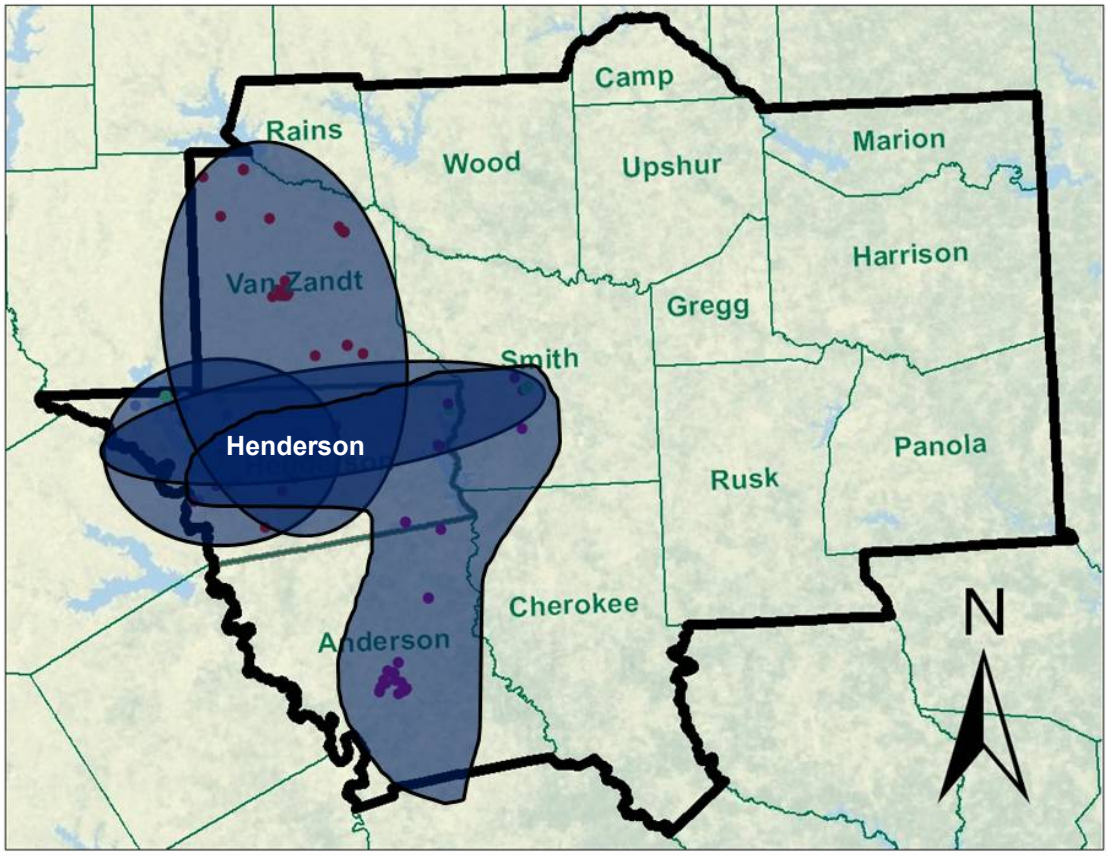


Figure 3-4. Identifying Data by Vehicle.

Table 3-5. Productivity Example from Henderson County (ETCOG).

Maximum Rideshare (Sample 5 Days)					
Time of Day	Vehicle A	B	C	D	Average Productivity Per Manifest
5:00 to 6:00			2		2.0
			3		3.0
			3		3.0
6:00 to 7:00		1	3	1	1.7
	1	1	3	2	1.8
	1	1	2	3	1.8
	1	1	2	3	1.8
7:00 to 8:00	2	3	3	1	2.3
	1	3	4	0	2.0
	1	3	5	1	2.5
	0	1	5	1	1.8
8:00 to 9:00	0	2	3	1	1.5
	0	3	3	1	1.8
	2	3	3	3	2.8
	2	1	3	3	2.3
9:00 to 10:00	2	0	3	4	2.3
	0	1	3	4	2.0
	2	1	3	5	2.8
	2	1	2	5	2.5
10:00 to 11:00	4	3	1	5	3.3
	3	3	1	3	2.5
	3	3	1	4	2.8
	3	4	2	5	3.5
11:00 to 12:00	4	3	2	5	3.5
	4	4	2	4	3.5
	5	4	1	4	3.5
	3	3	2	4	3.0
12:00 to 13:00	4	2	2	2	2.5
	1	1	2	4	2.0
	1	1	2	4	2.0
	1	1	5	4	2.8
13:00 to 14:00	2	2	5	3	3.0
	2	3	4	3	3.0
	2	3	4	3	3.0
	2	3	3	3	2.8
14:00 to 15:00	2	1	2	3	2.0
	2	1	2	2	1.8
	3	0	0	1	1.0
	2	1	1	1	1.3
15:00 to 16:00	2	1	1	1	1.3
	2	2	0	0	1.0
	3	0	1	2	1.5
	3	3	1	2	2.3
16:00 to 17:00	4	3	1	2	2.5
	2	2	0	2	1.5
	2	2	2	3	2.3
	1	2	2	3	2.0
17:00 to 18:00	1	2	1	3	1.8
	1	1	1	3	1.5
	1	1		2	1.3
	1	1		1	1.0
18:00 to 19:00	1			1	1.0
Productivity Per Manifest	2.0	1.9	2.2	2.7	

Manifests are most productive, on average, from 10:00 a.m. to 2:00 p.m. The least effective period is from 2:30 to 6:15 p.m. Table 3-6 ranks the productivity of these four vehicles.

A table like 3-5 might help you in determining if and how to adjust the number of vehicles during a particular time of day. However, Table 3-5 does not show the origin/destination information for the vehicles, which should be taken into account before adjusting resources. Although a vehicle may appear unproductive, its productivity rate might be reasonable if the vehicle travels long distances or in a different geographic area than other vehicles.

Note: Only one of the four vehicles operating trips in and around Henderson County was in service all five days of the sample week; the other three were in service four out of five days. The average number of vehicles in service at any one time was 3.5, meaning that three vehicles are operating half the week, and four are operating the other half.

Don't Have Time for Complex Analysis but Want to Save on Operator Labor Costs?

Calculating your system's overall productivity (passenger per revenue hour) rather than by time of day by vehicle can help you monitor trends and understand patterns. You can fine tune services with this data by demonstrating to management the areas of inefficiency and recommending changes to operator shifts and/or service practices.

Table 3-6. Productivity Rankings for Four Vehicles.

Productivity per Manifest (ranked most productive to least)				Passenger Trips per Vehicle Revenue Hour				Average Weekly Passenger Trips per Day			
D	C	A	B	A	D	C	B	D	C	A	B
2.7	2.2	2.0	1.9	1.62	1.51	1.50	1.37	17	16	16	11

Are There Any Other Recommended Best Practices to Control Labor Costs?

Yes. If possible, assign the same driver to the same manifest (or general geography); drivers will become familiar with both routing and regular passenger needs, which can lead to natural system efficiencies and increased productivity.

Likewise, if possible, assign the same drivers to the same vehicles. Drivers become familiar with vehicle maintenance issues and how equipment on-board their vehicles, such as lift and wheelchair tie-down equipment, operate. Drivers familiar with their vehicles may become aware of maintenance issues and report the vehicle for servicing before service interruptions occur, thereby reducing potential service interruptions.

Familiarity Matters for Dispatchers, Too

Service-area familiarity is also critical to effective scheduling and dispatching. This is especially true for agencies with large service areas covering multiple counties.

Take ETCOG, for example: service-area dispatchers must be familiar with 14 counties totaling 9,982 square miles. Demand-response service operates in all 14 counties most days of the week, and flexible (or point deviated) transit service operates in Marshall five days a week. Incoming calls are routed to dispatchers based on their familiarity with the client or geography. In other words, to increase quality of customer service and internal operational efficiency, ETCOG helps its dispatchers become experts on particular parts of the service area or passengers served.

Chapter 3: What to Remember

Proactively matching expected service demand with the appropriate amount of service is essential in optimizing agency productivity, typically defined as the number of passenger trips per hour (or mile) revenue vehicles handle (measured in "revenue vehicle hours" or "revenue vehicle miles"). Better managing productivity can decrease resources needed to provide services, increase the level of services you already provide using the same resources, and/or free up resources to provide new services.

Since staff salaries are the number one contributing factor to agency costs, properly allocating staff can significantly improve your agency's productivity. Although there

are factors beyond your control—like your region's geography—you can influence other factors, like slack time, to improve agency efficiency. Remember: dispatch staff have the most impact on a transit agency's productivity, so focus your efforts on this employee group.

By capturing accurate data routinely from drivers and dispatchers, you can identify system inefficiencies to improve productivity. For example, matching full- and part-time staff to busy and sparse service-demand periods, respectively, helps minimize slack time. Matching drivers consistently with vehicles and assigning drivers and dispatchers to routes they know promotes system efficiency through familiarity.

Service needs might change. You can most effectively manage productivity and optimize costs by monitoring trends and patterns over time and adjusting staffing levels to meet your agency's targeted service goals. In general, rural and small-urban transit agencies will more effectively manage labor operating costs by scheduling dispatchers and drivers to meet but not exceed demand.

References

1. American Public Transportation Association (APTA), KFH Group, Incorporated, "How Transit Agencies are Addressing the Impact of Fuel Price and Ridership Increases," September 2008.

2. Transit Cooperative Research Program (TCRP) Report 124, "Guidebook for Measuring, Assessing, and Improving Performance of Demand Response Transportation," 2008.

3. Transit Cooperative Research Program (TCRP) Synthesis 60, "Practices in No-Show and Late Cancellation Policies for ADA Paratransit." Transportation Research Board, Washington, D.C., 2005. p. 23.

Chapter 4. Maintenance: Vehicles and State of Good Repair

Texas Transit Maintenance Stats (2011)

- Rural agencies spent 6 percent on maintenance ($0.21 per revenue mile, $3.82 per revenue hour)
- State-funded urban agencies spent 18 percent on maintenance ($0.73 per revenue mile, $10.59 per revenue hour)

Every transit agency owns or leases vehicles to provide its services. This makes vehicle maintenance an unavoidable operating expense. However, maintenance costs—such as most internal agency expenses—can be proactively managed and optimized to avoid waste when possible.

Many factors influence maintenance expenses. Factors internal to your agency are ultimately controllable. These include fleet condition, fleet age, level of transit service provided, preventive maintenance practices, and contracts for maintenance.

External factors are not controllable. These include inclement or extreme weather, vehicular accidents (where the agency is not at fault), and roadway conditions.

As noted in Chapter 3 regarding managing staff costs, the key to managing maintenance costs involves:

- Gathering data about your agency's maintenance expenses.
- Using that data to set acceptable performance measures to optimize maintenance expenditures.

Table 4-1. Texas Transit District Operating Expenses by Function (Fiscal Years 2009 to 2011).

Function	FY 2009	FY 2010	FY 2011
Operating	$97,598,443	$106,497,995	$115,276,755
Maintenance	$20,990,585	$23,040,572	$22,945,568
Administrative	$18,473,477	$20,361,563	$21,094,627
Planning	$2,177,011	$2,727,457	$2,476,197
Purchased Transportation	$18,744,364	$19,575,641	$25,081,941
Transit Districts TOTAL	**$157,983,880**	**$172,203,228**	**$186,875,088**

- Creating flexible policies and procedures that are easily adaptable when the unexpected happens.

Why Be Concerned about Maintenance Costs When They Are Unavoidable?

Maintenance expenses constitute a significant portion of total transit operating costs. As Table 4-1 shows, from 2009 to 2011, Texas small-urban and rural transit districts spent an average of $22.3 million (approximately 12 to 13 percent of their annual budgets) on maintenance (not including the maintenance portion paid within purchased transportation contracts).

Maintenance programs can vary a great deal among agencies. Some agencies perform most maintenance internally, while others contract out their entire maintenance programs. In either case, an agency is expending operating dollars on maintenance. An efficient maintenance program that meets your agencies specific circumstances can help you optimize maintenance costs, reduce road calls for avoidable equipment breakdowns, and increase your agency's overall readiness to provide services.

Identify Current Maintenance Cost-Related Practices

Even the most efficient maintenance programs can be improved. The first two steps in determining where your agency can focus improvement efforts are to:

1. Assess your current maintenance expense levels.
2. Compile a list of your current maintenance practices.

Use the following questions to identify the areas of your own maintenance practices that might be improved.

Question	*Yes*	*No*
Does your agency have key performance measures for determining past and present performance?	☐	☐
Does your agency currently employ internal preventive maintenance practices?	☐	☐
Is there a staff member primarily responsibile for managing maintenance?	☐	☐
Do drivers routinely conduct pre- and post-trip vehicle inspections?	☐	☐
Are pre- and post-trip inspection reports reviewed, tracked, and regularly followed up on?	☐	☐
Do you benchmark maintenance performance against other peer operators?	☐	☐
Do you track the number of road calls made for your vehicles by vehicle and type of issue?	☐	☐
Do you periodically adjust your maintenance program due to performance or other issues?	☐	☐
Do you have an annual vehicle replacement plan?	☐	☐
Do you have a spare vehicles ratio of at least 10%?	☐	☐
Do you maintain vehicle equipment according to recommended preventive maintenance schedules?	☐	☐
Do you maintain a clear record (e.g., spreadsheet) of all vehicle-related data and maintenance activity?	☐	☐
Do you routinely conduct spot inspections of vehicle cleanliness and operation?	☐	☐
Do you monitor the performance of systems (e.g., exhaust system) for compliance with noise specifications?	☐	☐
If contracted, is your maintenance provider contractually bound to adhere to preventive maintenance standards?	☐	☐
If contracted, does your maintenance provider keep accurate records (paper or electronic) for all vehicle maintenance?	☐	☐

If you answered "No" to any of these questions, you might be missing an opportunity to save money on maintenance.

Gather and Use Information to Manage Maintenance Costs

To measure your agency's maintenance program performance and state of good repair, you must first collect information about your vehicle fleet. Transit agency fleets are as varied as their maintenance practices. Some agencies rely on paper records alone, while some use basic spreadsheet files (e.g., Microsoft Excel). Still others use advanced asset-management and maintenance tracking software.

State of good repair refers to an asset or system currently functioning at its ideal capacity and within its design life.

Whatever your preferred information tracking method, you must keep an accurate record of fleet characteristics in order to deliver safe and reliable transit service. This section provides details in tracking fleet characteristics and conditions.

Determining Your Current Vehicle Fleet Condition

Transit agencies must keep an asset-inventory and condition-monitoring database containing a list of all vehicles owned by the agency. Some agencies network their database(s), in order to increase the usefulness of data and decrease record duplication. Networking the database(s) allows multiple agency

departments to access and modify the data (see the section below regarding this practice).

The database should include revenue and non-revenue vehicles and should, at a minimum, contain the categories shown in Table 4-2.

By keeping a database with at least these fields and updating it at least once per week, you can assess each vehicle's age, mileage, and condition easily. Knowing your fleet's condition provides you with a baseline of maintenance information. For example, you can track the rate at which vehicles are accruing mileage and determine the rate at which vehicles might need replacement.

Table 4-2. Maintenance Database Minimum Required Fields.

Data Captured	Description
Vehicle Unit Number	Give all vehicles (revenue and non-revenue) an agency unit number. This makes the vehicle easily identifiable without having to use the vehicle identification number (VIN).
Year Model	Record the vehicle's year model. This allows you to keep track of the vehicle's age.
Vehicle Make/Model	Record the vehicle's manufacturer make and model. This information helps in quickly identifying vehicles when assessing fleet mix and performance.
License Plate	Include the state vehicle license plate number.
VIN	The VIN is the official identification number that stays with the vehicle throughout its life. Maintain full VIN numbers (all 17 digits) in the database.
Number of Seats	Transit vehicles can everything from 4-passenger minivans to 60-passenger articulated buses. To assess fleet mix and capacity, include the number of seats in the database for each vehicle.
Vehicle Length	Capture the vehicle length; useful in assessing fleet mix.
Vehicle In-Service Date	Knowing when the vehicle was put into service helps determine when the vehicle's useful life will end.
Vehicle Condition	Assess periodically (at least once every 6 months) the condition of each vehicle based on criteria defined by your agency.
Revenue/Non-Revenue	Label each vehicle as revenue or non-revenue to separate out support vehicles from revenue-service vehicles.
In-Service/Out-of-Service	Label each vehicle as to whether it is still in-service or if the vehicle has been retired (out-of-service). Retaining these records in the database—even once the vehicle has been retired—helps to create an evolving context in which to judge your existing fleet.

Why Networking Databases Is a Good Idea

A networked database allows the maintenance department to log information regarding service conducted, preventive maintenance intervals, and maintenance expenses. In many transit agencies, the asset-inventory and maintenance records are separate databases; this is usually the case when the agency contracts for vehicle maintenance to an outside vendor, but it can be used elsewhere.

If the asset-inventory and maintenance databases are separate, collect key maintenance components to include within the asset record. These key components include:

- Total vehicle maintenance expenses to date.
- Last preventive maintenance conducted.

By including these components, you can track vehicle maintenance costs and the approximate dates the vehicle will be out of service for routine preventive maintenance. Table 4-3 shows an example from Mineral Wells Public Transit Services' inventory database. **Note:** This excerpt does not include all categories listed above.

Vehicle Inspection Practices and Data

Bus operators should conduct pre- and post-trip vehicle inspections. Conducting pre- and post-trip inspections enables operators to collect vehicle data on a regular basis. Inspections are:

- Typically recorded on a paper form.
- Submitted to the maintenance manager to review and file.
- The first step to identify a potential problem (*1*).
- If the vehicle operator indicates that the vehicle needs immediate attention, the maintenance manager can complete a work order for maintenance. Instruct operators to indicate any problems that become apparent.
- The maintenance manager should keep a file for each vehicle that includes all inspection forms and work orders. The managers can use the inspection files to note reoccurring problems in vehicles. You might find it useful to input maintenance issues into the asset-inventory and condition-monitoring database. Doing so will give staff who schedule vehicles vital information as to the reliability of a given vehicle for service, which in turn can minimize maintenance-related downtime in the service schedule.

Table 4-3. Excerpt from Public Transit Services Asset Inventory Database.

A60	1999	Ford Van	12	17'	127,020	Poor	Sold

Conducting pre- and post-trip inspections enables operators to collect vehicle data on a regular basis.

Mileage-based inspections monitor a specified list of maintenance components with similar life cycles. This inspection typically involves:

- Lubrication.
- Filter replacement.
- Inspection for wear and damage.
- Fluid level checks (*1*).

These inspections are part of an agency's defined preventive maintenance schedule. You can assess a vehicle's overall condition and include that information in the asset-inventory and condition-monitoring database to alert schedulers as to the availability and reliability of a given vehicle.

Tracking Road Calls

You should keep a record of road calls and determine the frequency of calls per 10,000 miles. By tracking road calls by vehicle type and time of year, you can identify the need for improvements to the maintenance program. For example, a higher number of calls per 10,000 miles might indicate a need to:

- Reduce intervals between preventive maintenance activities.
- Change maintenance procedures for certain vehicle.
- Better accommodate conditions resulting from varying seasonal driving conditions (*2*).

Lessons Learned: Waco Transit System (WTS)

WTS is a small urban transit operator. Its dispatch office tracks road calls. Road calls are logged into a file, and the maintenance director uses the road-call data to help determine the cause for the call, which is typically the result of a part failure or a training issue.

By examining the failure trends and understanding the causes of failure, WTS determines the best course of action to minimize road calls and ensure safe and reliable transportation for its operators and consumers. Trends in road calls might lead to a fleet-wide inspection of the identified at-risk components.

Vehicle Failures

Track vehicle failures as another way to gage the performance of the maintenance program. *Revenue vehicle mechanical failures* are mechanical problems that affect a vehicle because the specific vehicle does not:

- Complete its scheduled revenue trip.
- Start its next scheduled revenue trip.

Agencies report revenue vehicle failures in two categories: *major mechanical failures* and *other mechanical failures*.

Major mechanical failures mean that the vehicle's movement is limited. Examples of major bus failures include problems with brakes, doors, engine cooling system, steering and front axle, rear axle, suspension, and torque converters. Other

mechanical failures include breakdowns of fare boxes, wheelchair lifts, heating, ventilation and air conditioning systems, and other problems not included as a major mechanical system failure. Your agency's policies usually specify what these failures entail and should mandate keeping the vehicle off the road even though it is technically able to operate.

You can calculate the number of miles between mechanical failures as a way to understand how well your maintenance program is performing. Methods for analyzing mechanical failures are detailed in the next section.

Maintenance Efficiency Performance Measure(s)

The most common and readily calculable performance measure for transit maintenance is maintenance cost per revenue mile (or hour). In Texas, urban and rural transit agencies submit detailed operating expense information to TxDOT via the PTN-128 reporting system. PTN-128 data are then used by TxDOT to report to submit annual reports to the Federal Transit Administration (FTA).

Resource

TxDOT's PTN 128
http://scopt.transportation.org/Documents/PTN-128%20Data-Elements%203-15-2010.pdf

This reporting mechanism is valuable for many reasons, one of which is that transit agencies have periodic data readily available to use in calculating maintenance expenses per revenue mile or hour. **Note:** Simply measuring maintenance expenditures does not speak to quality of maintenance, state of good repair, or agency readiness to provide service.

While you can use performance measures to optimize maintenance, understand that extenuating circumstances sometimes arise that negatively impact maintenance costs. Use performance measures to achieve increased efficiency and organization of your maintenance program rather than rely on across-the-board cuts to your maintenance budget at the expense of your vehicle fleet's condition.

How Can You Use Performance Measures to Communicate and Improve?

You should track the fluctuation and trends of maintenance cost per unit over time. Performance measures—created and tailored to your specific agency's needs—can help you monitor progress internally by answering the question: are the efficiency and efficacy of your maintenance program improving or worsening?

You can also use performance measures to identify higher-performing peer agencies (see Chapter 11). Comparing your own maintenance program to higher-performing peers can help you identify cost-saving practices to adopt within your own agency.

As a way to break down efficiency measure(s) further, you can use cost-per-mile or cost-per-hour data to guide specific aspects of vehicle maintenance. As an example: recording repair cost by type (e.g., air conditioning, wheelchair lift) enables you to track maintenance costs by repair category—air conditioning repair cost per revenue mile or hour, for instance. By isolating repair functions, you can identify specific areas in your program for optimizing maintenance costs.

Policies, Procedures, and Strategies to Manage Maintenance Costs

Effective policies and procedures can also help you control maintenance costs. To help you shape effective strategies, this section will address these concepts:

- State of Good Repair and Vehicle Replacement Planning.
- Preventive Maintenance Practices.
- Maintenance Contractor Oversight.
- Fleet Spare Vehicle Ratio.

State of Good Repair and Vehicle Replacement Planning

The FTA developed its "state of good repair (SGR)" initiative in order to promote and encourage transit agencies to maintain and protect assets by assessing fleet condition, developing sustainable fleet replacement plans, and practicing industry-standard preventive maintenance. The main goal of the SGR initiative is for transit agencies to provide consistently safe and reliable transit service.

Lessons Learned: WTS

WTS is a small urban transit operator. This agency uses maintenance software to generate reports by vehicle or system.

WTS can generate a report providing the cost of tire replacement or A/C repairs over time. The agency uses the data to plan its annual maintenance budget by analyzing:

- Cost per mile and cost per hour for its fleet.
- Fuel efficiency, part failures, and other components.
- Year-to-year average expenses.

Minimum service life is the expected miles or years an agency must use a vehicle before the vehicle is retired without financial penalty (meaning a financial obligation to return funds to the FTA).

The FTA establishes a minimum service life for vehicles (by vehicle category) in *Useful Life of Transit Buses and Vans*. The minimum service life is the expected miles or years an agency must use a vehicle before the vehicle is retired without financial

penalty (meaning a financial obligation to return funds to the FTA). The minimum service-life policy seeks to ensure that federal taxpayers obtain an adequate return on investment in transit vehicles by local agencies. The FTA service-life schedule varies by vehicle category. Table 4-4 provides details on vehicle categories and the FTA minimum service-life schedules.

Resources

FTA State of Good Repair Initiative
http://www.fta.dot.gov/12322_8986.html

National Transit Database
http://www.ntdprogram.gov/ntdprogram/

Table 4-4. Transit Vehicle Minimum Service-Life.

Category	Typical Characteristics				Minimum Life (Whichever comes first)	
	Length	Approx. GVW	Seats	Average Cost (2007$)	Years	Miles
Heavy-Duty Large Bus	35 to 48ft and 60ft artic.	33,000 to 40,000	27 to 40	$325,000 to over $600,000	12	500,000
Heavy-Duty Small Bus	30ft	26,000 to 33,000	26 to 35	$200,000 to $325,000	10	350,000
Medium-Duty and Purpose-Built Bus	30ft	16,000 to 26,000	22 to 30	$75,000 to $175,000	7	200,000
Light-Duty Mid-Sized Bus	25 to 35ft	10,000 to 16,000	16 to 25	$50,000 to $65,000	5	150,000
Light-Duty Small Bus, Cutaways, and Modified Van	16 to 28ft	6,000 to 14,000	10 to 22	$30,000 to $40,000	4	100,000

Source: *Useful Life of Transit Buses and Vans* , FTA, April 2007

In practice, transit agencies usually keep vehicles longer than the FTA minimum service-life requirement. *Useful Life of Transit Buses and Vans* contains an analysis of average retirement age based on National Transit Database (NTD) data. NTD provides a comprehensive dataset for assessing national transit vehicle statistics. Table 4-5 provides the average vehicle retirement by category of transit vehicle.

Table 4-5. Actual Average Vehicle Retirement.

Vehicle Category / Minimum Retirement Age	Average Retirement Age (Years)	Share of Active Vehicles That Are:	
		One or more years past the retirement minimum	Three or more years past the retirement minimum
12 - Year Bus	15.1	19%	9%
10 - Year Bus	8.4*	7%	4%
7 - year Bus	8.2	12%	3%
5 - Year Bus / Van	5.9*	23%	5%
4 - Year Van	5.6	29%	10%

Source: *Useful Life of Transit Buses and Vans* , FTA, April 2007

As shown in Table 4-5, 4-year transit vehicles are retired at an average age of 5.6 years, with 29 percent of the vehicles retired one or more years past the FTA retirement minimum. Additionally, agencies retire 10 percent of 4-year vehicles three or more years past the FTA retirement minimum.

A vehicle replacement plan helps you:

- Be accountable to FTA.
- Plan capital expenditures.
- Maintain your desired level of service for consumers.

Why Do I Need a Vehicle Replacement Plan?

Urban- and rural-transit agencies must have a vehicle replacement plan that provides for regular retirement of vehicles serving past their useful lives (expressed in terms of service years, service life miles, or both). Not only does this help agencies show accountability to the FTA, but it also helps agencies anticipate financial needs for capital investment, necessary for effective long-term strategic planning.

The goal of replacement planning is to project which specific vehicles need replacement in a given year. As mentioned earlier, tracking mileage, maintenance needs, and maintenance expenses can help you develop a reliable vehicle replacement plan.

As we all know from owning our own automobiles, a vehicle's maintenance needs increase as it ages. As a result, when your agency's vehicle is out of service more and driving fewer annual miles, it is less productive for your agency. Figure 4-1 shows how vehicle age relates to daily mileage and maintenance expenses. In this hypothetical example, at about 5.5 years old, this vehicle's cost to maintain begins to overshadow its service usefulness.

Table 4-6 provides an example fleet replacement plan. This type of information assists transit agencies in planning and preparing for the capital expenses associated with fleet replacement.

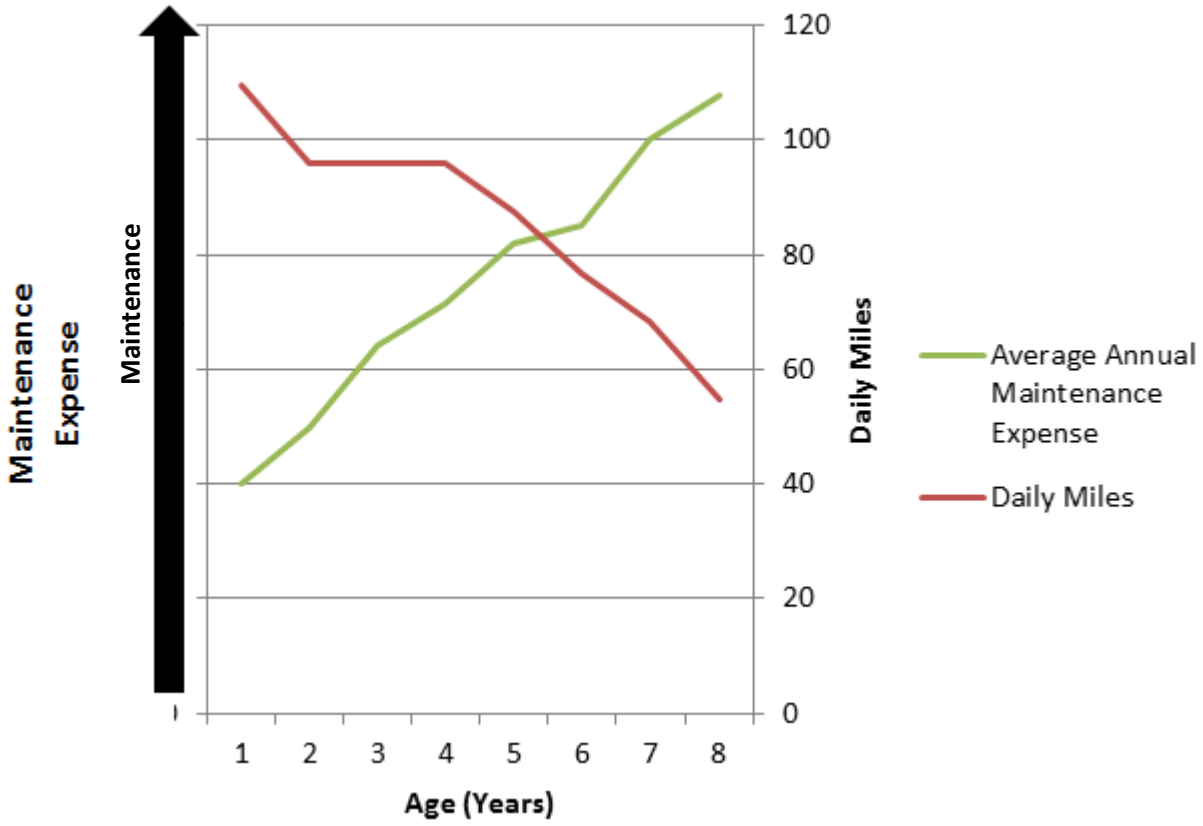


Figure 4-1. Maintenance Expense and Vehicle Usage by Age.

Table 4-6. Example Fleet Replacement Plan.

Year	2017			2018			2019			2020		
Vehicle Type	Retire	New	Fleet	Retire	New	Fleet	Retire	New	Fleet	Retire	New	Fleet
40-ft diesel	0	0	2	0	0	2	2	2	2	0	0	2
20-ft diesel	6	6	27	5	5	27	4	4	27	8	8	27
20-ft gas	3	3	4	1	1	4			4			4
Mini-van	1	1	8	1	1	8	3	3	8	1	1	8
Total	**10**	**10**	**41**	**7**	**7**	**41**	**9**	**9**	**41**	**9**	**9**	**41**
Cost 2012	$617,400			$303,200			$455,400			$454,100		
W/Inflation	$758,942			$385,755			$599,675			$618,892		

Lessons Learned: Mineral Wells PTS

Public Transit Services (PTS) in Mineral Wells assesses each vehicle's condition individually.

PTS aims to replace vehicles every 4-years or 150,000 miles, whichever comes first. If the vehicle meets one of these thresholds but is in good condition (i.e., the vehicle operates fine and maintenance expenses are relatively low), the agency will keep it in service.

By reliably predicting which vehicles need replacement, you can minimize downtime associated with major breakdowns not accounted for in your maintenance plan. By maintaining your vehicle fleet's state of good repair, you help to ensure your desired level of service for consumers.

A vehicle replacement plan combined with a proactive preventive maintenance program help ensure a state of good repair for your vehicle revenue fleet. As a result, a vehicle fleet in good repair will help ensure you provide comfortable, reliable, and safe services.

Preventive Maintenance Practices

TCRP Report 54 is an excellent resource when developing a preventive maintenance (PM) program. PM is essential to an effective and efficient maintenance program. PM involves scheduling certain types of routine maintenance procedures at specified intervals, typically by miles (PM can also be scheduled by time period for certain procedures). By performing systematic, regularly scheduled maintenance procedures at specified intervals, your system can minimize malfunctions.

Design your preventive maintenance program around specific vehicles. It should fit your operating environment and should be adaptable to changing vehicle or operating conditions. *TCRP Synthesis 81*, *Preventive Maintenance Intervals for Transit Buses*, provides a best practices guide for employing transit PM intervals and tools, such as checklists to use during PM inspections (*3*). Table 4-7 shows some examples of how you can tailor standard PM practices to your own agency's needs.

Resources

TCRP Report 54
http://www.tcrponline.org/bin/publications.pl?mode=abstract&cat_id=23&pub_id=802

TCRP Synthesis 81
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_81.pdf

Table 4-7. PM Practice Considerations.

Consideration	Examples	Benefits
Establish all the service intervals as multiples of a common denominator.	If oil is changed every 3,000 miles, consider doing tire rotations every 6,000 miles and transmission fluid services every 24,000.	• Minimizes vehicle downtime by minimizing the number of times the vehicle has to go in for maintenance. • Improves work and labor efficiency.
Consider seasonal/ environmental conditions that can impact maintenance and the necessary service interval for your PM program.	• If you operate in severe winters, consider changing the oil more frequently than every 3,000 miles because of cold starts/running. • You might need to replace air filters more frequently when driving over salted or sanded roads. • For rural operations, if you drive on unpaved, dusty roads, your vehicles might need more frequent oil changes and shock absorber replacement.	Optimizes vehicle performance by adapting standard maintenance practices to environmental factors.
Include a regular schedule for washing and cleaning your vehicles.	Certain dirt and grime—such as salt from the roads in winter—and chlorine compounds used to control dust on unpaved roads will accelerate rusting and vehicle aging.	• Improves public appearance of vehicles (and, thereby, your agency's public image). • Prevents acceleration of standard vehicular degeneration (e.g., rust).

Maintenance Contractor Oversight

Some agencies contract maintenance to an outside vendor. If you do so, monitor the contractor to ensure their maintenance program is operating efficiently and effectively:

- Ensure the contractor has the most up-to-date vehicle mileage information on a weekly basis. This ensures on-time PM interval performance.
- Store maintenance work orders with maintenance invoices and compare them against each other to make sure work scheduled matches work performed.
- Ensure your maintenance supervisor has sufficient time to oversee maintenance operations.

Fleet Spare Vehicle Ratio

Transit agencies should have a vehicle spares ratio between 10 and 20 percent. Spare vehicles increase your agency's reliability by providing a viable backup vehicle in case your regularly scheduled vehicle must be taken out of service.

Lessons Learned: WTS's PM Plan

WTS is a small urban transit operator with a written preventive maintenance plan that provides the information necessary to maintain vehicles and shop equipment to meet or beat manufacturer specifications. The plan requires maintenance at specific mileage and times. The maintenance program is audited by the FTA and city auditors to ensure expected vehicle life is met or exceeded.

When vehicles are refueled, vehicle mileage data are transmitted to the maintenance database; these data drive the PM schedule. WTS strives to sustain a preventive maintenance ratio of ±10 percent within the manufacturer's specifications. WTS conducts two types of PMs (categorized as B or C).

The major component of a B inspection includes an oil change and other minor checks and fluid inspections. It is conducted every 3,000 to 6,000 miles depending on the age and mileage of the vehicle.

WTS conducts C inspections at 35,000 to 36,000 miles (typically, one annually). The C inspection covers a transmission service and particulate filter cleaning/replacement, and can include wheel-bearing service depending on the manufacturer's specifications.

$$\text{Spares Ratio} = \frac{\text{Total Active Fleet} - \text{Peak Vehicle Requirement}}{\text{Peak Vehicle Requirement}}$$

Numerous factors influence the number of spare vehicles an agency might need. By understanding the effect each factor has on the number of vehicles needed, you can determine the number of spare vehicles your agency needs to own. By optimizing this number, you can limit unneeded capital expenditures (buying unneeded vehicles) and daily operating expenses (warehousing and maintaining unnecessary vehicles).

To determine the appropriate spares ratio for your agency, consider the following issues (*4*):

- Operating environment.
- Annual bus mileage.
- Bus operating speeds.
- Ridership fluctuations.
- Planned service/route adjustments.
- Age of fleet.
- Peak-to-base ratio.
- Fleet mix of bus makes and models.
- Road calls.
- Vehicles per mechanic.
- Alternative-fuel buses.
- Management and finance.
- Bus purchase/retirement schedule.
- Inventory management.
- Maintenance training.

Chapter 4: What to Remember

The authors have summarized what you should know about fleet maintenance in the form of the following top 10 list.

1	Gather data on your vehicle fleet to use in creating performance measures for monitoring the efficiency of your maintenance program.
2	Keep an asset-inventory and condition-monitoring database containing a list of all vehicles owned by your agency. Networking these databases enables staff from different departments to access data useful to them.
3	Operators should conduct pre- and post-trip vehicle inspections. Keep a file for each vehicle that includes all inspection forms and work orders.
4	Maintain a record of road calls and determine the frequency of calls per 1,000 miles as an indicator for program efficiency. Track vehicle failures as another way to measure program performance.
5	Use performance measures like maintenance cost per revenue mile (or hour) data to guide specific aspects of vehicle maintenance. Track the fluctuation and trends of maintenance costs per unit over time to identify trends and opportunities for improving program efficiency.
6	Have a vehicle replacement plan that provides for regular retirement of vehicles serving past their useful lives. This will help you better plan anticipated capital expenditures for purchasing new vehicles.
7	When possible, schedule routine maintenance procedures simultaneously to minimize malfunctions and vehicle downtime.
8	Tailor standardized preventive maintenance practices to your agency's environmental and circumstantial needs. For example, if you provide services during harsh winter months, you may need to schedule more frequent oil changes for your vehicles.
9	If contracting maintenance with a third party, monitor the contractor to ensure their maintenance program is operating efficiently and effectively.
10	Maintain a vehicle spares ratio between 10 and 20 percent of your overall fleet count.

References

1. Transit Cooperative Research Program (TCRP). Report 54. "Management Toolkit for Rural and Small Urban Transportation Systems (Part C)." Washington, D.C., 2009. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_54-c.pdf.

2. Transit Cooperative Research Program (TCRP). Report 54. "Management Toolkit for Rural and Small Urban Transportation Systems (Part A)." Washington, D.C., 2009. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_54-a.pdf.

3. Transit Cooperative Research Program (TCRP). Synthesis 81. "Preventative Maintenance Intervals for Transit Buses." Transportation Research Board, Washington, D.C. 2010.

4. Transit Cooperative Research Program (TCRP). Synthesis 11. "System-Specific Spare Bus Ratios." Transportation Research Board, Washington, D.C. 1995.

Chapter 5. Buying Fuel and Managing Consumption

Fuel is a significant driver of every transit agency's operating budget. In fact, fuel is the highest transit agency cost after labor and fringe benefits. This chapter provides strategies and lessons learned for purchasing and managing fuel consumption.

Table 5-1 represents Texas Transit District fiscal year 2010 expenses based on National Transit Database (NTD) urban-reported expenses and a sample of rural agencies. In 2010, fuel and lubricants represented an average of 13 percent of Texas transit-agency expenditures (an estimated $18.3 million statewide).

> Fuel is the highest transit agency cost after labor and fringe benefits.

Table 5-1. Distribution of Costs for Transit Agencies Directly Operating All Services (FY10 NTD Urban and Sample of Rural).

Operating Expense Category	Transit Agency Types in Texas			
	State-Funded Urban (10 Agencies)	Dual Rural/Urban (5 Agencies)	LEP (2 Agencies)	Rural (10 Agencies)
Salaries and Wages	44%	44%	57%	52%
Fringe Benefits	20%	16%	20%	14%
Services	11%	13%	2%	2%
Fuel and Lubricants	10%	12%	13%	17%
Tires and Tubes	1%	1%	2%	2%
Other Materials/Supplies	9%	4%	4%	3%
Utilities	2%	1%	1%	2%
Casualty and Liability Costs	3%	2%	1%	4%
Purchased Transportation	0%	0%	0%	0%
Miscellaneous Expenses	1%	7%	0.2%	4%
Leases and Rentals	0.1%	0.1%	0%	0%
Total Operating Expense	**100%**	**100%**	**100%**	**100%**

Market-driven costs, such as fuel, are difficult and often impossible to control. Figure 5-1 shows the volatility of fuel costs in recent years. Costs peaked in July 2008 at $4.03 for Texas retail gasoline and $4.74 for No. 2 Diesel Ultra Low Sulfur fuel.

How you purchase and manage the consumption of fuel can also significantly impact overall costs, however—and those are aspects you *can* control. Efficient purchasing methods, monitoring, service planning, pairing vehicle types with services need (vehicle fleet mix), in-vehicle mapping, efficient scheduling, and quality maintenance are all strategies that can reduce the overall impact of fuel prices on your operational budget.

Figure 5-1. Gasoline and No. 2 Diesel Ultra Low Sulfur Prices February 2007 to May 2012.

Source: Energy Information Administration, http://tonto.eia.doe.gov/oog/info/wohdp/diesel.asp

Identify Current Fuel Cost-Related Practices

Because you purchase fuel on a regular basis, it's a very visible, constant reminder of the cost of doing business. The sometimes-volatile fuel market makes it difficult to accurately budget for fuel in your annual budget. Here is a list of questions to get you started on self-assessment regarding how well you're currently managing your staffing costs. **Note:** All questions might not apply to your particular agency.

If you answered "No" to any of the above questions, there might be opportunities for you to improve your fuel purchasing and consumption practices.

How Fuel Is Currently Purchased/Housed by Transit Districts in Texas

Texas small-urban, rural, and limited-eligibility transit providers purchase fuel in several ways: fuel cards, city/county fueling agreements, local fuel-station agreements, and contractor-provided fuel. Some agencies store fuel locally in their own facilities. Table 5-2 provides a summary of methods used. Notice the tendency for urban agencies to maintain their own fuel tanks on site versus rural agencies, which prefer third-party providers. Reasons for these differences will become apparent as we discuss each method in more detail.

Question: Does Your Agency…	***Yes***	***No***
Consider the distance vehicles travel to fuel?	☐	☐
Consider different fueling strategies (fuel tanks, fuel cards, city/county agreements, contractor-provided fuel) based on service characteristics?	☐	☐
Dedicate a staff member to monitoring fuel usage?	☐	☐
Take advantage of fuel discounts or rebates?	☐	☐
Have detailed fueling reports for monitoring purposes?	☐	☐
Forecast fuel costs based on projected service miles to include deadhead (miles to move vehicle in and out of service)?	☐	☐
Have controls in place for limiting individual fuel purchases?	☐	☐
Monitor excess idling (over 3 to 5 minutes)?	☐	☐
Train drivers to maintain speeds and smooth vehicle operation to reduce fuel cost?	☐	☐
Check tire pressure daily to improve fuel efficiency?	☐	☐
Adjust transmissions, front-end alignments, and steering control to improve fuel efficiency?	☐	☐
Determine service demand requirements in the decision to purchase fleet types?	☐	☐
Consider vehicle-required fuel type and fuel efficieny vs. the cost of the vehicle when making vehicle purchasing decisions?	☐	☐

Table 5-2. State-Funded Rural and Urban Fueling Methods.*

Transit Provider Type	*Transit Agency Response*	Maintain On-Site Fuel Tank(s)	State Fuel Cards	Private-Company (Non-State) Fuel Cards	City and/or County Agreements	Local Fuel Station Agreements	Contractor Provided Fuel
Dual Rural and Small Urban	*8 of 8*	3	0	5	4	2	2
Limited Eligibility Provider	*3 of 4*	2	0	1	0	0	1
State-Funded Urban	*14 of 14*	14	0	4	2	3	4
Rural	*29 of 30*	5	4	21	9	6	5
Total	***54 of 56***	**24**	**4**	**31**	**15**	**11**	**12**

** Any single provider may use more than one means of fueling*

On-Site Fueling and Maintaining Storage Tanks: Pros and Cons

In Texas, a majority of urban transit providers possess on-site fuel tanks and fueling capabilities. Transit agencies typically use on-site fuel tanks when:

- Operating urban services.
- Providing services in a geographically concentrated service area.
- Utilizing alternative fuels (such as compressed natural gas).
- Operating fixed-route services with complementary paratransit.

A principal advantage of on-site fuel storage is the ability to purchase fuel in bulk.

When considering on-site fuel tanks, evaluate the cost, location (availability and convenience), billing and payment procedures, usage, tracking capability, and security of the tanks. Examples of on-site fueling in Texas include:

- Brazos Transit District (BTD) has an on-site diesel fuel tank in Bryan to operate the urban College Station-Bryan fixed-route service. BTD uses a private company-issued fuel card for rural-demand response service.
- Capital Area Rural Transit System (CARTS) has an on-site fuel tank to fuel propane vehicles.

A principal advantage of on-site fuel storage is the ability to purchase fuel in bulk.

- The City of Cleburne and Fort Bend County have fuel tanks to serve relatively small service areas of 689 and 641 square miles, respectively.
- Colorado Valley Transit uses a fuel tank only to serve the area around the city of Columbus.
- The city of South Padre Island has a diesel fuel tank and a gasoline fuel tank to operate transit in a service area of two square miles.

Case Study: Fueling Practices at Hill Country Transit District

Hill Country Transit District (HCTD) operates urban transit services in Killeen and Temple and rural services over a nine-county area. To meet its varied needs, HCTD uses a mixture of fuel management methods:

- An on-site diesel fuel tank for fixed-route and complementary paratransit urban services in Killeen.
- Local fuel station agreements for diesel fuel to operate its fixed-route and complementary paratransit urban service in Temple and throughout the rural service area to operate rural demand-response service.

One disadvantage of having on-sight fueling is the potential for spillage and the associated environmental impact.

At the time this guidebook is being written, HCTD plans to centralize both its Killeen and Temple divisions into one operations and maintenance facility. This will provide the ability to move vehicles directly from the fuel line to the wash bay, further saving on fuel costs.

Off-Site Fueling: Pros and Cons

Many Texas transit agencies use off-site fueling resources—such as fuel cards, city/county agreements, or local fuel-station agreements—for various reasons, including:

- A means to manage fuel consumption electronically.
- A backup means to purchase fuel.
- Convenient fueling locations (especially when servicing larger areas).
- Diesel fueling facilities.
- Access to discounted fuel.

Lessons Learned: HCTD & On-Site Fuel Tanks

- Purchase ultra-low sulfur diesel fuel in bulk to save money.
- Use fuel-tracking software to produce regular reports for review.
- Assign one fuel card per vehicle to facilitate monitoring (data entered into the tracking software).
- Require a division's vehicles to return to the yard daily to save fuel.
- Minimize staff slack time by piggybacking simple, routine maintenance procedures (e.g., checking engine oil) on-site while fueling.

Fueling off site provides a convenient means to operate efficiently in the dispersed areas typically serviced by rural agencies.

Unless rural-transit agencies serve concentrated areas of consumers, storing fuel on site is not practical for the majority of rural transit agencies covering large service areas. The on-site cost savings provided by purchasing in bulk is lost by the long distances vehicles must travel in these areas to be refueled at a single location. Fueling off site provides a convenient means to operate efficiently in the dispersed areas typically serviced by rural agencies. Fueling off site also means relying on third party vendors to maintain fuel supplies and work smoothly with operators to avoid causing your agency downtime.

Examples of off-site fueling in Texas include:

- BTD uses fuel cards throughout its rural service area.
- Golden Crescent Regional Planning Commission (GCRPC) uses fuel cards only for backup purposes.
- Longview Transit has a diesel-fuel tank and also contracts with Harrison County to use its private company-fuel card for gasoline purchases.
- CityLink in Abilene decided to purchase gasoline vehicles for demand-response services. Because CityLink has two 10,000-gallon underground diesel tanks and did not want to dedicate a diesel tank for the smaller amount of gasoline, the agency decided to use a private company-issued fuel card. The fuel card provides easy access to fuel at service stations around the city and reasonable pricing.
- CARTS has an on-site propane fuel tank for propane-fueled vehicles and uses two private company-fuel cards to operate diesel- and gasoline-fueled vehicles.

Overview: Fuel Cards

You can purchase fuel, as well as automotive goods and services, using fuel cards. The Council on Competitive Governments (CCG) has contracted with U.S. Bank to provide State of Texas fuel cards with the advantage of providing federal tax-exempt fuel. Whether public or privately supplied, fuel cards have several advantages:

- Net-out (or rebate) of federal taxes (CCG).
- Discounts on fuel.
- Rebates on all transactions.
- Coverage of fuel payments under a single invoice.
- Payment of maintenance on the same card.
- Acceptance of cards across the state.
- Ability to tailor retail fuel cards to meet the needs of agencies.
- Customized purchasing limits.
- Restricted transaction to locations, hours of the day, and days of the week.
- Authorized groups, sub-groups, or individual employees for specific purchases.
- Access to real-time transaction data.
- Access to information to resolve a declined fuel card.

- Ability to view and download transaction detail to analyze each driver's spending behaviors.
- Ability to track purchasing exceptions for each cardholder.
- Ability to block and unblock cards instantly.
- Ability to change purchasing authorization and spending limits in real time.
- Options to authorize one-time and emergency purchases.

The fuel card vendors provide web-based maintenance of your card account with details regarding authorized, posted, and declined transactions.

Resource

Texas Council of Competitive Governments
http://www.ccg.state.tx.us/contracts/retail_fuel_fy12.php

Fueling Agreements: Pros and Cons

Transit agencies sign fueling agreements with cities, counties, or local service stations when:

- The agency is a division/department of the city or county and can take advantage of the organization's bulk fuel purchase price.
- Local service stations provide convenience, especially in remote areas.
- Local service station provides alternative fuels.
- City and county agreements throughout service areas provide access to fuel at bulk prices.

Fuel agreements provide a convenient, consistent, and trackable source of fuel, especially in rural areas.

Examples of fueling agreements in Texas include:

- McAllen Express service is a department of the City of McAllen. The city provides fuel at its fueling station to operate transit service.
- The City of Victoria and the City of Cuero provide access to city-owned fueling stations for the GCRPC.
- Concho Valley Transit District has agreements with local municipalities and counties throughout its service area to provide fuel at the city/county fueling stations.
- HCTD fuels at fueling stations in more remote areas, where other fueling options are not viable.

One disadvantage of fueling agreements is that providers are not under your agency's direct authority.

Lessons Learned: HCTD & Fuel Agreements

HCTD has found that the main advantage of using fueling agreements with fueling stations is not in the fuel price but in the convenience, consistency, and ability to track fuel use, especially in rural areas where other fueling options are not a viable option. Drivers fuel the vehicles, and HCTD controls potential fraud by requiring them to submit signed credit-card receipts, which are then matched to statements and cross-checked with data from the fuel usage database.

Positive relationships with local vendors are another advantage. Beyond public relations, purchasing locally supports the local economy.

Reasons for Using Contractor-Provided Fuel

Although disadvantages exist in contractor-provided fuel (e.g., unrealized tax savings), advantages also exist. These include when your agency:

- Prefers not to shoulder the administrative burden for monitoring fuel use and potential fraud from your agency.
- Relies on fixed-price fuel, wherein the fuel price is standardized (like a fixed-rate mortgage, for example), removing some of the volatility of monthly rate changes. Vendors will usually set a threshold beyond which prices can vary in these kinds of agreements.
- Must meet a small- or disadvantaged-business requirement, and the contractor qualifies.

Examples of contractor-provided fuel in Texas include:

- BTD contracts with a private bus company to operate The Woodlands Express urban service to include fuel.
- GCRPC contracts to operate rural service in six counties to include fuel.

Policies, Procedures, and Strategies for Managing Fuel

Policies, procedures, and strategies for buying fuel and managing transit agency consumption differ based on the method of fuel purchase. Fuel cards can streamline transactions, improving efficiency and providing savings to your agency. Considerations for adopting a fuel management program are discussed here, and multiple real-world examples demonstrate various agencies' experiences with their own efforts (shown in Table 5-3).

Fuel cards can streamline transactions, improving efficiency and providing savings to your agency.

Table 5-3. Agency Experiences with Fuel-Card Programs.

Agency Name/ Headquarters	Transit Agency Type	How the Agency Has Implemented Its Fuel-Card Program
SWART/ Uvalde	Rural	• Assigns each vehicle a fueling card and each driver a unique PIN. • Records mileage and PINs when the card is used. • Notes gallon vs. mileage discrepancies in the weekly billing reports. • Restricts, daily, for each vehicle: the number of times it can refuel; the type of fuel; and how many gallons can be input. • Studies weekly use reports to detect fraud. Man hours spent on fuel consumption analysis have decreased, overall.
CTRTD/ Coleman	Rural	• Limits fuel cards for use by individually approved staff only. • Submits employee names to the fuel-card vendor, which establishes a unique password for each individual. • Establishes a policy of removing employees' access to cards as soon as they leave agency employment. • Assigns each vehicle a fuel card. • Requires drivers to enter the driver identification number, vehicle mileage, and their unique password for each purchase. • Reviews statements itemizing each vehicle's charges—including date, time, location, vehicle, mileage, driver, gallons, and price—at the end of the month. • Requires drivers to submit receipts—containing the vehicle number, mileage, and driver name—weekly. Accounting staff match these receipts to monthly statements; all missing information is researched and reconciled monthly.
CityLink/ Abilene	Small-Urban	• Trains all vehicle servicers and mechanics on fuel-card use. • Provides a reference card detailing fuel-card instructions to ensure consistency. • Identifies vehicle servicers and mechanics as "active users" in the fuel-card vendor database. • Assigns an access code, necessary for fueling the vehicle, to each user. • Monitors fuel-card usage reports for possible abuse.
Capital Metro/ Austin	Large-Urban	• Assigns a fuel card to each vanpool vehicle. • Monitors card use through the vehicle maintenance department. • Sets a weekly gallon limit depending on the estimated mileage for the vanpool. • Limits cards to fuel purchases only.

Are Fuel-Card Programs Right for Your Agency?

Fuel-card programs carry risk. Cost savings depend on avoiding waste, fraud, and abuse that would offset savings. Recommended practices to manage risk and more effectively pursue cost savings include:

- Providing effective transaction review and approval processes.
- Ensuring consistency in program monitoring.
- Separating duties.
- Limiting the number of cards issued and credit amounts.
- Ensuring that training occurs before a card is issued and reinforcing training periodically.
- Establishing a policy of consequences if the card is used inappropriately.
- Using available data and software tools to monitor credit card purchases.

Before implementing a fuel-card program, evaluate the pros and cons of the program considering your own unique administrative and operating environment. SWART suggests you carefully consider your geographic location to ensure enough fueling stations exist, especially if you cover a rural area. Also, compare the man hours needed to review mileage and fuel logs manually vs. the expense associated with monitoring reports provided by fuel-card companies.

Remember: adopting a fuel-card program is not something you can simply plug into your existing operations. You will need to develop proper controls and accountability standards to avoid waste, fraud, and abuse, which can easily cancel out the benefits of a fuel-card program.

Fuel-card programs carry risk. Cost savings depend on avoiding waste, fraud, and abuse that would offset them.

Considerations for Service Design and Policies in Managing Fuel Consumption

Fixed-route schedulers can reduce fuel costs by minimizing deadhead miles on routes or redesigning routes to reduce total vehicles needed (e.g., reducing trip frequency). Any change in service must be balanced with service quality and market demand.

Rural demand-response systems might design a route to begin near a selected driver's home, allowing the driver to take their assigned transit vehicle home at night. This reduces deadhead miles and their associated fuel and maintenance costs.

Other considerations in service design and policies that impact fuel consumption include:

- Providing service over large service areas.
- Serving areas of low-population density.
- Traveling to destinations outside the service area.

Lessons Learned: HCTD & Service Design Considerations

HCTD Rural Division assigns vehicles and drivers individually to small towns throughout the service area to minimize deadhead miles and time. For Killeen and Temple—the agency's two urban divisions where the service area is limited—the benefit of operating one instead of multiple facility locations outweighs the fuel and mileage saved by reduced deadhead miles in the rural divisions. Distance to first stops and last drop-off points in relation to facilities and fueling costs are considerations in routing assignment decision making.

HCTD's real lesson is that no one policy fits all agencies; look at your operation, decide what works best for your agency, and implement that specific solution. Even if, like HCTD's, it's actually a hybrid solution.

- Scheduling practices (e.g., ridesharing) to minimize individualized trip-making. (For more on ridesharing, see Chapter 3).
- Implementing policies to control no-show and late cancellations resulting in unnecessary trips.

Are Alternative Fuels Right for Your Agency?

In addition to fuel pricing and consumption considerations, *TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements* can help you evaluate options regarding an alternative fuel fleet (e.g., liquefied natural gas, compressed natural gas, electric vehicles, bio-diesel, propane). Alternative fuel choice considerations are based on capital and operating costs, environmental concerns, reliability of fuel and technology suppliers, popularity (including political support), transit agency experience, and risk associated with fuel change. In making choices about alternatively fueled vehicles, consider the following factors that affect costs:

- Unavailability or interruption in fuel supply.
- Fuel-specific equipment required.
- Necessary spare parts.
- Equipment maintenance and warranty services.
- Retrofitting garages (capital costs).
- Training employees to handle fuel.
- Bus price (capital costs).
- Fuel price per diesel gallon equivalent (DGE).

TCRP Report 146 provides a spreadsheet tool, "FuelCost2," for making decisions regarding lifecycle costs of vehicles with differing fuel types.

Resources

TCRP Report 146
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_146.pdf

FuelCost2 Spreadsheet
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_146FuelCost2.xls

Reducing Fuel Consumption by Changing Driver Behavior

Fuel economy is affected by many factors including fleet type and age, driver behavior, and idling policies. You can likely reduce fuel expenditures by improving fuel economy with a program of driver training and oversight. Identifying poor driving habits and rewarding efficient driving habits can improve performance and reduce fuel cost. In fact, driver-training programs can improve fuel economy by 5 to 10 percent for your agency. On-the-road training yields the best results for training drivers to conserve fuel.

Driver training programs typically focus on safe-driving habits and on-time performance. When finalizing your driver-training curriculum, incorporate driving techniques to improve fuel economy.

Training might include classroom review, driving simulators (if available), instructional videos, and on-the-road training with an instructor, which yields the best results for teaching drivers to conserve fuel. Most drivers are aware of good driving practices but might have developed fuel-inefficient habits. Fuel-efficient driving techniques include the following:

- Reducing excess idling (over 3 to 5 minutes).
- Maintaining consistent vehicle speed (keeping engine RPMs at optimum levels).
- Accelerating and decelerating smoothly.
- Using vehicle momentum to maintain cruise speed.
- Avoiding filling the gas tank to the very top (especially in summer months).
- Avoiding pumping the accelerator pedal.
- Avoiding riding the brakes.
- Avoiding hard turning.

Trainers can spot habits that promote fuel inefficiency and correct drivers on the spot.

Driver-training programs can improve fuel economy by 5 to 10 percent.

How Can My Agency Encourage Drivers to Improve Their Driving Habits and Reduce Fuel Use?

Transit managers can monitor drivers by vehicle to determine which drivers have the worst fuel economy. As noted in the previous section, retraining can yield fuel-economy improvements as much as 10 percent. Motivating employees and management alike to see fuel economy as a benefit to your organization helps create a culture that values fuel-efficiency.

Combining a culture change with technological solutions creates longer-lasting, positive results for your agency budget. Consider posting in the break room

or emailing out the monthly average-fuel-economy performance by driver. In addition, your agency could post fuel economy by vehicle type or route. Creating a token economy (or rewards program) for high performers among drivers who achieve fuel economy goals can motivate others to achieve similar goals.

Motivating employees and management alike to see fuel economy as a benefit to your organization helps create a culture that values fuel-efficiency.

Lessons Learned: SWART & Using Driver Behavior to Reduce Fuel Consumption

SWART staff monitor the time drivers take to drive their routes, then compare times across drivers to analyze speeds and idle time. SWART trains drivers to minimize idling time in traffic and plan routes that avoid traffic congestion, construction, and detours.

Reducing Fuel Consumption by Improving Vehicle Maintenance

According to *TCRP Synthesis 84: Current Practices in Greenhouse Gas Emissions,* routine vehicle maintenance programs can improve vehicle efficiency. For example, keeping bus tires properly inflated is a simple maintenance measure that improves fuel efficiency.

"In 2005, TriMet maintenance crews (in Portland, Oregon) boosted gas mileage on buses by approximately 10 percent by adjusting transmissions, front-end alignments, and steering control arms, and maintaining a set tire pressure."

—TCRP Report 84

The Energy Sector Management Assistance Program (ESMAP) Guidance Note *Best Operational and Maintenance Practices for City Bus Fleets to Maximize Fuel Economy* suggests that agencies need the following to maximize fuel economy:

- *Management commitment and ownership.* Management must oversee and implement the fuel oversight program to ensure implementation occurs in a coordinated manner.

- *Data collection and analysis.* Conduct fuel-consumption data collection and analysis consistently. Implement benchmarks, targets, and measurement of fuel economy indicators to take action where improvement is needed.
- *Maintenance directed at low fuel-economy buses.* Focus technical-support interventions on the 10 percent of the fleet showing the lowest fuel economy. Underperforming buses should undergo proper operations and maintenance practices and quality assurance of repairs processes.

Transit agencies that have processes and procedures in place to ensure their vehicles are maintained at optimal levels—where management shows commitment to monitoring fuel efficiency and where benchmarks and targets are set for fuel economy—are most likely to realize fuel-cost savings.

Resources

TCRP Report 84
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_84.pdf

ESMAP Guidance Note
http://www.esmap.org/esmap/sites/esmap.org/files/FINAL_EECI-BusGuideNote_BN010-11.pdf

Reducing Fuel Consumption by Improving Fleet Mix

From small sedans (used for ambulatory needs) to vans to a variety of bus sizes, most transit providers use a mix of vehicles types and sizes. The main advantage in using a fleet of mixed vehicles is the cost effectiveness in dealing with variation-in-seating requirements (*1*).

The main advantage in using a fleet of mixed vehicles is the cost effectiveness in dealing with variation-in-seating requirements.

Lessons Learned: HCTD Fleet-Mix Decisions

HCTD decides what size of vehicle to purchase based on service demand. For example, to gain fuel efficiency, the agency uses minivans for long-distance and/or lower-capacity trips and small buses for door-to-door service. HCTD operates 30–35 ft buses in its higher-capacity fixed-route service.

Fleet mix and the vehicle seating/wheelchair configuration can influence how much service you provide consumers. For example, the number of vehicles and drivers needed to provide services carrying a large number of wheelchair users to the same location would directly depend on the wheelchair-carrying capacity of the vehicle.

A high-demand commuter service might require a large vehicle with maximum ambulatory seating to provide higher productivity (through, for example, fewer trips) and fewer vehicles with overall lower operating costs. A larger vehicle does not automatically yield higher productivity, however.

The use of larger vehicles means higher fuel costs (per vehicle) and lower maneuverability. In a shared-ride general-public demand-response service, trips are constrained by travel time as well. Filling the vehicle might be impractical due to passenger travel-times requirements. Smaller, more fuel-efficient vehicles might prove optimal in serving low-density areas with lower demand (*1*) and directly influence the amount of fuel consumed.

Resource

TCRP Report 146, http://www.trb.org/TCRP/Blurbs/165390.aspx

Fleet-mix considerations should take into account fuel type and efficiency in the context of capital-cost requirements. *TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements* is a good source for evaluating this. For each fuel and supporting technology, this report provides the state of the fuel/technology for potential transit application, emissions information, capital and operating cost information, impacts on operations and facilities, and other information (*2*).

Chapter 5: What to Remember

Fuel is likely your highest agency cost after staff expenses. Some aspects of fuel management are controllable, some aren't. Strategies aimed at controllable factors include efficient purchasing methods, monitoring performance, pairing vehicle types with services need (vehicle fleet mix), efficient scheduling, and quality maintenance.

Some agencies store fuel locally in their own facilities, gaining the pricing advantage of purchasing in bulk by doing so. However, fuel agreements are recommended for fleets operating across wide service areas. As with all vendor contracts, fueling agreements must be monitored.

Fuel cards can have numerous advantages. Fuel cards can save you money by streamlining transactions and removing administrative costs associated with maintaining and tracking fueling data. Fuel-card programs carry risk—including the potential for waste, fraud, and abuse—so proper monitoring is necessary.

Are alternative fuels right for your agency? Moving to alternative fuels might require the purchase of new vehicles or the conversion of existing vehicles to fuel-specific needs. Certainly employees will need to be trained, especially maintenance personnel used to working on gasoline engines. The cost of additional infrastructure (e.g., fueling stations) is a capital expense consideration.

Schedulers can reduce fuel costs by minimizing deadhead miles on routes or

redesigning routes to reduce total vehicles needed. Also, varying your fleet mix can increase efficiency by better matching the number of passengers on a given route or trip to the size of the vehicle (optimizing fuel use).

Motivate employees and management alike to see fuel economy as a virtue. Properly training drivers and maintaining vehicles routinely can improve vehicle efficiency by up to 10 percent each. Focus technical-support interventions on the 10 percent of the fleet showing the lowest fuel economy. By making fuel economy a goal agency wide, you can achieve significant cumulative savings.

References

1. F. Liping and G. Ishkhanov. *Fleet Size and Mix Optimization for Paratransit Service.* Transportation Research Record: Journal of Transportation Research Board. Volume 1884. Washington, D.C. 2004.

2. Transit Cooperative Research Program (TCRP). Report 146. "Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements." Washington, D.C. 2011.

Chapter 6.
Contracting for Transit Services

Public transit agencies use different approaches to deliver services, from using their own vehicles and personnel to enlisting outside contractors for some or all services. Agencies contract out services as a way to increase efficiency and reduce operating costs. Other reasons for contracting include more flexibility, improved customer service, better use of technology, and opportunities for regional coordination (*1*).

Contracting for services does not ensure lower costs. Successful contracting for transit services requires:

- Careful planning.
- A realistic assessment of the market and opportunities to save money.
- An effective procurement process.
- Consistent performance monitoring and contractor oversight.

Transit Services and Contract Providers

Transit agencies enter into contracts for different purposes and scopes of work.

- **Management contract** — Several Texas urban transit districts contract with a private company to serve as the general manager for transit services. The private company provides an experienced general manager, and in some cases additional key staff, to oversee the public transit system. The transit district retains ownership of the

vehicles, and public employees operate the transit system. Financial risk remains with the transit district; the public entity directly pays all operating and capital expenses as well as the cost for the management contract.

- **Transit services contract** — A transit agency might contract for services with another public entity, a non-profit organization, or a private company. The contractor is responsible for managing, supervising, and operating transit services with the company's employees. Financial risk is shared with the contractor within the terms of the agreement. The contractor provides the transit services typically for a fixed price (e.g., cost per hour), while the public entity provides the transit vehicles and, often, the operations and maintenance facility.

Variations on the concept of a contract for services include a contract for operations only or a contract for vehicle maintenance only.

- **Turnkey contract** — *Turnkey* means the contractor is responsible for managing, supervising, and operating the transit services, and also provides the vehicles and the operations and maintenance facility. The contractor assumes the financial risk to operate transit services within the price set by the contractor agreement.

A transit district might contract for transit services with one of several different types of contractors.

- **Another transit agency** — to take advantage of regional resources, focus on core strengths, or reduce administrative overhead.
- **Human service transportation provider/non-profit** — to serve a niche market, improve customer service, or support the goals of regional coordination.
- **Private for profit** — to reduce costs or improve efficiency. The private company might be a national, regional, or local transportation provider, or a private-for-hire transportation company (taxicab operator).

In this chapter, we are going to focus on the transit services and turnkey contract options and, in particular, contracting with a private for profit company. The best practices discussed can apply to contracting with another public transit agency, a human service transportation provider, or a non-profit agency.

Why Contract for Transit Services?

According to the Transportation Research Board's (TRB's) *Special Report 258: Contracting for Bus and Demand-Responsive Transit Services*, reducing costs and improving operational efficiency are the most often cited reasons for contracting for transit services (*1*). Private companies are often able to use labor and assets more efficiently with part-time personnel and flexible service scheduling throughout the day. Small public transit systems report reductions in staffing and administrative burdens assumed by the contractor. The

Transit Cooperative Research Program's (TCRP's) *Research Results Digest 46: Supplemental Analysis of National Survey on Contracting Transit Services* supplements *Special Report 258* with other reasons for contracting transit services include to (*1,2*):

- Start new service or expand services quickly.
- Secure the specialized expertise needed to deliver particular kinds of service.
- Enhance customer service.
- Avoid upfront capital costs by contracting for service and vehicles, especially for new service.

Other agencies may be required to contract for services by a legislative mandate or local governmental policy.

Resources

TRB Special Report 258
http://onlinepubs.trb.org/onlinepubs/sr/sr258.pdf

TCRP Research Results Digest 46
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rrd_46.pdf

NCTR Report
http://www.nctr.usf.edu/wp-content/uploads/2011/08/77923.pdf

The National Center for Transit Research's (NCTR's) *Analysis of Contracting for Fixed Route Bus Service* suggests that, in addition to cost savings, contracting for transit services allows a public agency to shift risks associated with new service that can be easily withdrawn or modified if the service is unproductive (*3*). Contracting for transit services can apply to urban or rural operating environments.

Reducing costs and improving operational efficiency are the most often cited reasons for contracting for transit services.

What Types of Agencies Contract for Services

In 2002, TRB sponsored a study of contracting by recipients of federal transit grants. General managers of 250 transit systems responded to the survey, representing about half of all federal aid recipients at the time.

According to the survey, in general, transit systems with more than 50 total vehicles are more likely than smaller ones to contract for some transit services. Yet when small systems do contract, they are more likely to contract for all services. City and county agencies that do not specialize in transit are often responsible for small transit systems. These general government agencies are twice as likely as regional transit agencies to contract for all transit services.

A corollary is that, while regional transit agencies are more likely than city and county agencies to have some contracted services, they seldom contract for most or all of their services. Overall, contracting is much more common for demand-responsive than fixed-route bus services (*1,2*). Larger fixed-route transit systems often contract for Americans with Disabilities Act (ADA) complementary paratransit services.

A contract can cover specific services, parts of services, or all transit services. An agency that contracts part of its transit services identifies specific routes or specific types of services appropriate for contracting. Agencies use partial contracting to increase cost efficiency for a particular service, such as peak-only routes, shuttle-style connectors, service to outlying areas, or to preview the cost efficiency of a potential new service.

Potential Pitfalls of Contracting for Services

General managers who responded to the 2002 TRB survey also reported the perceived problems of contracting for transit services. The most-often stated concerns were loss of control over operations and reduced quality of service. Other concerns about contracting transit services according to the survey included (*1,2*):

- Quality of contractor work force.
- Employee turnover/low wages.
- Poor customer service.
- Time and effort to ensure contractor performs up to expectations.
- Less savings over time.
- Local environment might not be competitive; therefore, low anticipation of cost savings and little reason for changing practices.

Some of the problems can be resolved or mitigated, as discussed in the section *How to Ensure Your Contractor Delivers Quality Service* later in this chapter.

What Is the Extent of Contracting for Transit Services in Texas?

As part of the National Transit Database (NTD), the Federal Transit Administration (FTA) maintains a national database of "purchased transportation" by transit systems that received federal aid. According to NTD data for all transit systems in the U.S. in 2010, 16 percent of all buses operated in maximum service for fixed route transit service are purchased transportation, and 77 percent of all vehicles operated in maximum service for demand responsive transit services are contracted.

According to 2010 NTD reports, 13 urban transit systems in Texas purchased one or more types of transit services. The urban transit systems include regional transit authorities, state-funded urban transit districts, and Harris County. Of the 13 transit systems that purchased transit services, 8 transit agencies purchased fixed-route transit service, 7 transit agencies purchased demand-responsive transit services, and 6 transit agencies purchased taxicab service (*4*).

Resource

National Transit Database
http://www.ntdprogram.gov/ntdprogram/

Texas rural transit districts also report data each month to the TxDOT Public Transportation Division using Form PTN-128. According to PTN-128 reports for fiscal 2011, 14 rural transit districts reported purchased transportation (*5*). Purchased transportation refers to interlocal agreements with other transit agencies, contracts with human service transportation providers, and agreements with private contractors.

Interlocal Agreements

Transit districts enter into interlocal agreements with other public transit agencies to take advantage of regional resources. Examples include:

- The Texarkana Urban Transit District contracts with the rural transit district, Ark-Tex Council of Governments, to provide transit services in the Texarkana urbanized area.
- The Capital Metropolitan Transportation Authority (Capital Metro) contracts with Capital Area Rural Transportation System (CARTS) to provide transit service in parts of Travis County.

Contracts with Human-Service Transportation Providers

Other transit agencies contract with human-service transportation providers and non-profit agencies to support regional coordination. Examples include:

- West Texas Opportunities, Inc. (WTO, I) contracts with Big Bend Community Action Agency to provide rural transit services in the Big Bend, and WTO contracts with Midessa Taxi to provide some passenger trips in the cities of Midland and Odessa.
- South East Texas Regional Planning Commission (SETRPC) contracts with Orange County Transportation, Nutrition and Services for Seniors and Orange Community Action Association to provide rural transit services.

Transit districts enter into *interlocal agreements* with other public transit agencies to take advantage of regional resources.

Agreements with Private Companies

The following are several examples of Texas rural and state-funded urban transit systems that contract with private companies:

- Fort Bend County Public Transportation contracts with a national for-profit to provide commuter fixed-route and demand-responsive transit services. The transit vehicles used to provide services are a combination of county-owned buses and buses provided by the private contractor.
- Brazos Transit District provides The Woodlands Express transit services in Montgomery County through a turnkey contract (service, vehicles, and maintenance facility) with a private company.
- Tyler Transit contracts with a taxicab company to provide demand-responsive transit services.

Regional transit authorities are contracting for transit services in several metropolitan areas in Texas.

- The Metropolitan Transit Authority of Harris County (Houston METRO) contracts with a private company to operate all fixed-route transit services from one (of six) METRO operations and maintenance facilities. Houston METRO also contracts with a national for-profit company and a local taxicab company to provide ADA complementary paratransit services.
- San Antonio VIA Metropolitan Transit contracts with a regional for-profit company to provide a portion of ADA complementary paratransit services.
- Dallas DART contracts with a national for-profit company to provide ADA complementary paratransit services.
- The T (Fort Worth Transportation Authority) contracts with a taxicab company for The T's Richland Hills Airporter (door-to-terminal reservation service to D/FW International Airport).

There is a growing interest in contracting to private contractors to save operating costs.

- The Capital Metropolitan Transportation Authority contracts all fixed-route and demand-responsive transit services to private for-profit companies. Capital Metro entered into new contracts effective August 2012 that are expected to save 6 percent of operating costs over the next seven years as compared to directly operated fixed-route and ADA paratransit services. The savings percentage is calculated after subtracting savings offsets for the change in labor structure (transaction costs, benefit payouts for employees, and continuing expenses for contractor oversight).
- Effective November 2012, the City of El Paso transitioned Sun Metro LIFT paratransit services from directly operated to a national for-profit company. The reasons for contracting transit services are to save operating costs (approximately 15 percent less than directly operated services over five years) and improve customer service.

How Does a Private Contractor Reduce Costs?

The primary way that a private contractor can offer transit services at a lower price is through lower payroll costs—both wages and benefits. Traditionally, a privately owned transit operator could achieve economic efficiency because the work force was not unionized. Now, however, a private company is as likely to employ unionized workers as publicly operated agencies, although wages may still be lower. Today, the majority of financial savings are likely to accrue from not having to pay large public sector healthcare and retirement benefits to the contracted employees (*6*).

Other reasons a private contractor can reduce operating costs include the following:

- **Work practices** — private companies are often able to use labor and assets more efficiently with part-time personnel and flexible scheduling of service throughout the day.

- **Lower administrative overhead** — a contractor may employ less administrative staff and have lower ratios for supervisors-to-drivers or -mechanics.
- **Expertise** — private companies that specialize in a particular type of transit service—ADA complementary paratransit for example—might operate services more efficiently.
- **Use of technology** — if the public agency has not invested in technology or has not achieved a level of proficiency in the use of technology, a private company can use state-of-the-industry technology to improve efficiency and productivity.
- **Cost-effective vehicle maintenance procedures** — private companies might use industry best practices to schedule preventive maintenance inspections, enforce mechanic time for repairs according to standards for particular repair types, and manage parts inventory to limit cost. National companies might have the advantage of lower costs for larger quantities of parts purchased.
- **Flexibility** — a private company might respond to changing situations more quickly, especially when needed to quickly start new service or expand an existing service.

Smaller transit agencies also report cost savings from contractors' assumption of supervisory and administrative burdens (*1*). A smaller agency might delay or avoid creating or expanding administrative staff by contracting for transit services.

Cost Considerations That Can Offset Savings

Contracting for transit services often results in reduced operating costs, but not always. Significant transaction costs are associated with third-party contracting, including procurement, contractor oversight, performance monitoring, and service coordination. Public transit agencies that have lower wages, less than generous benefit plans, and efficient work rules and administrative processes may find little financial benefit from contracting out because the transaction costs of contracting can be greater than the operational savings (*7,8*). The net financial savings of contracting out services might be minimal for small- to medium-sized agencies.

The net financial savings of contracting out services might be minimal for small- to medium-sized agencies.

In addition, transit agency needs can change over time in ways that affect the comparative advantages of contracting and operating services directly. Contracting can entail a trade-off between cost savings and service quality. Concerns over ensuring service quality might temper an agency's original desire to contain costs through contracting. Over time, as a transit agency exerts more control over service quality by imposing more stringent performance requirements in contracts, it is reasonable to expect contractor costs to rise (*1*).

Before making the decision to contract for transit services, weigh costs associated with

developing and administering the contract against the expected savings in operating costs and other benefits of contracting (*3*).

Is Contracting a Good Option for Your Agency?

Whether or not directly operated service or a contractor is more cost effective will depend on a number of factors such as size of your agency, the type of services you provide, and the competitive market in the geographic area.

As shown in Table 6-1, contracting public transit may be more cost-efficient under certain circumstances, but not all (*2,3,7*).

Table 6-1. Examples of Circumstances Favorable for Contracting (or Not).

Result	Circumstances
More Cost-Efficient to Contract	• There exists a strong need for flexibility (e.g., to implement new services). • The level of service is easy to quantify as the basis for calculating costs. • Your agency has relatively high wages, generous benefit plans, or restrictive work rules; therefore, a contractor can likely reduce costs. • The contractor can provide more expertise than your agency.
Less Cost-Efficient to Contract	• Potential cost savings are not easy to calculate. • Estimated cost savings are minimal after considering transaction costs and contractor oversight. • Lower cost may sacrifice effectiveness. • There is a lack of competition in the procurement of services. • Procurement arrangements are not transparent. • Your agency yields too much policy control to the contractor.

Your Agency's Context for Decision Making Is Important

Political, social, and institutional conditions as well as economic criteria influence the local decision to contract. A contracting strategy is only a viable option to improve cost efficiency in transit services when a transit agency carefully chooses the service level to contract based on an adequate assessment of conditions (*9*). Table 6-2 shows recommended best practices if you are considering contracting for transit services.

Leveraging Funding from FTA Section 5307 for Capital Costs of Contracting

Another reason to consider contracting is to leverage as much funding as possible from FTA Section 5307. In most cases, public transit agencies that receive funds from the Section 5307 Large Urban program are required to use the funds for capital costs, not operating expenses. There are exceptions in federal legislation that permit small transit

Table 6-2. Recommended Steps When Considering Contracting Services.

Step	Action
1	Clearly state the objectives for contracting transit services. Know what your agency hopes to achieve.
2	Take an open-minded and realistic view of the advantages and disadvantages of contracting. Conduct a full analysis of the likely outcomes, not only by examining budgetary effects, but also by weighing potential effects on service quality, work-force motivation and morale, and flexibility to respond to new and changing service demands (*1*).
3	Consider various approaches to structuring contracts, including the option of the public agency providing vehicles, facilities, and other costly assets or supplying the fuel and insurance required for operations (*1*).
4	Complete an internal cost analysis of providing services directly. Develop a thorough understanding of the actual costs of existing services and any indicated enhancements to services (*3*). See Chapters 2 and 3 of this guidebook for how to calculate your agency's costs to directly operate transit services.
5	Investigate if there is sufficient competition in your market to attract multiple interested companies either from national, regional, or local suppliers of transit services. Competition among providers will benefit your agency in terms of pricing.
6	Establish a competitive procurement process that invites high-quality proposals and screens out unrealistic proposals and unqualified contractors.
7	Compare price proposals to the internal costs of providing the same services to confirm if a contract will result in savings. Take into account savings offsets and indirect costs or savings.

agencies that operate less than 100 buses in a large urbanized area to use some Section 5307 funds for operating assistance (Resource: MAP-21 FTA Summary of Public Transportation Provisions http://www.fta.dot.gov/documents/MAP21_essay_style_summary_v5_MASTER.pdf).

Federal regulations for Section 5307 funding permit any transit agency the flexibility to recover the capital costs of contracting—the capital investments of the private contractor to deliver the transit services under contract. Public transit agencies are cautioned to review the most recent federal legislation and FTA guidance for Circular 9030.1D Urbanized Area Formula Program: Program Guidance and Application Instructions to understand the applicability of the provisions for funding the capital cost of contracting (*10*).

Resource

FTA Circular 9030.1D
http://www.fta.dot.gov/documents/FTA_Circular_9030_1D_3-31-10.doc

Effects on Agency Employees

Existing employees will also be a consideration if your agency directly operates current services and is considering contracting those services to a third party. Procurement specifications can require the private contractor to offer employment to existing agency employees affected by the change as long as each employee meets the required background check and physical examination, including drug and alcohol tests.

Transit agencies must confer with legal counsel to determine the applicability and impact of federal protections for transit workers.

Contracting usually means lower wages and a reduction in benefits for employees. Your agency can set a standard for minimum wages and payroll benefits for employees of contractors; however, such standards can increase the contractor's costs and, thus, offset the savings you hoped to achieve by contracting out services. You must also assess risk associated with Section 13(c) of the Federal Transit Act.

Resource

DOL Fact Sheet
http://www.dol.gov/olms/regs/compliance/special_warranty.htm

What You Should Know if Your Employees have Protective Labor Arrangements Section 13c of the Federal Transit Act (15)

As a precondition for a grant of federal assistance by FTA, Section 13c of the Federal Transit Act (Section 5333(b) of Title 49 USC) requires grant applicants to afford "fair and equitable" protections to affected employees. Events resulting from federal assistance that cause a change in operations or organization are subject to this precondition.

The statute generally requires that grant applicants include provisions addressing four specific matters in such protective labor arrangements:

- Preservation of rights, privileges, and benefits under existing collective bargaining agreements.
- Continuation of collective bargaining rights.
- Protection of employees against worsening of their positions in relation to their employment.
- Assurances of employment to employees of acquired mass-transportation systems; priority of reemployment to those workers laid off or terminated; and paid training and retraining programs.

In its grant application, a transit agency must estimate the impact on employees and specify the protections proposed. FTA forwards the grant application to the Department of Labor (DOL), which is authorized to determine and certify what is "fair and equitable." In most cases not involving routine replacement of equipment or facilities, DOL refers the grant application to unions representing transit employees in the service areas. DOL encourages grant applicants and the affected unions to develop acceptable employee protections through negotiation.

Because Section 13c agreements are the product of individual negotiations, terms vary among agreements. Most, however, include protections against worsening conditions such that an employee displaced or suffering a loss of compensation as a result of a federally assisted project can be eligible for a monthly displacement allowance.

Estimating Cost Savings and Savings Offsets

Evaluate the likely opportunity to save costs by contracting services before pursuing a change from directly operated transit. Such an evaluation requires the comparison of agency costs to the estimated competitive price from a contractor. As noted in Table 6-2, an accurate cost comparison requires clearly defining the work to be performed.

Outlining a Proposed Scope of Services for Contractors

The first step of a cost comparison requires a clear and specific statement of the scope of services to be provided by the contractor and a delineation of the optional services and assets, if any, to be included in the scope. You must also consider savings offsets by administrative and transition costs incurred when engaging a contractor. A clear and specific scope of services for transit includes:

- Describing the span of service (days of the week, span of hours per day).
- Specifying the level of service (vehicle or revenue hours and miles).
- Identifying resources required (number of maximum vehicles in peak service).
- Outlining minimum expectations for supervision, management, and administration.
- Defining required performance standards and measures of performance.

The description of services can then be translated to labor requirements to calculate payroll costs—both wages and benefits.

Other items in the scope of services can significantly impact costs. The public transit agency could choose to supply the following services and assets (or include one or more of the items in the contract for transit services). This is a sample list of optional services and assets and does not include all options:

- **Fuel** — If your agency is part of a larger organization such as a city or county, your agency might be able to purchase fuel cheaper through a bulk purchases. If a contractor is a national company, the contractor may have a bulk purchase advantage.
- **Insurance** — Your agency might be able to procure auto liability and worker's compensation insurance more cost-effectively through the Texas Municipal League intergovernmental risk pool.
- **Vehicle maintenance** — If your agency contracts a portion of transit services and supplies the vehicles, you might elect to continue maintaining the vehicles with public agency personnel. If your agency is part of a local general government, you might elect to maintain vehicles through an existing city or county department (if the departmental personnel are perceived to be highly trained and efficient), rather than to contract vehicle maintenance through a contractor.
- **Reservations and scheduling demand-responsive services** — If the scope of services is demand responsive, then your agency can retain responsibility for the reservations and scheduling function or include these key services in the scope

for the private sector. Preference depends on local circumstances. If your agency has invested in an automated routing and scheduling system operated by skilled, experienced personnel, then you might decide to retain that responsibility as one way to ensure service productivity and effective contractor oversight. On the other hand, the private sector might argue that responsibility for reservations and scheduling will improve operational efficiency. You must weigh the risks and opportunities for either controlling reservations and scheduling or including the function in the scope for contracted transit services.

- **Routing and scheduling fixed route transit services** — Similar to the reservations and scheduling function for demand-responsive transit, the best choice for retaining public control or contracting for routing and scheduling for fixed-route services is subject to local circumstances. More often than not, your agency will elect to retain the responsibility as one way to manage service design and service levels. Your agency might create the routes and schedules, but the contractor should be responsible for developing the specific assignment of buses and operators to take advantage of more flexible work practices.
- **Dispatch** — Another service your transit agency can retain or contract to the contractor is dispatch, or radio control, over daily operations in the field. If the contracted services are a portion of all transit services, then your agency will typically continue providing the dispatch center for communications. If all services are contracted, then the dispatch function can be included in the scope of services for the private contractor.
- **Technology** — The scope of services for a contractor often includes the responsibility and opportunity to use technology to improve efficiency, effectiveness, and customer service.
- **Vehicles** — With the advantage of federal funds to pay up to 80 percent of the capital costs for purchasing transit vehicles, your agency can often buy the vehicles at a lower local share cost. Owning the vehicles means greater long-term flexibility to either bring the service back in-house or change contractors. Your agency can readily take back or rebid a service if a contractor fails to meet responsibilities and expectations or if the contractor goes out of business during the term of the contract (*1*). On the other hand, if the contractor provides the vehicles, then the capital cost for vehicles is amortized over the life of the contract in the price for services. This might be an advantage to lower the up-front capital costs to start services. The contractor might also be able to bring currently owned vehicles to the contract at a lower cost per unit or procure new vehicles more rapidly than the public sector.

The contracting decision requires your agency to weigh costs associated with developing and administering the contract against the expected savings in operating costs and other benefits of contracting.

- **Operations and maintenance facility** — If your agency already owns a suitable operating and maintenance facility for transit, you might offer the facility for low- or no-cost lease to the contractor.

Estimating the Competitive Price for a Contractor

A public transit agency can estimate the competitive price for a contractor in two ways:

1. *Collect the pricing for similar scopes of services for peer public transit agencies.* Assumptions about adjustments in contractor costs will be required for any *material differences* in the scope. (For example, if the peer contract includes fuel supplied by the contractor but you intend to provide the fuel, you should adjust your estimate of the contracted services for fuel and fuel taxes.) Contract terms and conditions may also affect the price reflected in a peer public transit agency contract.
2. *Develop an estimate of pricing based on a cost build-up approach.* This process generally uses the details of your transit agency cost of doing business and then makes assumptions of what the contractor cost might be for the same category of expense (e.g., assumptions about wages and percent payroll benefits). Corporate overhead and profit must be added as elements of private-sector costs not typically reflected in a public agency or not-for-profit agency cost.

As stated earlier, the contracting decision requires your agency to weigh costs associated with developing and administering the contract against the expected savings in operating costs and other benefits of contracting (*1,3*).

Consider the expense of transaction costs associated with contracting. Administrative expenses are necessary to develop requests for proposals, solicit proposals, qualify proposers, evaluate proposals, and award contracts. Varying degrees of service disruptions at the start and end of a contract, or when a contractor changes, represent another potential cost. The contracting agency must consider recurring costs associated with contracting, including contract oversight, monitoring contractor performance, coordinating contracted and in-house services, and resolving contract disputes (*1,3*).

Should transaction costs exceed operational and administrative savings from contracting, an agency will generally choose to operate the service in-house. If operational savings exceed operational and administrative costs, the agency might continue evaluating the merits of contracting transit services (*1,3*).

The Competitive Procurement Process

Most agencies award service contracts through a competitive procurement process. Any public transit agency that receives funds from the FTA (as a direct recipient *or* subrecipient) must follow FTA Third Party Contracting Guidance (FTA Circular 4220.1F) for any procurement for contracted transit services (*13*). The FTA also provides and maintains online the *Best Practices Procurement Manual* (*12*). Hopefully, a procurement will attract multiple competitors, which usually works to reduce price. Smaller transit systems have the most difficulty attracting proposers if no supply of local transportation providers exists and if the regional market does not attract a national company.

Resources

FTA Circular 4220.1F
http://www.fta.dot.gov/documents/FTA_Circular_4220.1F.pdf

FTA *Best Practices Procurement Manual*
http://www.fta.dot.gov/grants/13054_6037.html

Assessing the Competitive Contractor Marketplace

A public agency needs to know, preferably in advance, if the agency is likely to receive competitive responses to a solicitation for transit services. Prospective vendors can also provide helpful feedback on a draft description of the scope of services to ensure the solicitation can be adequately addressed by vendors. Suggested ways to solicit feedback from contractors include:

- **Research possible contractors** — Investigate industry sources of information (American Public Transportation Association, Community Transportation Association of America) and local suppliers about possible vendors. Inquire among peer agencies about responsive proposers to similar procurements.
- **Issue a request for interest** — Issue a request for letters of interest in a prospective scope.
- **Provide an opportunity for open discussion** — Send invitations to meet and discuss a draft description of proposed contracted transit services to generate interest and help refine the scope of services.
- **Hold a pre-proposal conference** — Widely advertise a pre-proposal conference to determine if competitive responses to the procurement are likely. If attendance at the pre-proposal conference is not satisfactory, consider postponing the procurement to allow time to generate interest in the procurement through the other methods listed above for reaching out to contractors.

Types of Procurement

Competitive procurements include contracts awarded in several different ways:

- Solely based on low bid.
- Through a process where price is one of the several factors considered.

- Through a two-phased process in which the lowest price among qualified entries is accepted.
- By best-value negotiation.

Other negotiated procurements might include sole-source negotiations or interlocal agreements with other governmental agencies (*2*). Since procurement methods are often governed by state and local law, confer with the local procurement officer to select the best type of procurement that conforms to statutory requirements and local procurement policies.

Invitation for Bid (IFB)

One method of competitive procurement is the IFB. This method is used most often for obtaining commonly transacted goods but less frequently for the provision of services.

When the IFB is used, the agency usually has a high degree of certainty about the bid price range because of the well-understood nature of the deliverable. Bids are commonly sealed, and the bidders and agency have limited opportunity for communication before and during the bid period.

Final selection of the contractor is usually based on low price. Nevertheless, even many IFBs contain language limiting the award to the lowest *responsive* bidder (i.e., the agency might refuse to award the contract to a low bidder that does not meet minimum levels of licensing, bonding, and financial wherewithal) (*11*).

Request for Proposals (RFP)

The RFP is perhaps the most commonly used method to purchase transit services. Usually an agency describes the product or service it is seeking and openly solicits both technical and cost proposals. The RFP is used when the product or service being sought is complex and difficult to describe in detailed specifications, so it typically contains a general description of the desired product or service. Therefore, responding contractors have the opportunity to be creative and convincing about their capabilities.

In the case of an RFP for transit services, an agency might ask the contractor for a technical proposal that describes its startup plans, transition plans, key management personnel, inspection and maintenance programs, and personnel hiring and retention programs. Likewise, you might ask the contractor for a business proposal that gives detailed cost assumptions, including expectations about wage rates and other factors that account for the proposed price.

The soliciting agency might score each of the proposals separately, and the agency might then negotiate the specific contract terms with the winner. Thus, price might not be the primary determinant of the winning proposal—although price typically remains a critical factor, according to FTA's *Best Practices Procurement Manual* (*12*).

Two-Step Procurement

Agencies sometimes use a two-step procurement process to limit the pool of respondents to those that meet certain qualifications. Proposers are prequalified

through a request for qualifications to ensure technical capabilities, financial capacity, and other qualifications, such as proper licensing and insurability. An agency issues the second step to only prequalified contractors. Often the second step is an IFB, and the lowest price among the qualified contractors dictates the winning bid. The second step can also be an RFP, with final proposals evaluated based on a combination of qualifications and price (see the discussion of *best value procurement* next) (*12*).

Best Value Procurement

A variation on the two-step procurement, best value also calls for a two-phase process for contract award. An agency selects a limited group of proposers based on qualifications and general approach to the project, then examines detailed proposals from those short-listed proposers, choosing the ultimate winner on a *best value basis*.

The best value method calls for ranking proposals based on the scores each receives for evaluation factors in the solicitation document. The factors will include cost but might also include qualitative measures such as past performance, management plan, and staff expertise. The agency might award the contract after the initial evaluation, or it might discuss proposals with those considered competitive and then permit the short listed proposers to submit their best and final offers (*12*).

Example: Public Provider Competition

The Fort Worth Transportation Authority (The T) responded to an RFP from the Northeast Transportation Services (NETS). NETS selected The T to provide transit services based on:

- Qualifications to supervise transit services.
- The merits of a proposed subcontract to a private non-for-profit to operate transit services.
- Price.

Non-Competitive Procurement

Negotiated (non-competitive) procurements might apply in the case of sole-source negotiations or interlocal agreements with other governmental agencies. Sole-source procurements are usually for small purchases or in cases where a product or service is sought from another government agency. FTA regulations for third-party contracting prescribe specific steps for documentation and approval of sole-source procurement.

In Texas, the Interlocal Cooperation Act (Government Code, Chapter 791: Interlocal Cooperation Act) encourages the maximum cooperation between local governments to improve their efficiency and effectiveness. This act allows local governments the greatest freedom in contracting to provide governmental functions and services.

Resource

Texas Interlocal Cooperation Act
http://www.statutes.legis.state.tx.us/Docs/GV/htm/GV.791.htm

Choosing the Right Procurement Method for You

Your agency should chose the procurement method that best fits the circumstances and that conforms to local statutory requirements, since procurement methods are often governed by state and local law (*12*).

Because of the greater number of steps involved, the RFP and two-step methods usually take longer to complete than an IFB or non-competitive procurement. While the RFP might entail less specification writing, RFPs typically require more complex evaluation and selection processes, which can slow evaluation and decision making. The specifications that accompany RFPs and the selection criteria for evaluation should be well defined to ensure fairness and minimum levels of proposal quality (*12*).

Best Practices for Procurement

Keep in mind the FTA requirements mentioned earlier for any public transit agency that receives funds from the FTA (as a direct recipient *or* subrecipient). The FTA guidance and best practices (cited earlier in this chapter as resources) address all types of procurement.

Recommended best practices for procurement include:

- Learn from peer experiences.
- Write clear contract requirements.
- Specify a contract term appropriate to the services scoped.
- Establish an appropriate basis for payment.

Learn from Peer Experiences

An excellent way to develop procurement documents is to research examples from other public transit agencies. Often procurement documents are available online, or the procurement officer for a public transit agency is typically pleased to forward the documents from a recent procurement to a peer. Collecting several examples will provide an opportunity to see both common and distinguishing elements of different procurements.

Write Clear Contract Requirements

Most transit service contracts not only define the kinds of services to be offered, but also prescribe:

- How those services are to be provided.
- How service quantity and quality are to be measured and monitored.
- Performance standards and performance measures.
- Who will provide the vehicles, facilities, maintenance, and support services.

Detailed contracts are especially important to ensure that all parties understand each other's responsibilities and expected performance (*2*).

Contract provisions must contain clearly defined requirements that encourage the contractor to control costs and focus on the quality of the transit service provided (*3*). The following are examples of best practices recommended by the Federal Acquisition Regulation (FAR) for writing contract requirements:

- Define the requirements in clear, concise language identifying the specific work to be accomplished and the desired level of performance.
- Describe the work in terms of the required performance rather than how the work is to be done.
- Define clearly the selection criteria and process to identify the successful bidder or proposer.
- State how the public transit agency will monitor the performance of the contractor.
- Rely on the use of measurable performance and financial incentives to encourage the contractor to develop and institute innovative and cost effective methods of performing the work (*14*).

Resource

FAR 37.6 Service Contracts
https://www.acquisition.gov/FAR/

Request information in proposals that reveals the capabilities of prospective contractors. Examples of information you might want to solicit include:

- Technical and business information on startup plans.
- Assumptions about wage rates and benefits.
- Plans for hiring, training, and retaining workers.
- Qualifications and experience of the management team (*1*).

RFPs or IFBs should include key requirements of the contract:

- The basis for payment.
- How payments will be made and fare revenues treated.
- Who is responsible for the vehicles, equipment, and facilities.
- Who is responsible for scheduling, marketing, and planning.
- How much insurance is needed and who will provide it.
- Who is responsible for towing vehicles and maintaining radio systems and fare box equipment.

Specify a Contract Term Appropriate to the Services Scoped

Most contracts for transit services cover multiyear periods. The recommended length for the contract term depends on whether or not the contractor will provide the capital for vehicles and facilities. The typical base contract period is three to five years with one or two option years (if the contractor provides the transit services and the public agency provides the vehicles and the operating and maintenance facility for the service).

Considerations for the contract term include the costs for the public transit agency to re-compete the procurement and the disruption that will occur for a change in contractors. The interval for the contract term must be long enough to avoid repeated transaction

costs associated with frequent rebidding, but short enough to ensure that incumbent contractors do not become complacent and competitor interest is sustained (*1*). An incumbent contractor should be required to face competition periodically to discourage complacency.

Who Owns the Capital Assets (e.g., Vehicles)?

A primary aspect regarding contract length involves deciding who owns the key capital assets used to provide transit services. There are several advantages to the public agency providing the capital assets.

- Doing so can foster competition by reducing the contractor's financial risks (*2*).
- With the advantage of federal grants to fund up to 80 percent of capital costs, the agency can often buy the vehicles at a lower local share cost.
- Owning the vehicles means greater long-term flexibility to either bring the service back in-house or change contractors down the road.

By owning these key assets, transit systems can readily take back or rebid a service if a contractor fails to meeting responsibilities and expectations (*1*).

If the contractor is responsible for capital, then the term of the contract should be sufficiently long to amortize the capital investment and offer a lower cost to the soliciting agency. The term of the contract with capital risk might be five to seven years, with options up to 10 years, depending on the investment required.

Contractor-provided capital might be advantageous in the case of new or expanded transit services. Private-sector companies can acquire vehicles and facilities more quickly, especially if specialty vehicles are required. Capital cost is incorporated in the pricing for the contract, and so the transit agency might be able to spread costs over time rather than make a large initial capital investment. However, the unit price as the basis for payment (discussed in the next section) will be substantially higher if capital is included in the contracted service.

Establish an Appropriate Basis for Payment

Most contracts are structured to pay contractors based on the amount of service provided according to a *rate per unit of output produced* (e.g., an hourly rate for employee labor time). Thus, the contractor is responsible for controlling costs at the set price and within the terms of the contract agreement.

Relatively few transit agencies pay contractors based on a reimbursed cost to provide the service, such a practice places the financial risk entirely on the transit agency. Pay per unit of service shifts the cost-containment responsibilities to the contractor (*1*). The basis for payment might be a single flat rate per unit of total cost or a combination of two rates to reflect variable and fixed costs. The most common rate per unit in the transit industry is cost per revenue hour of service.

Why Cost per Hour?

As noted throughout this guidebook, the majority of costs for transit services are the cost of the driver (payroll and benefits). The cost per hour is similar for all types of transit services because a driver is always required. If a cost per mile is applied, the costs can vary by type of service—higher speed routes will have a higher cost based on miles traveled, and slower (local) routes have a relatively lower cost.

Why Cost per Revenue Hour?

Revenue hours reflect the direct purpose of transit—to provide service to fare-paying passengers. If the contractor is paid per revenue hour, the contractor is not paid for deadhead (travel to and from the start and end of revenue service) and takes responsibility for the location of the vehicle maintenance facility. If your agency provides the facility, then the required deadhead distance is controlled, and you might prefer cost per vehicle hour (or "service hour") as the basis for payment.

Other "Cost Per" Options

Other options are cost per mile and cost per vehicle for a defined period (per day or per month) or for a unit of service (route). Cost per mile might be a useful basis for payment when the service is funded by multiple jurisdictions. Agencies can allocate service costs based on the miles of service operated in each jurisdiction, though the impact of different operating speeds on cost is still a consideration. Cost per vehicle is common in the school bus industry, when the amount of service can be defined by an average number of hours or miles of service consistently required each day per vehicle.

Another basis for payment is a combination of two rates to reflect variable and fixed costs. Typically, agencies charge variable costs on a cost per hour (or mile) and fixed costs on a flat rate per month. (Variable and fixed costs are discussed in Chapter 2.) This approach is useful if services could change significantly over the term of the contract or if seasonal variations exist in the services under contract. The contractor identifies fixed costs and is assured of covering these costs each month. Only those costs that are impacted by changes in service levels (hours and miles) are included in variable cost per hour. The payment for variable costs changes with the level of service.

Ensure Budget Controls

Review your contract terms and conditions to be sure there is sufficient basis to enforce the anticipated budget or contract total cost. The transit agency should establish authority over the factors that influence the contractor's invoice for services. For example, a competitive rate per revenue hour for demand-responsive services is of little value if the contract provides no controls or limits on the number of revenue hours the contractor can operate and invoice.

Ensuring Your Contractor Delivers Quality Service

Agencies that contract for transit services most often identify the possible negative effects of doing so as:

- Loss of operational control.
- Shortcomings in service quality.
- Problems with customer service (*1*).

Transit systems that report successful contracting have found ways to achieve acceptable levels regarding these issues. Factors that correlate with agency satisfaction include:

- Engaging as a team and maintaining communication with the contractor.
- Using a competitive selection process not based solely on cost.
- Assigning a combination of rewards and penalties for the contractor based on performance.
- Flexibility to address issues as they come up and adapt to changing conditions.

Agencies with the most positive contracting experiences establish a balance between working with their contractors to ensure high-quality service (addressing issues as they come up) and invoking appropriate penalties for unsatisfactory performance.

Agencies with the most positive contracting experiences establish a balance between working with their contractors to ensure high-quality service and invoking appropriate penalties for unsatisfactory performance (*2*).

You should define the quality of transit services to be delivered thoroughly and formally in contract documents. However, not all the qualitative aspects of transit service can be articulated in a set of specifications. Contract monitoring, oversight, and management are also required. Communicate with the contractor frequently and openly about performance expectations (*1*).

Selecting the Contractor

Recommendations for selecting the contractor are covered in more detail earlier in this chapter in "The Competitive Procurement Process," but the highlights are presented in Table 6-3.

Table 6-3. Suggestions for Selecting the Contractor.

Suggestion	What to Do	What to Remember
1	Use a competitive selection process that includes qualifications and is not based solely on costs.	Be sure to adhere to adhere to local and state purchasing requirements and FTA Circular 4220.1F.
2	Clearly define the selection criteria and the process that will be used to select the successful bidder or proposer.	If the procurement includes qualifications as a factor, the selection criteria and the evaluation methodology should be described.
3	Use internal cost estimates to provide the service as a baseline in assessing the credibility of contractor proposal.	Conduct this comparison for all proposers, including contractors whose prices appear too low or too high.
4	Survey your peers at transit agencies that have used the contractor(s) before to assess the contractor(s) qualifications before making a final selection.	Never rely solely on a contractor's self-reporting of past performance.
5	Ask contractors to identify issues during the past three years where they feel they could have improved services provided and how they remedied those situations.	Be wary of a prospective contractor that claims there have not been any issues to report.
6	Compare the contractor's self-reported "areas for improvement" with the contracting transit agency.	Identify areas of discrepancy and follow up with the contractor for an explanation.

Maintaining Public Control

Do not yield too much public control to the contractor. Maintain overall control of strategic planning, service requirements and levels, and performance standards. For demand-responsive services, maintaining control of service requirements and levels can include retaining responsibility for reservations and scheduling of passenger trips within your agency.

Other best practices to maintain public control include the following (*1*):

- Outline all the duties and roles of all parties in the contract.
- Establish a clear mechanism for making changes in contract agreements.
- Define all expectations with respect to service quality.
- Review performance standards and performance measures precisely. Make sure the standards of performance match expectations. Do not leave room for interpretation of the performance measures by the contractor.

- Include penalty clauses and rewards (incentives) in contracts to motivate good performance. Make sure the dollar value attached to incentives and disincentives are adequate to motivate the contractor's performance.
- Routinely monitor contract performance (monthly at a minimum), and provide the contractor with candid and frequent feedback.
- Maintain an open and collaborative relationship with the contractor.

Identifying Performance Measures

You must monitor contractor performance and enforce the terms of the contract. Identify the performance measures and the standards for performance in the procurement documents. Attributes of a good performance measures are shown in Table 6-4. Table 6-5 shows sample performance measures and hypothetical standards related to objectives outlined by Anytown Transit Agency (ATA).

Table 6-4. Attributes of Good Performance Measures.

Attribute	Description
Relevancy	• Based on your agency's goals and objectives. • Reflects the contractor's accountability pursuant to the contract scope.
Understandable	• Reasonable and concise but comprehensive. • Limited to a number and degree of complexity that provides a meaningful performance assessment.
Comparable	• Measures typical for the transit industry. • Consistent with performance standards for services delivered by your agency.
Timely	• Reports produced frequently that provide the ability for your agency to make assessments within a reasonable amount of time to address issues. • Provides data over time for trend analysis used to update performance standards.
Reliable	• Verifiable. • Represents what the performance measure is designed to evaluate.

Table 6-5. Sample Performance Measures and Hypothetical Standards for Anytown Transit Agency.

Objective	Measure Reported Monthly	Performance Standard Target Goal
Safety	• Incidents per 100,000 vehicle miles	• 1.5 per 100,000 vehicle miles
Reliability	• On time performance • Revenue miles between road calls	• 90% on time performance • 6,000 revenue miles between road calls
Quality	• Complaints per 100,000 passenger boardings	• 15 complaints per 100,000 passengers boardings
Productivity	• Passenger boardings per revenue hour	• 17 passengers boardings per revenue hour

Linking Performance to Payment

Generally, there are two ways to link performance to payment:

- Connect incentives and disincentives to standards of performance.
- Include monetary penalties to discourage poor performance.

Incentives and Disincentives

You can motivate the contractor to improve performance or exceed minimum standards for performance by using incentives. Similarly, disincentives can help ensure performance does not decline or fall below established minimum standards. When using monetary incentives, set the dollar amounts to ensure you get the result you want for a fair value.

In general, follow these instructions when creating incentives or disincentives for contractors:

- Define the standard for each performance measure subject to an incentive or disincentive.
- Determine the value of the incentive/disincentive that is both a reasonable expense to your agency and will achieve the intended effect on the contractor.
- Decide the frequency of evaluation and payment (monthly, quarterly, annually).

Well-defined service standards and associated incentives and disincentives are important to public transit agencies that enter into contracts to supply transit services and wish to balance both cost savings and service quality. Table 6-6 shows sample incentives and disincentives created for ATA.

Table 6-6. Sample Incentives and Disincentives for Anytown Transit Agency.

Performance Standard	Amount + Incentive — Disincentive	Incentive	Goal Performance Standard	Disincentive
Incidents per 100,000 Vehicle Miles	$10,000*	<1 per 100,000 vehicle miles	1.5 per 100,000 vehicle miles	>2 per 100,000 vehicle miles
On-Time Performance	$10,000	> 93%	90%	< 87%
Revenue Miles between Road Calls	$10,000	> 7,000 revenue miles between road calls	6,000 revenue miles between road calls	< 5,000 revenue miles between road calls
Complaints per 100,000 Passenger Boardings	$10,000	<10 complaints/ 100,000 passengers	15 complaints/ 100,000 passengers	>20 complaints/ 100,000 passengers
Passenger Boardings per Revenue Hour	$10,000	<14 boardings/hour	17 boardings/hour	>20 boardings/hour

**Incentive/disincentive values are illustrative only. Make sure the dollar value attached to incentives and disincentives are adequate to motivate the contractor's performance.*

Liquidated Damages

Generally, contracts that involve the exchange of money or the promise of performance have a *liquidated damages stipulation*. The stipulation establishes a predetermined sum to be paid if a party fails to perform as promised under the terms of the contract.

> Seek legal advice before including liquidated damages as part of contract terms and conditions.

Liquidated damages are an amount estimated to equal the extent of injury that may occur with a breach of contract. These damages are determined when a contract is drawn up and serve as protection for both parties that have entered the contract.

Liquidated damages clauses must be *reasonable*. The general rule is that the liquidated damages must bear some reasonable relationship to anticipated actual damages.

Seek legal advice before including liquidated damages as part of contract terms and conditions. Legal counsel might advise you to set liquidated damages *only* when a failure to perform will cause damages and apply the cost for *actual* damages. Below we show you an example of a liquidated damages stipulation for our fictional transit agency.

Example Liquidated Damages Clause

Liquidated damages will be assessed for contract deficiencies specified herein. Anytown Transit Agency (ATA) will consider extenuating circumstances in assessing damages. In the event Speedy Services, Inc. (SSI), fails to comply with the following minimum performance standards, ATA shall assess liquidated damages as follows:

- All required supervisory positions (starters, dispatchers, reservationist, and street supervisors) must be covered each day in case of turnover, sickness, vacation or other absences with a qualified replacement. If SSI fails to cover for a supervisory position, liquidated damages will be assessed per day per uncovered employee for the cost to ATA to fill the supervisor's position with a replacement from ATA staff.
- SSI is required to maintain all required vehicles in accordance with terms and conditions of this Contract. If a vehicle is removed from service by ATA due to non-compliance, SSI may be assessed liquidated damages cost of sending another vehicle resource (taxi or other provider) to cover all passenger trips affected.
- ATA will assess liquidated damages if SSI is found to be in violation of FTA guidelines for the Drug and Alcohol policy and program. Liquidated damages will be based on ATA staff time and expenses to intervene, identify the problem, negotiate resolution, and take remedial action if required.
- Liquidated damages will be assessed for failure to submit required National Database Report information by November 15 of each year. Liquidated damages will based on ATA staff time and expenses to follow-up and respond to inquiries from FTA and to intervene, identify the problem, negotiate resolution, and prepare the NTD report if required.
- Liquidated damages shall be deducted from any monies due, or which may thereafter become due, to SSI. Liquidated damages will not be assessed for the above described occurrences arising from causes beyond the control of SSI as determined by ATA.
- The maximum amount of liquidated damages to which SSI is subject to under this Contract is 10 percent of the contract value. In the event this Contract has not been otherwise terminated, the Contract shall be considered terminated for default when accumulated liquidated damages exceed 10 percent of the contract value at any time during the Contract term.

Chapter 6: What to Remember

By and large, agencies contract out transit services to increase efficiency and reduce operating costs. You can enter into agreements with a human service transportation provider or non-profit agency, a for-profit private company, or another public agency via an *interlocal agreement*. Successful contracting requires careful planning, a realistic assessment of the chances to save money, and a good procurement process followed by consistent oversight of the contractor's work.

Be aware contracting for transit services does not automatically ensure lower costs. Run the numbers prior to the procurement process to ensure that contracting costs do not outweigh savings. Agencies find it most effective to contract for services when they need flexibility to expand or add new service, the level of service is easy to quantify, agency costs (e.g., salaries and benefits) are high, or the contractor can provide more expertise. Be aware, however, that contracting usually means lower wages and benefits for agency employees. Confer with legal counsel to determine if Section 13c of the Federal Transit Act applies to your agency.

When looking to engage a contractor, be sure to follow federal guidelines for third-party contracting and use best practices during the competitive procurement process. Construct a clear and specific scope of services; ensure the contract term is appropriate for the services scoped; and establish an appropriate basis for payment.

Choose the right procurement method for your agency's unique circumstances. When evaluating proposals, ask peers about their experiences with specific contractors.

Maintain overall control of strategic planning, service requirements and levels, and performance standards. Monitor contractor performance and enforce the contract's terms. Identify measures for ensuring performance meets your agency's expectations as stipulated in the contract. Incorporate incentives and disincentives in the payment provisions to encourage compliance with service standards. Contracting services works best for agencies when they work with contractors to ensure high-quality service (addressing issues as they come up) and invoke appropriate contractual penalties when contractors perform unsatisfactorily.

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Moving Ahead for Progress in the 21st Century (MAP-21), 49 USC Chapter 53 as Amended.

Chapter 7. Minimizing No-Shows and Late Cancels

When a consumer fails to show up for a scheduled demand-response trip (or cancels after it is too late to schedule another consumer in his or her place), your agency has spent its resources on a wasted trip.

No-show events negatively impact on-time performance and service productivity:

- First, when the initial event occurs (e.g., when the dispatcher and driver spend time trying to find the consumer, causing the driver to run late and decreasing the number of passengers the vehicle carries in the day).
- Second, if another trip must be scheduled to pick up the consumer who initially no-showed.

Resources

FTA Topic Guide 7
http://dredf.org/ADAtg/noshow.shtml

TCRP Synthesis 60
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_60.pdf

TCRP Report 124
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_124.pdf

TCRP Report 136
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_136.pdf

Obviously, making two trips when one would have sufficed is inefficient for your agency.

Several Transit Cooperative Research Program (TCRP) projects have studied no-show rates for both urban- and rural-transit providers:

- Of the 134 completed surveys in 36 states and the District of Columbia (representing small-, medium-, and large-transit agencies), the average consumer no-show rate reported is 2.9 percent of total consumer trips for ADA paratransit demand-response service (*1*).
- Agencies that implemented and enforced written no-show and late-cancellation policies decreased those rates (as a percentage of total trips) between 1 percent and 10 percent annually, significantly improving productivity and service quality (*2*).
- Rural-system managers stated performance benefits from enforcement of their no-show policies (see Table 7-1). "While the policies vary, the managers spoke to the critical role of enforcement: it is not enough to just adopt and publish a policy" (*3*).

To determine whether no-shows and late cancellations are excessive (and therefore costly) to your agency, first consistently record and track them. Questions you can ask to determine if you can more efficiently manage costly consumers are included as Figure 7-1 in the case study at the end of this chapter.

Recommended No-Show and Late Cancellation Policies and Procedures

The transit industry has no one way to manage no-shows and late cancellations, but you can reduce them through positive and negative reinforcement of consumer behavior. To that end, all policies should:

- Define no-shows and late cancellations.
- Determine a value for "the number of excessive events," such as five in a month, as a trigger to identify consumers who may have "a pattern or practice of missed trips."
- Set a percentage of the consumer's trips taken that are no-shows, such as 10%, as a threshold before a sanction is imposed.
- Establish progressive sanctions for consumers with a pattern or practice of no-shows and late cancellations.

Some recommendations for forming specific policies and procedures include:

- Specifying a number of hours before pick-up time, such as two hours, in which the consumer must call to cancel or be labeled a "late cancellation."
- Calling a no-show or late consumer before infractions reach the sanction threshold to remind him or her of the policy and upcoming sanctions.
- Letting consumers know that your agency is tracking their actions, thereby discouraging abusive behavior.
- Establishing a progressive policy for repeat offenders (e.g., begin with a verbal and advance to a written warning,

then enforce a three- or seven-day suspension).
- Notifying the consumer in writing, citing specifically the full reason for the proposed suspension and its length, including the exact no-show dates, times, pickup locations, and destinations on which the proposed suspension is based.

Beyond suspension, other penalties can discourage habitual no-shows and late cancellations, and incentives can encourage on-time behavior. Some examples of these include:

- Rewarding responsible consumers (proven reliable over a defined period of time) with a free trip or other reward.
- Requiring consumers with a history of no-shows or late cancellations to confirm their trips with dispatch at a specified period of time (e.g., a half hour) before the scheduled trip or the trip is canceled without penalty.
- Contacting consumers with a problem history each night to confirm the next-day trip.

Some circumstances that cause no-shows or late cancellations are beyond the control of the consumer, including:

- Consumer was ill or experienced a sudden emergency.
- Consumer had a mobility aid failure (e.g., wheelchair breakdown).
- Consumer could not get through to your agency by telephone.
- Consumer's transportation connection was late (intercity bus, airline).
- Dispatcher did not record the cancellation.
- Dispatcher recorded an incorrect pick-up location.
- Dispatcher transmitted the wrong information regarding the cancellation.
- Driver canceled the wrong trip.

To account for these, many no-show and late-cancellation policies and procedures include both a method for tracking the reason for the missed trip and a process for consumer appeal.

TCRP Synthesis 60 conducted a survey of transit agencies with written no-show and late cancellation policies. Table 7-1 shows the results of the survey. **Note:** respondents could check more than one answer.

Table 7-1. Percentage of Agencies Including Suspensions or Fines in Policies.

Consumer Behavior	Include Suspensions	Include Fines	No Fines or Suspensions
Excessive No-Shows	90.2%	20.3%	7.3%
Excessive Late Cancellations	56.2%	13.2%	40.5%

How Dispatch Can Handle Remaining Scheduled Trips after a Consumer No-Shows

How does dispatch handle a consumer's remaining trips after a consumer is a no-show? What policies are in place?

FTA Topic Guide 7 states that the FTA has made the policy interpretation that if a consumer misses a scheduled outbound trip, transit agencies may not automatically cancel his or her return trip. Without an indication from the rider that the return trip is not needed, it should remain on the schedule.

If a consumer cancels a trip late, the dispatcher should ask if the rider would still like the return trip kept on the schedule. If a consumer no-shows a trip and the dispatcher cannot make contact with the consumer, then the consumer's return trip should not be canceled.

Cancellation Recording Procedures

Late cancellations and no-shows are not always the fault of the consumer. Dispatchers and reservationists do make errors. To minimize these errors, procedures and forms for accurately and consistently recording reservations, cancellations, and no-shows should be developed. Staff should be trained and monitored in using them. Table 7-2 shows suggestions for potential inclusion in your procedures and forms.

No-Show Procedures

TCRP Synthesis 60 reports that 91 percent of survey respondents said that, for no-shows, "drivers are directed to contact dispatch, either for instructions or to confirm the consumer no-show, before they proceed." Most are instructed to wait five minutes before contacting dispatch for assistance. Of those agencies requiring dispatch confirmation, 15 percent instruct the driver to leave the vehicle to look for consumers, while 4 percent indicated they leave a door hanger or card. Some 53 percent of respondents indicated that, for no-shows, dispatch would attempt to contact the consumer before instructing the driver to declare the consumer a no-show.

Table 7-2. Suggestions for Procedures and Forms.

Suggestion	Description
1	Utilize an automated scheduling system, which typically allows for recording faster changes while talking to the consumer.
2	Use a detailed trip reservation form that includes all information needed if recording trips manually.
3	Have dispatchers/reservationists record information while talking with the consumer and repeat it back to the consumer to ensure reliability of information gathered.
4	Make changes and cancellations for same-day trips immediately. Make changes and cancelations for future trips when convenient (e.g., at the time of the call).
5	Use a trip-change form to record changes to make later, after terminating contact with the consumer. This improves agency efficiency when experiencing a large number of trip changes.
6	Use a form to record changes to subscription/standing order trips that tracks the history of changes. Keep the form in the consumer's file documenting the change request.
7	Use a form to record trip changes or added trip information if your agency requires drivers to record information on paper manifests. Provide the driver with proper instruction regarding the form's use (e.g., recording, in full, all information requested).
8	Train dispatchers to dispense trip information in a standard format to facilitate drivers' use of the form in suggestion #7.

Staff responsible for monitoring and identifying no-shows might have related duties, such as:

- Determining whether the consumer was at fault.
- Investigating a location causing no-shows (e.g., difficult addresses or unclear entrances).
- Mailing postcards or letters to consumers advising them of the apparent no-show.
- Attempting to contact consumers to verify a return trip for that day.

The key is to have a clear and effective procedure followed by all relevant agency personnel.

Consider implementing a procedure to call consumers who no-show on their first trip of the day. The call would help determine if a situation exists that might prevent the consumer from traveling for a period of time. If the dispatcher cannot contact the consumer, consider canceling return trips for the day. The consumer will eventually call if the return trip is needed, which gives the dispatcher the opportunity to remind the consumer of the policy regarding canceling trips. Suggested steps in determining and handling no-shows are shown in Table 7-3.

Table 7-3. Determining and Handling No-Shows.

Determining a No-Show	
Steps	**Description**
1	Driver reports no-show to dispatcher and verifies the actual pick-up time and address to ensure correct information. (Common address errors include recording incorrect endings such as “street,” “road,” and “lane.”)
2	Dispatcher attempts to contact consumer by phone.
3	Dispatcher verifies the driver made an unsuccessful attempt to physically locate consumer.
4	Driver waits five minutes after the scheduled pick-up time before consumer is considered a no-show.
Handling a No-Show	
Steps	**Description**
1	Dispatcher documents circumstances of the no-show event, recording arrival time, attempts to contact consumer, and time driver left.
2	Driver leaves a “no-show door hanger” on consumer’s door.
3	Dispatcher cancels consumer’s remaining trips for that day.

Capturing No-Show and Late Cancellation Data

By tracking no-shows and late cancellations by category, the dispatch and driver staff can determine specific improvements in each category. Table 7-4 shows suggestions for what data to record regarding no-shows and late cancellations.

Table 7-4. Suggestions for Recording No-Show/Cancellation Data.

Suggestion	Description
1	Record and monitor (monthly) no-shows and late cancellations to resolve problems before they become excessive.
2	Categorize no-shows to help determine responsibility for the no-show (consumer or agency). Use the following categories: 1. consumer no-show and a. driver is on-time b. driver is late 2. consumer cancellation on driver arrival due to a. unpreventable cause (e.g., illness/emergency) b. preventable cause (e.g., consumer forgot to cancel) c. undetermined cause (consumer cannot give a reason) d. address error by • consumer • reservationist • dispatcher • unknown
3	Record cancellations by trip purpose or location (helpful in addressing chronic cancellations). **Example:** workshops for persons with disabilities might be closed on certain holidays, but consumers with subscription trips might forget to cancel trips.
4	Track workshop locations and work with host facilities to provide holiday schedules to consumers. Be proactive in contacting consumers to cancel trips in advance.

Creating a Comprehensive No-show/Late Cancellation Program

TCRP Synthesis 60 suggests that a comprehensive no-show program requires:

- Realistic expectations of consumers and drivers.
- Consistently applied operating procedures, particularly with respect to dispatch and drivers declaring an apparent consumer no-show.
- A means for consumers to cancel trips as far in advance as possible, including during times when the agency is not open for business.
- Good documentation based on a reliable, consistent method of recording no-shows and late cancellations.
- Effective computer programs that capture accurate information and produce reports that facilitate analysis.
- A system for sending letters to notify consumers about no-shows on a regular—perhaps daily—basis.
- An effective process for determining excused no-shows based on consistently applied criteria.
- A way to monitor no-shows and late cancellations on an ongoing basis and to impose suspensions at the appropriate time.
- Appropriate technological tools, such as computerized scheduling and dispatching, along with AVL and other technologies to manage no-shows and late cancellations.
- Public outreach to solicit input and educate consumers and their caregivers about the negative effects of no-shows and late cancellations.
- A recognition that imposing sanctions must be done with due process and concern for individuals who might rely on paratransit as their only source of transportation.

Anytown Transit Agency: Example No-Show Review and Analysis

In this section we provide an example of a no-show review and analysis for Anytown Transit Agency (ATA). The review shows example tools and reports that your agency might use to identify no-show issues and determine areas for possible improvement.

Assessing Policies and Procedures

Use the questionnaire checklist below to determine if your agency could more efficiently manage no-show and late-cancellation costs. As an example, the questionnaire is filled out for ATA.

Item	Yes	No
Late Cancellations/No-Shows Has the agency developed and implemented policies and procedures for consumer cancellations and no-shows?		
• Policy defining "no-show"	X	
• Policy defining "late cancellation"	X	
• Procedure for tracking the reason for the no-show or late cancellation		X
• Policy defining consumer penalties:	X	
○ Verbal Warning	X	
○ Written Warning		
○ Require consumer trip confirmation		X
○ Dispatch calls consumer to confirm next-day trip suspension	X	X
○ Fines/charges		
• Policy defining consumer appeals process	X	X
• Policy is actively monitored and enforced		
• Procedure for no-show authorization:	X	
1. Verify the pickup time and address	X	
2. Dispatch attempt to contact consumer	X	
3. Established wait time after the scheduled pick-up time	X	
4. Driver attempt to locate the consumer	X	
5. Leave a no-show hanger or card	X	
• Are no-shows investigated to determine if the consumer is at fault and should be charged with a no-show?		X
• Are no-show locations tracked for patterns?		
Recording Reservations and Cancellations Does the agency have procedures to record reservations and cancellations while the consumer is on the phone?		
• Are reservationists and dispatchers instructed to repeat the trip information back to the consumer to confirm?	X	
• Are same-day trip cancellations and changes made immediately?	X	
• Does the agency have procedures for making future trip cancellations and changes?	X	
• Is the driver instructed to record all information in full on a form as the trip is dispatched?	X	
• Does the dispatcher give out trip information in a defined sequence every time a trip is dispatched?	X	
• Does the agency have a subscription/standing order change form?	X	
Consumer Responsibilities Does the agency educate consumers on the policies and procedures of the demand response transit system?	X	
• Does the agency actively educate consumers regarding:		
○ Canceling rides in advance?	X	
○ Being ready at the start of the pick-up window?	X	
○ Shared-ride service?	X	
• Does the agency provide this information:		
○ Orally from drivers/dispatchers/telephone message system?	X	
○ In writing with a consumer's guide/educational booklet?	X	
○ Via a consumer's page on the agency's website?		X

Item	Yes	No
Data Collection to Calculate Performance Measures		
Does the agency collect and analyze the following data elements to optimize agency performance?		
• Consumer trips (boardings)	X	
• Missed trips		X
• Late trips		X
• Excessive ride times		X
• No-shows and late cancellations	X	
• Accidents	X	
• Roadcalls/service interruptions	X	
• Complaints	X	

Figure 7-1. Example Checklist for Determining/Tracking Efficiency for No-Shows and Late Cancellations.

Assessing No-Shows for Anytown Transit Agency

You can create reports that sort no-shows in various ways to identify what might be driving no-shows or where you might focus your efforts to control no-shows. By analyzing no-shows from multiple perspectives, you can determine if no-shows are more likely by trip purpose, day of the week, or number of trips scheduled per consumer during the week (consumer frequency of trips) for example.

No-Shows by Trip Purpose

You might want to know if certain trip types have more prevalent no-shows. Table 7-5 provides an example of no-show rate by trip purpose for ATA. The system average no-show/late-cancellation rate is 12 percent system-wide. The highest no-show rate is 17 percent for trips coded as "Medical." ATA transit agency might focus on the medical trips to determine the cause of the problem. For example, ATA might find that certain health facilities have long wait times for patients, and this delays is contributing to the likelihood of no-shows.

No-Shows by Day of the Week

You might want to know if a particular day of the week has higher no-shows. Table 7-6 provides an example of the no-show rate by day of the week. For ATA, Monday has the highest no-show rate of 16 percent, while Thursday has the lowest at 8 percent. ATA might find that an extra effort to call consumers on Saturday to remind them of their Monday appointments might cut down on the number of Monday no-shows.

No-Shows by Consumer

You might want to know if consumers that schedule a high number of trips during the week also have the highest no-show rates. Table 7-7 provides a comparison of consumers with and without no-shows for ATA showing that consumers scheduling the most trips (regular users) had the lowest rate of no-shows. Consumers that scheduled 10 trips or more during the week had a 9 percent no-show rate while patrons that scheduled one to 4 trips had a no-show rate

of 18 percent. In this case, ATA may focus on the consumers that are not "regular users" and make reminder calls prior to the scheduled trip.

One analysis that can help determine if no-shows are a system problem or isolated to a few consumers is to determine how many *individual* consumers no-show. For ATA, there were 181 consumers that took trips during the week, of which 58 (or 32 percent) had at least one no show event.

Table 7-5. ATA No-Shows by Trip Purpose One-Week Sample.

Trip Purpose	No. of Trips Scheduled	No. of Trips Taken	Count of Cancels/No Shows	No Show Rate
Other	287	254	33	11%
Medical	123	102	21	17%
Recreation	40	35	5	13%
School	131	116	15	11%
Shopping	150	134	16	11%
Work/workshop	121	105	16	13%
Grand Total	853	747	106	12%

Table 7-6. ATA No-Shows by Day of the Week.

Trip Date	No. of Trips Scheduled	Total Trips Taken	Count of Cancels/ No-Shows	No-Show Rate
Monday	181	152	29	16%
Tuesday	172	151	21	12%
Wednesday	169	147	22	13%
Thursday	157	144	13	8%
Friday	157	136	21	13%
Saturday	17	17	0	0%
Grand Total	853	747	106	12%

Table 7-7. ATA No Shows by Number of Trips Scheduled per Consumer.

Category: Range of Weekly Trips Scheduled per Consumer	Total No. of Consumers	Total No. of Trips Scheduled	Avg. No. of Trips Scheduled per Consumer	Category No-Show Rate
10 Trips or More	20	259	13.0	9%
5 to 9 Trips	51	325	6.4	11%
3 to 4 Trips	42	151	3.6	18%
1 to 2 Trips	68	118	1.7	18%
Total	**181**	**853**	**4.7**	**12%**
No. of Consumers w/ at least one No-Show	58			
% of Consumers w/ at least one No-Show	32%			

Estimating the Impact of Reducing No-shows/Late Cancellations

By reducing the number of no-shows/late cancellations, you might free up a vehicle to provide more passenger trips (increasing productivity) or reduce the vehicle hours needed in service (decreasing service hours).

Decreasing No-Shows to Increase Productivity

Table 7-8 shows how much ATA could increase service productivity by reducing no-show and late cancellations by 50 percent. In this example, we assume that ATA annual passenger trips are 40,000 and total annual scheduled trips are 45,455, yielding a no-show total or 5,455 or 12 percent.

Reducing no-shows by 50 percent would decrease the no-show total from 5,455 to 2,728. The example assumes that all 2,728 trips can be scheduled into existing service hours, thereby increasing actual passenger trips performed from 40,000 to 42,728 annually.

The example shows a best case scenario for increasing productivity. Realistically, ATA probably cannot reschedule all the trips probably into existing service hours. However, the example provides a framework for estimating the productivity impact of no-shows. Productivity would increase for ATA from 2.00 passengers per revenue hour to 2.14. Cost effectiveness of the service would also improve from $25.00 per passenger to $23.40 per passenger.

Table 7-8. Reducing No-Shows/Late Cancellations to Increase Productivity (50 Percent Reduction)

	ATA Current Service	ATA Service with Reduction in No-Shows by 50%
Scheduled Passenger Trips	45,455	45,455
Actual Passenger Trips	40,000	42,728
No-Shows	5,455	2,728
No-Show Rate	12%	6%
Revenue Hours	20,000	20,000
Passengers per Hour	2.00	2.14
Operating Cost	$1,000,000	$1,000,000
Cost per Passenger Trip	$25.00	$23.40

Reducing No-Shows/Late Cancelations by 50 percent (Assumes Equivalent Increase in Consumer Boardings)

Example: As shown in Table 7-8, reducing incidents by 2,728 results in an equivalent increase of consumer boardings (to a total of 42,728 consumer trips) for the same amount of revenue hours operated (20,000).

Productivity rate = consumer trips / revenue hours

Productivity rate = 42,728 / 20,000 = 2.14

To calculate the cost effectiveness of the service after reducing no-shows/cancelations by 50 percent, divide the total operating budget by the total consumer trips.

Decreasing No-Shows to Decrease Service Hours

As shown in Table 7-9, reducing no-shows/late cancellations can help you reduce required hours of service. The example shows a best case scenario for ATA decreasing service hours. Realistically, a one-to-one savings is unlikely. However the example provides a framework for estimating the financial impact of no-shows.

Per the table, assuming ATA provides the 2,728 at a rate of 2.00 passenger trips per revenue hour, in theory the agency can reduce service by an estimated 1,364 revenue hours (2,728 divided by 2.00 = 1,364). At a cost per revenue hour of $50.00, the savings of 1,364 revenue hours equates to an annual savings of $68,200 for ATA.

Reducing No-Shows/Late Cancelations by 50 percent (Assumes Overall Reduction in Revenue Hours Needed)

Example: As shown in Table 7-9, reducing incidents by 2,728 results in an equivalent decrease in revenue hours needed (to a total of 1,364 revenue hours).

Revenue-hour-reduction value = reduced # of consumer trips / # of consumer per revenue hour

Revenue-hour reduction = 2,728 / 2.00 = 1,364

To calculate the cost savings through reduced service hours offered, multiply the cost-per-revenue hour by the revenue hour reduction value.

Cost savings = cost-per-revenue hour × revenue-hour-reduction value

Cost savings = $25.00 × 1,364 = $34,100

Table 7-9. Estimated Impact of Reducing No-Shows/Late Cancellations (Decrease in Revenue Hours Needed).

	ATA Service with Reduction in No-Shows by 50%
No-Shows	2,728 (50% reduction)
Passengers per Hour	2.00
Estimated Revenue Hours	1,364
Cost per Hour	$50.00
Estimated Cost Savings	$68,200

Assessment of No-Shows and Late Cancellations for ATA

Generating automatic reports from the scheduling system might prove beneficial to our fictional agency, ATA. Based on the results of *TCRP Report 136,* a 12 percent no-show rate appears to be on the high side. In addition, the results that show 32 percent of the consumers that scheduled trips had at least one no-show might indicate that a concentrated focus on no-show monitoring and enforcement would have a positive impact on productivity.

As ATA grows and schedules become more productive, driver slack time should be significantly reduced. No-shows, though in theory less frequent, will become even more significant as a hindrance to providing productive and cost effective services. ATA might explore establishing a no-show threshold of three or more no-shows in a one-month period that would result in a penalty for the offending consumer.

One key to successfully reducing no-shows is established reports to track the offense, consistent monitoring through performance measurement and assessment, and deliberate, fair enforcement. ATA would benefit from:

- Developing automated reports.
- Establishing consistent monitoring procedures.
- Establishing a no-show threshold policy.
- Implementing advanced reminder phone calls for identified offenders.
- Providing "no-show door hangers" and consistently enforcing the ATA no-show policy.

Resource

TCRP Report 136
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_136.pdf

Chapter 7: What to Remember

You can reduce no-shows and late cancellations through positive and negative reinforcement of consumer behavior. By reducing the number of these incidents, you can free up a vehicle to provide more passenger trips (increasing productivity) or reduce the vehicle hours needed in service (decreasing service hours), thereby saving money for your agency.

To redress these problems, you must first construct rules defining exactly what no-shows and late cancellations are, what thresholds result in penalties (e.g., three no-shows in a month), and then enforce penalties for consumers with excessive patterns of breaking those rules. To better track reasons for wasted trips, create procedures and forms for accurately and consistently recording reservations, cancellations, and no-shows and train staff in how to use them. By tracking no-shows and late cancellations by category, your staff can target specific improvements for each category. By analyzing no-shows from multiple perspectives, you can even begin forecasting when no-shows are more likely.

Create reports from tracked information that sort no-shows in various ways to identify contributing factors causing the problems

and where you might focus your efforts for improvement. Other strategies for reducing no-shows and late cancellations include consistent monitoring through performance measurement and assessment, as well as deliberate, fair enforcement of policies.

Remember, it's not always the consumer's fault; dispatchers and reservationists make errors. To protect consumers, include a method in your policies and procedures for tracking the reason for the missed trip, as well as a process for consumer appeal. To minimize agency costs from no-shows and late cancellations, consider a system for calling consumers who exhibit a pattern or practice of no-show behavior. For example, call to remind consumers about Monday trips if Mondays have the highest no-show rate.

References

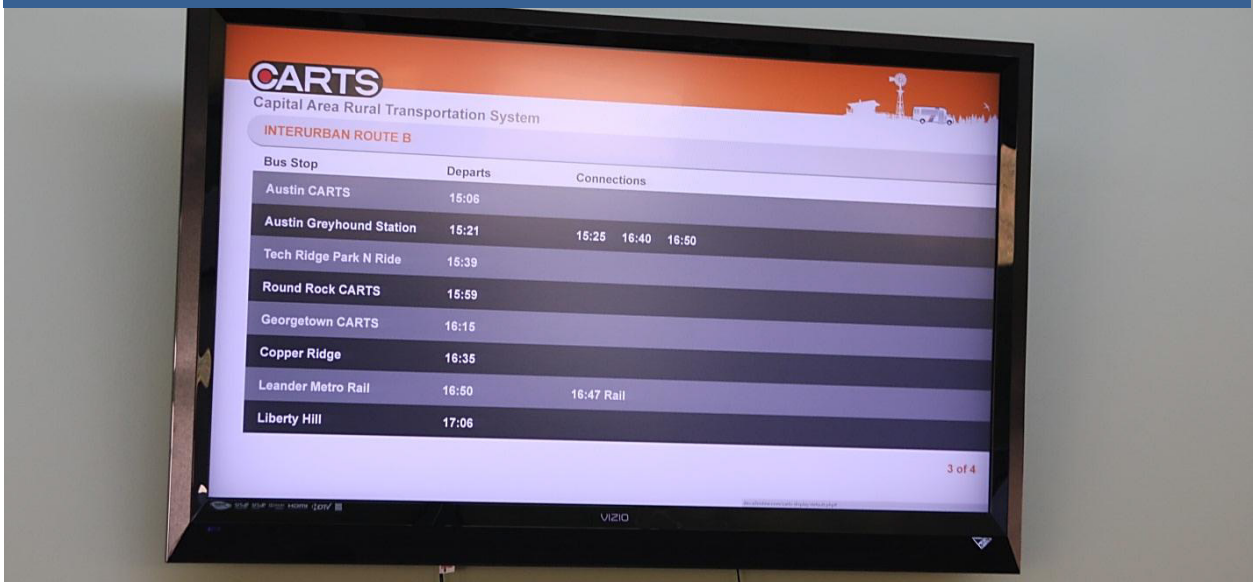
1. Federal Transit Administration (FTA). Topic Guide 7. "No-Shows in ADA Paratransit." Washington, D.C. 2010.

2. Transit Cooperative Research Program (TCRP). Synthesis 60. "Practices in No-Show and Late Cancellation Policies for ADA Paratransit." Washington, D.C. 2005.

3. Transit Cooperative Research Program (TCRP). Report 124. "Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation." Washington, D.C. 2008.

4. Transit Cooperative Research Program (TCRP). Report 136. "Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance." Washington, D.C. 2009.

Chapter 8. Future Trends and Forward Thinking Approaches



The current economic environment requires transit agencies to think outside the box to overcome fiscal challenges.[1] Considering innovations in technology, trends in multimodal approaches to service delivery, and new ways to mix your transit fleet are important to optimize your agency's resources.

This chapter presents an introduction to these innovative methods and lessons learned from Texas transit agencies, which have implemented many of them.[2] The three general categories of cost-saving approaches in rural and small-urban transit identified by researchers are:

- Use of technology.
- Innovative service design areas increasing in urbanization, with changing demographics, and the need for multimodal integration.
- Fleet mix and fuel efficiency.

Seven transit service providers in Texas participated in the fact-finding exercise by the authors. The respondent pool comprised four rural systems and five urban systems (see Table 8-1). Summary information from the table is derived from 2010 Transit Statistics (*1*).

Table 8-1. Texas Transit Agency Participation in This Fact-Finding Exercise.

	Administration Office Location	Total Vehicles	Operating Cost/VRH	Operating Expense/ Passenger Trip	Pass. Trips/Rev Hour	Vehicle Revenue Miles	Unlinked Passenger Trips	Rev/Veh System Failures
Rural Transit Systems								
CARTS	Austin	114	$50.90	$18.63	2.73	2,089,886	415,143	54
Brazos Transit District *	Bryan	58	$86.78	$15.69	5.53	2,445,187	681,514	74
ETCOG - GoBus	Kilgore	63	$43.71	$27.60	1.58	1,341,635	110,828	33
Hill Country Transit District - The Hop *	San Saba	69	$43.97	$15.53	2.83	702,729	138,429	85
Urban Transit Systems								
Brazos Transit District *	Bryan	16	$50.20	$1.33	37.68	2,032,101	5,566,585	36
Hill Country Transit District - The Hop *	Killeen	37	$53.06	$8.65	6.13	951,208	344,237	38
Hill Country Transit District - The Hop *	Temple	35	$48.74	$13.66	3.57	622,031	152,518	64
Longview Transit	Longview	11	$70.66	$8.15	8.67	337,432	187,026	24
Waco Transit	Waco	62	$53.88	$6.16	8.75	1,676,772	764,804	23
Falls Ride	Wichita Falls	14	$48.38	$4.20	10.8	521,882	337,419	9

** Denotes transit agency providing service in rural and urbanized area (listed separately in table above)*

Innovative Technology and Social Media

Leveraging technology to better manage costs requires preparation. To benefit from technology, you must first know what is available, how each technology can help you, and the skill sets required to deploy and maintain technological solutions. Most of the technologies our respondents have experience with have scalable cost entry and provide increased operational efficiencies. Table 8-2 summarizes our findings. Following the table are specific examples of lessons learned by respondents.

Two additional resources were identified by the researchers that could aid rural and small urban transit operators in technology deployments.

TCRP Report 76: Guidebook for Selecting Appropriate Technology Systems for Small Urban and Rural Public Transportation Operators provides guidance in selecting technologies specific to your agency's needs. Though 10 years old, the report's overviews on product selection criteria and processes are still valid. **Note:** Recommendations for best fit for system size might have changed given that technology costs have decreased to allow for wider affordability among small-fleet systems.

TCRP Report 84, Volume 8: Improving Public Transportation Technology Implementations and Anticipating Emerging Technologies includes a more recent screening of available transit technologies, addresses prerequisites within a transit agency to increase deployment success, and addresses emerging technologies and their potential value to transit providers.

Table 8-2. Benefits Gained by Respondent Agencies Leveraging Technology.

Technology	Benefits
Fleet Maintenance Software	• Track and schedule preventive maintenance inspections. • Understand actual operating costs through development of periodic reports. • Develop centralized maintenance scheduling and repair, including regional maintenance sites shared by multiple transit providers.
Dispatch and Scheduling Software	• Increase passenger boardings per vehicle trip. • Improve real-time information from satellite service centers to centralized dispatch centers. • Increase the ability of a central-dispatch facility to update driver schedule information in real-time. • Enable planning staff to extract trip reports to help evaluate route performance.
Mobile Data Computers and Similar Devices[3]	• Convey scheduling information directly to drivers, improving communication efficiency re: schedule information. • Facilitate driver reassignment (e.g., change trip assignments) on short notice. • Enables trip report information to flow directly back to central dispatch in real time. • Forecast arrival of buses at locations.
Communication Systems	• Leverage a regional radio- or cell-tower platform capable of linking your entire service area (allows for centralized control of dispatch and scheduling).

Resources

TCRP Report 76
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_76.pdf

TCRP Report 84
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_84v8.pdf

Dispatching and Scheduling Software

Dispatching and scheduling software is used by a large number of service providers for even small fleets of 8 to 10 vehicles. This software aids schedulers in developing more efficient demand-response routes and helps dispatchers achieve more effective vehicle and route oversight. For larger systems, this software is often incorporated with:

- Mobile data computers (and more recently, less expensive computer tablet technology).

- Automatic vehicle location hardware to allow dispatchers real-time visual contact with vehicles (and provide passengers with real-time arrival information).
- GIS software for more robust planning and scheduling of subscription bus routes or real-time dispatching.

Dispatching and scheduling software aids schedulers in developing more efficient demand-response routes and helps dispatchers achieve more effective vehicle and route oversight.

Lessons Learned: Dispatching and Scheduling Software
Hill Country Transit District (HCTD)

Use of dispatching and scheduling software has been seen by most service providers as only benefiting their demand-response services. HCTD uses Streets software for its fixed-route systems in Killeen and Temple. Product benefits for HCTD include:

- Reduce/eliminate redundant services (e.g., excessive trips).
- Identify route paring opportunities.
- Merge several inefficient routes to achieve time savings.
- Maintain service levels while expanding into previously unserved areas.
- Increase overall ridership (increase in vehicle boardings/revenue vehicle hour).

HCTD's first step in implementation was to build a pool of employees with requisite computer literacy. This required training existing employees and ensuring that new hires had the requisite skills. HCTD sees this as an ongoing process (through training, hiring standards, and retraining), which continues to net increases in administrative efficiencies. Close monitoring is key to ongoing success.

Lessons Learned: Web-Based Routing and Scheduling System
Southwest Michigan Regional Planning Commission (SWMPC)

SWMPC has worked with four counties over the last five years to deploy a web-based routing and scheduling system used by seven service providers. One goal was to allow multiple human service sub-contractors access to their client schedules while retaining client privacy among other service providers.

Some service providers use only the software's reporting functions; this helps them to better understand passenger demand and cost for their ridership base. While the software came with different levels of deployment, at the time this guidebooks is being written, no user yet trusts the system enough to fully deploy some features. The most notable untapped feature would allow for adjusting prices based on demand or same-day booking.

No provider has cited a reduction in operating costs as a result of deployment. However, they did indicate achieving more detailed recording, which can assist in creating performance measures for improving service efficiency. One operator indicated the software—which allows for the storage of standing-order information—helps them better assist senior riders, who sometimes have difficulty in remembering the details of their trip. While metrics were not available to determine operational cost savings, one agency's operators report enhanced administrative customer service and productivity.

Mobile Data Terminals or Computers (MDT or MDC)

Mobile Data Terminals or Computers (MDT or MDC) and the more recent adaptation of tablet computers, such as the iPad, provide a low-cost alternative for deployment of software that allows for:

- Demand-response dispatch.
- Fare collection tracking.
- Fixed-route passenger counting.
- English translation.

Similar to cell-phone plans, tablets are being used by dispatch and scheduling software vendors for less than $200 per bus, depending on the length of contract and the number of buses in the plan.

Lessons Learned: Deploying Mobile Data Computers
Capital Area Rural Transportation System (CARTS)

Using a paper manifest every day required that CARTS devote a larger number of employee hours to audit the data against the computerized schedules, make changes to manifests, and fax that information to each remote transit facility. Deploying MDCs has replaced these steps with one direct delivery to each driver in-vehicle. Since deploying MDCs, CARTS:

- Performs its audit automatically.
- Deploys audit information to each driver's MDC.
- Delivers updates in real time directly to the driver and from the driver to central dispatch.
- Provides faster data turnaround and, thereby, more efficient passenger billing.
- Enables more efficient use of driver time since central dispatch can monitor passenger pick-ups and drop-offs in real time.

Lessons Learned: Assigning Tablets to Drivers to Capture Trip Information
Fort Smith Transit

After assessing MDCs for their demand-response fleet, Fort Smith Transit in Arkansas purchased tablets for each driver for $700 each (compared to $3,000 per MDC). The agency purchased extra units for relief drivers and as spares. Drivers have individual email addresses, so schedules are dispatched directly to each driver's tablet instead of an assigned vehicle. Other advantages of the tablets include:

- More accurate tracking of passengers per hour and more efficiently scheduling trips per driver, resulting in an average savings of **2.5 hours per route/day**.
- Drivers receive updated schedules in real time and return information back to central dispatch upon trip completion.
- Rapid reprogramming allows for quick replacement or reassignment.
- A low-cost software application enables fixed-route drivers to submit ridership, stop, mileage, and fuel data directly to dispatch.
- Installing a language translator allows drivers to conduct basic communication with Spanish-speaking riders.
- Individually assigning tablets means drivers can take them home, providing low-cost, efficient communication between dispatch and drivers after hours.
- Using off-the-shelf applications has limited agency costs to the up-front investment of the tablet and applications.
- Monthly operational costs are limited to the cell data plans for each tablet.
- Using a locator application enables dispatchers to find specific vehicles on duty.

Lessons Learned: Centralizing Radio/Data Systems
CARTS

CARTS used to run multiple call centers. Radio-coverage limitations prevented the agency from piecing together one system for the entire service area.

CARTS centralized their radio and data systems with the Lower Colorado River Authority (LCRA) .[4] Successfully deploying this large-service-area radio center was a watershed moment for LCRA. The robust nature of LCRA's system and successful partnership with CARTS convinced LCRA to market the same service to others in Central Texas.

LCRA's radio system enabled CARTS to centralize call and dispatch functions into one location with voice coverage. The subsequent successful deployment of a digital radio stream created a backbone upon which to deploy other technologies such as Mobile Data Terminals and a uniform fare card (the RideCARTS card). Efficiencies gained through the automation of dispatch and fare collection have allowed CARTS to move toward a paperless model and reduced the need to collect cash fares.

Communications

Communications systems are primarily built on radio-frequency or cell-tower coverage, which they on in a given service area. A good communication system can allow a transit provider, particularly a rural provider over a large service area, to increase service efficiency by providing the backbone required to deploy other technologies such as MDT or MDC units, computerized scheduling software, on other real-time applications through a central dispatch center.

General Transit Feed Specifications

Developed by Google and others, General Transit Feed Specification (GTFS) provides a layer of map-based information specific to transit. Used by Google Transit and other map-based services, GTFS allows the sharing of real-time online transit route information for fixed-route public transit schedules.

Placing routes in this format offers passengers a one-stop planning solution. End-users searching sites like Google can plan a trip on public transit across multiple transit agencies. None of the respondent agencies interviewed by the authors indicated they had completely uploaded their route information in this format to Google or any other online transit information program, though several agencies said they had programs under development. There are, however, examples of using Google Maps to design "mash-ups." (A mash-up is created when two or more sources of data—in this case a Google Map and transit system route information—to develop new, more useful information.) These are a good starting point for getting passengers comfortable with using

technology and making them more aware of online resources available to them for trip planning (see Figure 8-1).

A mash-up is created when two or more sources of data—in this case a Google Map and transit system route information—to develop new, more useful information.

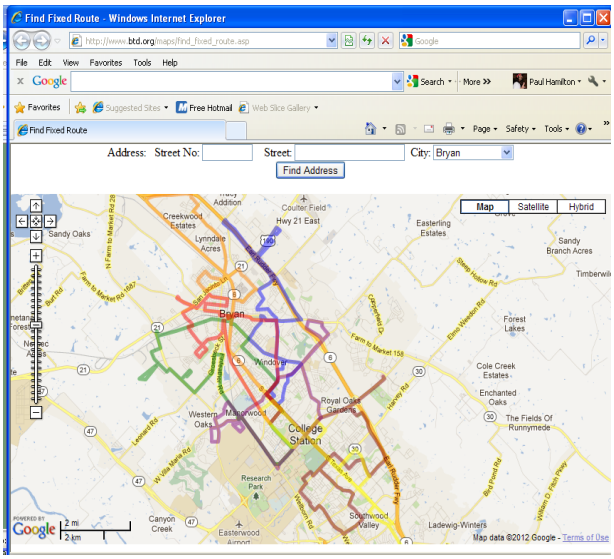


Figure 8-1. Example Mash-Up Map Used by Brazos Transit District (BTD).

Lessons Learned: Mash-Up and GTFS Use
Brazos Transit District (BTD)

BTD developed a fixed-route mash-up that displays route corridors in each of their serviced urban areas (Figure 8-1). Users type in their street address and street name, then select "Find Address." The map zooms automatically to identify the route closest to that address point.

Adding GTFS data to this platform can benefit end-users by:

- Displaying text-based navigation enhancements (e.g., a table of contents).
- Providing schedule table links to each bus stop within a fixed-route system.
- Enhancing the overview (provided by the mash-up) to provide route-specific information on a large scale as end-users zoom in on a given service area.

You can develop maps for defining service routes similar to BTD's using free Google tools online available through the resources provided here.

- Start at Google Support to learn how mapping tools work and set up an account.
- Go to Google Maps to set up your user-specific maps to define each of the fixed routes in your service area.
- Use GTFS to define stop locations, which can include more detailed route tables, stop numbers, and photos of each stop location.

Those who have GTFS programs under development indicated they anticipate ridership gains by connecting services with other providers. They also anticipate improved customer-service support resulting from better route information availability to non-riders who plan trips online. The authors found that, for those agencies that have already developed GTFS, shared data yields increased productivity.

Resources

Google Support
http://support.google.com/maps/

Google Maps
https://maps.google.com/

Social Media

Social media use in the United States has grown dramatically in recent years, revolutionizing the way we communicate. The popularity of web-based networking sites such as Facebook, Twitter, and blogs have led private enterprise and government to embrace these channels for communicating with consumers (*2*).

Transit agencies can use social media to:

- Better engage with citizen feedback.
- Enlighten passengers with more detailed route and schedule information.
- Provide prompt updates regarding service changes or disruptions.

While no respondents reported that they use social media to communicate with current or potential passengers, rural-service areas across the country are beginning to use social media.

Understanding how social media works can help you reach passengers and provides a low-cost conduit for service feedback. Several rural-transit providers and service planners came together to discuss this issue (*3*). Agencies ready to embrace these tools should consider the following conclusions from this discussion:

- Make sure you have a plan; assigned staff must be proficient in using the selected media outlets.
- Keep your content fresh; if you post route changes to a blog, update that content as routes change.
- Screen posts and be ready to respond; bad news travels as fast as good news. This can be an opportunity to reach riders, but it must be managed and maintained.

Innovative Service Design

In developing and updating route-service design, nearly all respondents identified using portions of the four-step transportation model to improve efficiency on both demand- and fixed-route systems. Primary strategies focused on identifying trip generators and maximizing route assignments using trip-generation and distribution data.

Coordination implies the ability to maximize resources within a specific service area.

Connectivity is a more accurate term for how to develop inter-agency services designed to better meet passengers' trip needs.

Agencies rely on surveys, data collected by local MPOs and COGs, and data reports (now available from dispatch and scheduling software). Most transit systems using computerized dispatch and scheduling software rely on reports generated by the software to optimize route efficiency, from increased trip pairing for demand-response systems to route modifications for fixed-route providers.

Maximizing opportunities for cost containment and operational efficiencies have largely focused on coordination.[5] *Coordination* implies the ability to maximize resources within a specific service area. However, agencies cannot always meet passenger demand for trips between specific points within their own service area. Often trips require traveling across agency boundaries between rural-service areas or, more commonly, between and rural- and urban-service areas.

One respondent identified *connectivity* as a more accurate term for how to develop inter-agency services designed to better meet passengers' trip needs. This includes ensuring that consumers can access the entire transit network affordably and easily. While not all respondents characterized services in this way, many used tools designed to reach this same objective.

Resources

TCRP Synthesis 94
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_94.pdf

TCRP Synthesis 53
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_53.pdf

As *TCRP Synthesis 94: Innovative Rural Transit Services* (*4*) notes, identifying innovative services by surveying providers is sometimes difficult. True innovations occur when transit agencies adapt themselves to meet changing demographics, new technology, and economic challenges. Some providers either fail to realize that what they are doing is innovative or they believe their practices are just "common sense."

TCRP Synthesis 53: Operational Experiences with Flexible Transit Services (*5*) provides additional details regarding flexible transit services (i.e., services not fully fixed route or demand response) in over 50 transit systems of all sizes throughout North America. These providers typically deploy a variety of models to address demographics, street layout, low demand (overall or at specific time periods), and low density within a small-urban, suburban, or rural-service area.

Lessons Learned: Connectivity with Other Transit Providers (CARTS)

In the last 10 years, CARTS has seen parts of its service area shrink or disappear as urban areas grow or new urban areas develop. This has left the overall rural area with less funding but has not reduced the distance passengers from these areas need to travel to reach vital services.

CARTS is working with Capital Metro, Austin's Public Transit agency, to design a regional fare structure on its Elgin route feeding into Capital Metro's service. Passengers would pay one fare when they board and ride into Austin to connect with Capital Metro via one fare media device. Both agencies would receive a portion of the fare from a pre-determined agreement.

CARTS has worked with Capital Metro to develop a bus marked with the Capital Metro brand, further advertising the agencies' *connectivity* when a passenger boards an Elgin route to Austin. While the integration of fare systems, for example, implies a need to coordinate providers, *connectivity* expresses the goal to develop a regionally connected transit infrastructure that better meets consumer needs. Connectivity strategies include:

- Seamless fare payment.
- Connecting services between rural and urban providers using consistent bus branding.
- Improved service frequency.
- Enhanced route information to enable trip planning.

These tools can decrease mode barriers, increase ridership, and lead to greater farebox recovery and lower route subsidies.

Lessons Learned: Future Trends Wichita Falls - Falls Ride

Sharp Lines provides intercity bus and rural service into Wichita Falls, but Falls Ride had no location to conduct passenger transfers between bus systems. Falls Ride is currently building an intermodal transfer center to allow intercity operators, the rural provider, and city bus service to leverage ridership via a common transfer point. This will increase convenience for riders and operators.

Transfer facilities will encourage more efficient service alternatives (e.g., fixed-schedule designs used by CARTS), enabling the rural provider to increase passenger effectiveness via additional low-density trips in the urban area before picking up outbound transfers.

Lessons Learned: Metrics to Evaluate Service Design
Waco Transit

Waco Transit (urban provider) identifies trip generators as new urban development occurs to see if current routes need adjusting or new routes are justified. Each route is evaluated annually against the prior year's numbers and against the fleet average to see how well each route is performing. The agency also tracks fuel consumption for each route using annual comparisons to determine if changes in route structure contribute to operational costs. Waco Transit's greatest challenge is getting good public feedback as performance metrics are developed and published for comment.

Challenges and Future Opportunities

Coordination might seem a poor term to transit agencies that have deployed exemplary regional service designs, including having achieved connectivity across agency lines. If coordination were truly a means to an end, service design could greatly improve efficiency and service delivery if all transit funding were fully coordinated into all state transit service providers. Therein lies the challenge: to better coordinate all public transit-service resources *including* health and human service program. Doing so could provide a more developed regional transit system for all riders.

Fleet Mix Characteristics

Based on respondent feedback, the authors have determined that the mix (or number of different types) of service vehicles was proportional to the number of different service types (e.g., demand-response, fixed-route, Medicaid contract service) provided by each transit agency. Through research and interviews, the authors identified several maxims for this guidebook:[7]

- Optimal vehicle size is positively correlated with level of demand.
- Larger vehicle size allows for more ridesharing opportunities.
- Fleet size and mix should take into account future travel demand forecasts.

Most respondents prefer developing one vehicle model for each service type to standardize parts inventory and lower repair costs.

Most respondents prefer developing one vehicle model for each service type to standardize parts inventory and lower repair costs. (For example, a fixed-route service provider might convert their fleet to a particular bus type to lower parts inventory and ease preventive maintenance procedures.) Several agencies (both demand- and fixed-response) deliberately standardized to low-floor vehicles to lower maintenance and

Table 8-3. Fleet Mix Criteria of Respondents.

Criterion Type	Description
Maintenance	• Ability to maintain the fleet in-house. • Purchasing vehicles that meet service demands with standardized engine, drive train, HVAC, and other major components.
Fleet Mix	• Using lift-type (low-floor ramps vs. lifts) vehicles. • Shifting fleets to ramp-equipped buses and vans due to their lower maintenance and repair costs and quicker boarding times (applies to both paratransit and larger fixed-route buses).
Fleet Mix	• Homogenous fleet design (prevalent among demand-response and fixed-route fleets, less so among medical transit and paratransit) — reduces parts inventory and mechanic training and allows for standardized preventive maintenance inspection processes.

repair costs while decreasing passenger boarding times.

The authors found that most operators look at three criteria when developing a fleet mix (Table 8-3).

Several operators also indicated they are:

- Developing a regional maintenance facility.
- Contracting with another government or transit provider to provide service at their maintenance facility.
- Expanding in-house maintenance to reduce reliance on third-party services providers. Bringing maintenance in-house frees agencies from relying on the outside vendor's availability and leverages in-house personnel's greater familiarity with transit-specific maintenance needs.

One agency has finished a regional central maintenance facility that provides service to its urban- and rural-transit systems. Several others are developing a similar arrangement.

The two greatest challenges to developing these facilities are funding and distance:

- Basic funds for replacement capital and operating costs eat up most rural and small-urban budgets. There is no set-aside specific to capital construction, and available funding is usually limited and highly competed for across the United States. Most transit systems are working to maximize fleet life by centralizing fleet maintenance control with computerized fleet maintenance systems.
- Rural providers with large service areas see small regional maintenance facilities placed throughout their service area as the first step in providing better maintenance control. More facilities also mean less travel time (and less fuel used) for vehicles accessing maintenance facilities. Over the long term, this can save agency dollars spent on fuel.

Rural and small-urban transit providers must make informed decisions regarding their budgets. According to the American Association of State Highway Officials, the average state funding for transit in 2008 was $42.50/person while Texas transit funding stood at $1.18/per person (*6*).

As stated throughout this guidebook, the strategies and best practices presented here can help you better meet the challenges of limited funding by improving the efficiency of how you manage your resources and staff, even as service demands by an increasingly transit dependent population base continue to grow.

Lessons Learned: Regional Maintenance and Fleet Mix
Waco Transit

In 2005, Waco Transit became the first Texas agency to fully deploy a regional maintenance facility for their small-urban fleet and the fleet of the Heart of Texas Rural Transit District (HOTRTD, Waco's rural provider). Drawing from the larger combined fleet and two maintenance budgets allowed them to pay mechanics a more competitive wage and distribute the facility's capital costs between two transit systems. Waco received funding from FTA 5309 in 2002. Intended to service both Waco Transit and HOTRTD, the facility was constructed at a cost of $5.2 million.

An interlocal agreement was not finalized between the agencies until September 2010, at which point a regional maintenance system was formed. Benefits have only just begun to accrue to the rural provider, so not enough data yet exist to quantify exact savings. However, this holistic approach to maintenance has allowed HOTRTD to identify and address capital maintenance processes that have increased its fleet's state of good repair.

Waco Transit's performance measure for its maintenance program is "miles between road calls." Though, again, the facility has not operated for long, Waco Transit already reports a 117 percent increase in miles traveled *between* road calls (TxDOT 2009 and 2010 report data).

One implementation challenge was to ensure all parties understood their fleets' existing state of good repair. Then, each agency had to assess the cost-benefit of bringing those fleets up to an acceptable operating standard by identifying and addressing all repairs and implementing standardized preventive maintenance procedures. As a result, HOTRTD saw an initial increase in maintenance costs, but these costs leveled out after the first 18 months; HOTRTD's fleet reliability has improved.

Waco Transit identified the Opus low-floor vehicle model as best suited for all its urban fixed-route services. Standardizing to this vehicle lowered maintenance costs via fleet uniformity, mechanic training, and the reduction in maintenance and repair costs inherent to the ramp vs. lift design. The ramp system on low-floor has also reduced boarding times for wheelchair-bound and ambulatory passengers (formerly limited in their ability to board high-profile vehicles with steps).

Both agencies have worked together to limit the number of vehicles types used in demand-response and medical transportation to reduce the need for mechanic training and spare parts inventory.

Lessons Learned: Regional Maintenance Centers
HCTD

Service corridor layout and required fleet distribution are important considerations when evaluating the need for regional maintenance centers. CARTS and HCTD indicate that developing local maintenance solutions is still the most viable strategy for large rural-service districts. HCTD relies on local vendors for basic maintenance and repairs but performs fleet-specific functions (e.g., lift maintenance) using a rural fleet manager.

Within Killeen and Temple, HCTD developed and has begun to deploy a three-step process to centralize repairs:

1. Bring fleet maintenance in house using industry standards for preventive maintenance inspection and repairs.
2. Computerize preventive-maintenance scheduling and reporting to track costs and control quality.
3. Merge urban functions into one central urban-maintenance facility to minimize maintenance travel and enable the sharing of fleet resources between its two urban service areas.

Step 3 is ongoing. Unlike Waco Transit, HCTD decided against a regional maintenance center for its rural district given the miles required to relocate vehicles for fleet repairs. Its urban centers are closely located, allowing for maintenance economies of scale. One size does not fit all; each service area needs to weigh costs against benefits. Results depend highly on the service area and the availability of central infrastructure to support fleet size and repair needs.

Lessons Learned: Fleet Mix

CARTS

CARTS has standardized approximately 80 percent of its fleet to a body-on-chassis (BOC) vehicle built on an E450 chassis using a 20–30' body, thereby reducing parts-inventory, repair, and maintenance costs associated with maintaining multiple vehicle models.

For fuel, CARTS has used propane to varying degrees of success since 1981 and has set an agency goal of eventually having 40 percent of its fleet run on propane. In the last three years, CARTS has developed its own propane fueling stations. Benefits of this approach include:

- Negotiating bulk fuel purchases with vendors to reduce costs.
- Providing on-site refilling at local facilities.
- Controlling the fuel quality delivered and used.

In addition to the air-quality or emissions benefits (important for a transit operator providing service in an EPA near-nonattainment area), propane also saves the agency money over the use of other fuels. (For more information on how to reduce fuel costs for your agency, see Chapter 5.)

Since 2006, CARTS began maintaining a small sub-fleet of Crown Victoria automobiles. These vehicles can:

- Transport single passengers or smaller groups while achieving higher gas mileage.
- Lower repair and maintenance costs.
- Burn E85 fuel (i.e., are dual-fuel capable).

Given their relatively small boarding-per-hour ratio, several providers of paratransit or medical transit services indicate a need for a more heterogeneous fleet to give them more deployment choices to meet capacity demands while more effectively allocating agency resources.

Lessons Learned: Fleet Mix
Wichita Falls - Falls Ride

Falls Ride's fleet currently has 14 buses, eight low-floor Gillig and six ElDorado XHF vehicles. All buses are 35' purpose-built transit buses with a mix of low- and high-floor configurations. The agency is transitioning toward one bus type, the Gillig, and was due to replace two XHF buses at the time this guidebook was written. The fleet should be fully transitioned to low-floor by 2016.

Given that Falls Ride's service type is route-deviation,[8] the agency consistently anticipates the need for multiple-lift deployments throughout the service day. Shifting to the low-floor bus design has sped up passenger boarding times by deployment of a ramp instead of a lift. Many passengers have limited mobility and benefit from this quick-deployment option; it also facilitates access compared with the high-floor design that, without deployment of the lift, can only kneel to the curb while still requiring passengers to climb the last few steps.

Low-floor design ramps have had far lower maintenance costs and breakdowns as well. Manual deployment is much quicker and easier than with a high-floor design, and low-floor ramps require no service calls on route.

Finally, and as mentioned in other lessons learned, moving toward the one-model low-floor fleet vehicle lowers costs associated with keeping parts in stock and has made it easier to train mechanics, who can now focus on one engine, drive train type, and HVAC system. It is also reducing, and will eventually eliminate, the need to make hydraulic repairs to lifts.

Other Fleet Characteristics – Fleet Access

Similar to the research we reviewed, the authors found that developing bicycle and pedestrian infrastructure has not been a priority for small-urban and rural agencies (*7*). As might be expected, development of these amenities has occurred primarily in large urban areas.

The initial investment necessary could be a financial barrier for smaller agencies. Cyclists are beginning to use transit to commute long distances, but only if they can securely store the bikes they ride to get to the bus's origination point. Over the past five years, many large-urban and university transit agencies have begun building on-site bicycle parking at facilities where trips originate because bicycle storage is so limited on buses themselves. (Cyclists' inability to store their bikes at the facility or on the bus itself makes biking to the origination point impossible for them, since they have no place to safely and securely store their bikes.) No such demand is readily apparent among small-urban or rural providers.

With limited exception, few providers linked large numbers of passengers on developed routes between their rural-service areas and large trip-generator destination points on first-shift commuter bus routes (i.e., routes supported by investment in bicycle infrastructure). While bicycle amenities often enhance first- and last-mile legs of a route, the service characteristics and demographics of our respondent pool might have more to do with the lack of observed demand.

Lessons Learned: Pedestrian and Bicycle Considerations
Longview Transit

Longview Transit identified pedestrian and bicycle access as an important aspect of route development. During route evaluation, the agency has collected data on bus-stop inventory including amenities such as benches, signage, bike racks, and pedestrian access. These are seen as important elements to help grow access to transit routes for more persons living along route corridors.

Lessons Learned: Bicycle Racks on Buses (BOB)
CARTS

CARTS installed BOBs on all fixed-route buses and commuter-bus routes. These amenities currently receive light use, but their presence in the growing small-urban San Marcos market—which includes Texas State University with an enrollment of over 34,000 students and CARTS' commuter link to Austin and Round Rock—provide service links likely to see increased use in the near future.

BOB overloads or left-behinds are already common for Texas State's commuter-bus route between Austin to San Marcos. Passengers, predominately students, commonly use their bicycles to get to bus stops in Austin. They sometimes find themselves waiting for the next bus to depart campus in the afternoon, if all bus bicycle rack positions are taken.

Over time, risk-averse passengers who don't need a bicycle at their destination will likely park them at an Austin bus stop. As CARTS and other rural and small-urban providers continue to connect their passengers to larger systems, they will likely see an increase in rack use on their buses and at connecting bus stops. Ensuring these amenities are available at connections will be an important aspect of customer service as agencies seek to increase ridership.

Chapter 8: What to Remember

Future strategies for optimizing agency costs include leveraging technology, adapting service design to changing consumer needs, and creating a more flexible fleet mix. Leveraging technology requires knowing what's available, how it can help you, and how you need to adapt to use it. For example, schedulers can use software to develop more efficient routes, but only if they understand how to use the software. Mobile technology solutions, like the iPad, can provide low-cost connectivity for drivers. To take advantage of many technological solutions, a good communications infrastructure must support your service area.

GTFS's online mapping option offers passengers a one-stop trip-planning solution for accessing the entire transit network in many urban areas. In fact, you might even experience ridership gains and improved customer-service support resulting from better route information availability to those consumers who plan trips online. GTFS has even been shown to increase productivity for those agencies using it. Facebook, Twitter, and blogs can help your agency better communicate with consumers via easier sharing of detailed route and schedule information and by providing timely updates when service changes or disruptions occur.

Adopting one service vehicle helps agencies save dollars by standardizing parts and lowering cost repairs through mechanics' greater familiarity with the one vehicle model. Consider developing a regional maintenance facility or outsourcing your maintenance to another agency with the capacity to meet your needs.

Think about adapting your service design as the multimodal landscape changes. For example, cyclists are beginning to use transit to commute long distances, but only if they can securely store their bikes at the bus's origination point. To be successful in the future, your agency must adapt to meet consumer preferences as they take advantage of a wider variety of transportation modes (e.g., walking and biking).

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Chapter Footnotes

[1]The Texas Statewide Long-Range Transportation Plan for 2035 (The Texas Department of Transportation 2010) indicates an "anticipated public transportation capital investment" (SPCI) for rural and small-urban transit systems as 5% of total SPCI between 2006 and 2035. During the same period, they project a total increase of 14.7% in available operating funds for these service areas. During a similar period, (2006–2040), the Texas Data Center projects that Texans 65 or older will double to 18% of total population. Rural and small urban transit service providers will be serving an increasingly transit dependent population who will occupy over 75% of the total land area with a disproportionate portion of available funding to serve their riders.

[2] The information presented in this chapter was obtained two ways:

- A fact-finding exercise with individual rural- and small-urban transit service providers in Texas.
- A roundtable fact-finding exercise with members of the Federal Transit Administration (FTA) Region 6 rural- and small-urban service providers (conducted at the Community Transportation Association of America's 2012 Expo).

The authors selected rural- and urban-service providers to offer a representative balance between both service types, while affording examples of service providers in close proximity to growing urban areas. Questions were framed to address three specific cost-saving approach sub-categories identified in the literature review. The authors sought to understand innovative transit agency practices and link them back to examples identified in the literature review and previous research.

[3] The proliferation of mobile phones, smart phones, and access to the internet has resulted in a high reliance on these devices for basic and personalized communications. Their increased use and access by the general public; and the computerized integration of basic route and schedule information by most rural and small urban transit providers make real-time route and schedule technology (Schweiger 2011) and social media (Bregman 2012) the next logical platform to disseminate this information.

[4] The LCRA operates a telecommunications network that supports public safety and community development functions across their service territory. They provide 900MHz and 700MHz radio service on a non-profit, cost-shared basis, providing reliable telecommunication services to CARTS, Capital Metro, and other community service organizations throughout Central Texas.

[5] Coordination was identified as an operational initiative after the 78th Session of the Texas Legislature. HB 3588, Article 13 mandated the coordination of public transportation and tasked TxDOT with identifying inefficiencies in public transportation services. However, this State mandate had been locally and regionally applied by many public transit service providers in advance of the legal requirement as an economical means to connect trips often separated by high-miles and low-density.

[6] Flexible-route segments were identified in *TCRP Synthesis 53* as one of the operational alternatives that allow transit providers to deviate to unspecified locations within short portions of each route. CARTS was identified in *TCRP Synthesis 94* as providing a similar service model. Their service, (referred to as fixed-schedule), did not indicate service was developed to a transfer point, but to shared destinations. Both models allow rural providers to develop more efficient service to low-density service areas and provide for the ability to transfer to other service providers.

[7]Existing research did not help the authors much in developing fact-finding questions for our rural and urban-transit respondents. Specifically, determining optimum fleet size focused on paratransit service and was highly analytical while providing few concrete observations or solutions of use to existing service providers. Earlier research (Fu and Ishkhanov 2004) determined 103 vehicles were required for an optimum fleet mix; however, only two rural or small-urban Texas operators have fleets this large. Fu and Ishkhanov also indicated that factors other than service efficiency figure into the appropriate fleet mix.

[8] Route deviation is a scheduled route corridor with scheduled stops that allow time for deviations throughout the route; usually designed to comply with ADA by providing a lower cost service alternative to fixed-route service with complementary paratransit service.

PART 3

Tools and Resources

Chapter 9.
Allocating Costs by Service Type

Allocating costs by service type can help you:

- Price services.
- Make informed future service-change decisions.
- Understand current cost drivers.
- Communicate needs for potential grant funding and sponsorship.

You can determine cost allocation across service types in a number of ways. Traditionally, determining costs for differing trip types is based on a boardings-based allocation—that is, allocating costs by number of boardings by trip type. However, this methodology does not account for trip lengths and times, which can differ across trip types and result in differing costs across trip types.

Passenger miles and hours describe how far/long *consumers* ride in the vehicle. Vehicle miles and hours measure how far/long the *vehicle* operates.

For example, a trip that is 5 miles long will differ significantly cost-wise compared to a 50-mile trip. For urban areas where trips are relatively the same average distances, trip costs can differ significantly. For rural areas serving large territories where trip lengths vary greatly, cost differences can vary just as greatly.

Vehicle miles/hours measure far/long the *vehicle* operates. If your agency operates fixed-route or dedicated services (i.e., one type of consumer service per vehicle), then allocate costs by vehicle miles/hours. In

most demand-response services, vehicles serve consumers sponsored by a variety of funding sources. Passenger miles/hours measure how far/long consumers ride in the vehicle. Use *passenger miles and hours* to allocate costs for shared-ride demand-response services.

Fixed-Route and Dedicated-Service Cost Allocation

For fixed-route and dedicated-services, allocate costs by vehicle service miles/hours. Determine vehicle service miles/hours by totaling (for each bus in service) the miles and hours from the garage pull-out to the garage pull-in. Once the vehicle miles/hours are determined by service type, you can allocate costs. Both the miles-driven costs and hours-driven costs are *variable* costs.

Allocate *miles-driven costs* (e.g., fuel, tires, and maintenance cost) based on the proportion of vehicle miles (see Table 9-1).

Allocate *hours-driven costs* (operating cost less fuel/tire cost) based on the proportion of vehicles hours (see Table 9-2).

Table 9-1. Miles-Driven Cost Allocation.

Service Types	Vehicle Miles	% Vehicle Miles	Miles-Driven Costs (maintenance, fuel and tires)
Total	**900,000**	**100.0%**	**$500,000**
Commuter Route	108,000	12.0%	$60,000
School Route	108,000	12.0%	$60,000
Local Routes	684,000	76.0%	$380,000

Table 9-2. Hours-Driven Cost Allocation.

Service Types	Vehicle Miles	% Vehicle Miles	Hours-Driven Costs (Operating less fuel/tires cost)
Total	**900,000**	**100.0%**	**$500,000**
Commuter Route	108,000	12.0%	$60,000
School Route	108,000	12.0%	$60,000
Local Routes	684,000	76.0%	$380,000

To determine the total cost for each service (Table 9-3), apply the fixed-cost overhead multiplier to the variable costs (see Chapter 2 for more details).

The overhead multiplier rate is the fixed costs (administration, building maintenance) divided by total variable cost. The overhead multiplier rate allocates a percent of the overhead to each service type.

Table 9-4 illustrates fixed route and dedicated service cost allocation.

Table 9-3. Determining Total Cost per Service.

Service Types	Miles-Driven Cost (Maintenance & Fuel/Tires)	Hours-Driven Costs (Operating less fuel/ tires)	Total Variable Cost (A)	Fixed Costs (Admin. & Building Maint.) (B)	Overhead Multiplier Rate (B / A)	Operating Costs
Total	**$500,000**	**$1,000,000**	**$1,500,000**	**$250,000**	**116.67%**	**$1,750,000**
Commuter Route	$60,000	$60,000	$120,000		116.67%	$140,000
School Route	$60,000	$120,000	$180,000		116.67%	$210,000
Local Routes	$380,000	$820,000	$1,200,000		116.67%	$1,400,000

Table 9-4. Example Fixed/Dedicated Service Cost Allocation.

	Vehicle Miles/Cost			Vehicle Hours/Cost			Total Operating Cost (Variable + Fixed)			
Trip Type	Vehicle Miles	% Vehicle Miles	Miles-Driven Cost (Maintenance & Fuel/Tires)	Vehicle Hours	% Vehicle Hours	Hours-Driven Costs (Operating less fuel/ tires)	Total Variable Cost (A)	Fixed Costs (Admin. & Building Maint.) (B)	Overhead Multiplier Rate (B / A)	Operating Costs
Total	**900,000**	**100.0%**	**$500,000**	**50,000**	**100.0%**	**$1,000,000**	**$1,500,000**	**$250,000**	**116.67%**	**$1,750,000**
Commuter Route	108,000	12.0%	$60,000	3,000	6.0%	$60,000	$120,000		116.67%	$140,000
School Route	108,000	12.0%	$60,000	6,000	12.0%	$120,000	$180,000		116.67%	$210,000
Local Routes	684,000	76.0%	$380,000	41,000	82.0%	$820,000	$1,200,000		116.67%	$1,400,000

Resulting Cost per Consumer Boarding by Route	Consumer Boardings	Allocated Operating Cost	Operating Cost per Consumer Boarding
Total	**175,000**	**$1,750,000**	**$10.00**
Commuter Route	10,000	$140,000	$14.00
School Route	25,000	$210,000	$8.40
Local Routes	140,000	$1,400,000	$10.00

Demand-Response Shared-Ride Service Cost Allocation

In most demand-response services, vehicles serve consumers typically sponsored by a variety of funding sources. The co-mingling of consumers complicates determining the cost of service by type in a shared-ride demand-response service.

Passenger miles/hours describe how far/long *consumers* ride in the vehicle. (Understanding the difference between these values and using them in specific calculations can help you determine different aspects of your operational costs.) Thus, passenger miles/hours per boarding provide the average trip distance *each consumer* traveled on average. This service-based cost-allocation model apportions costs based on the proportion of miles and hours by trip type.

The authors developed a cost-allocation methodology using passenger miles/hours to account for the differences in resources used by trip type. Table 9-5 shows the methodology's steps.

Table 9-5. Methodology to Account for Differences in Resources Used by Demand-Response Trip Types.

Step	Description
1	Take a sample of driver manifests to calculate passenger miles/hours by trip type. (This allows you to determine costs by trip type across the shared-ride service.)
2	Allocate miles-driven costs (e.g., fuel, tires, and maintenance) based on the proportion of passenger miles.
3	Allocate hours-driven costs (operating cost less fuel cost) based on the proportion of passenger hours.
4	Apply the fixed-cost overhead multiplier to the variable costs to determine the total cost of the service.

STEP 1. Passenger Miles/Hours Are the Sum Total of Miles/Hours *All* Consumers Travel

Calculating Passenger Miles

Table 9-6 shows sample calculations of passenger miles. The equation is

Total passenger miles = passenger boardings × trip miles

Table 9-6. Sample Calculations of Passenger Miles.

Passenger Boardings (A)	Start Odometer	End Odometer	Trip Miles (B)	Passenger Miles (A x B = C)	Trip Type
4	40,785	40,787	2.00	8.00	General Public
1	40,961	40,963	2.00	2.00	Gold Card
2	59,722	59,733	11.00	22.00	Gold Card
1	42,282	42,289	7.00	7.00	General Public
1	47,649	47,654	5.00	5.00	General Public
1	68,467	68,492	25.00	25.00	Medicaid

STEP 2. Once the Passenger Miles Are Determined by Service Type, Allocate *Miles-Driven Costs* (e.g., Fuel, Tires, and Maintenance Cost) Based on the Proportion of Passenger Miles (see Table 9-7)

Table 9-7. Miles-Driven Cost Allocation.

Service Types	Passenger Miles	% Passenger Miles	Miles-Driven Costs (maintenance, fuel, and tires)
Total	**625,000**	**100.0%**	**$400,000**
General Public	350,000	56.0%	$224,000
Senior Discount	25,000	4.0%	$16,000
Medicaid	250,000	40.0%	$160,000

STEP 3. Once the Passenger Hours Are Determined by Service Type, Allocate *Hours-Driven Costs* (Operating Cost Less Fuel/Tire Cost) Based on the Proportion of Passenger Hours (see Table 9-8)

Table 9-8. Hours-Driven Cost Allocation.

Service Types	Passenger Miles	% Passenger Miles	Hours-Driven Costs (Operating less fuel/tires cost)
Total	**25,000**	**100.0%**	**$600,000**
General Public	15,000	60.0%	$360,000
Senior Discount	1,000	4.0%	$24,000
Medicaid	9,000	36.0%	$216,000

STEP 4. To Determine the Total Cost for Each Service, Apply the Fixed-Cost Overhead Multiplier (See Chapter 2) to the Variable Costs. The Overhead Multiplier Rate Is the Fixed Costs (Administration, Building Maintenance) Divided by Total Variable Cost. The Overhead Multiplier Rate Allocates a Percent of the *Overhead* to Each Service Type (see Table 9-9).

Table 9-9. Total Cost per Service Calculation.

Service Types	Miles-Driven Cost (Maintenance & Fuel/Tires)	Hours-Driven Costs (Operating less fuel/ tires)	Total Variable Cost (A)	Fixed Costs (Admin. & Building Maint.) (B)	Overhead Multiplier Rate (B / A)	Operating Costs
Total	**$400,000**	**$600,000**	**$1,000,000**	**$150,000**	**116.67%**	**$1,166,700**
General Public	$224,000	$360,000	$584,000		116.67%	$681,353
Senior Discount	$16,000	$24,000	$40,000		116.67%	$46,668
Medicaid	$160,000	$216,000	$376,000		116.67%	$438,679

Table 9-10 illustrates demand-response shared-ride service cost allocation.

Table 9-10. Demand Response Shared Ride Cost Allocation.

Trip Type	Consumer Miles/ Cost			Consumer Hours/ Cost			Total Operating Cost (Variable + Fixed)			
	Passenger Miles	% Passenger Miles	Miles-Driven Cost (Maintenance & Fuel/Tires)	Passenger Hours	% Passenger Hours	Hours-Driven Costs (Operating less fuel/ tires)	Total Variable Cost	Fixed Costs (Admin.)	Overhead Multiplier Rate	Operating Costs
System-Wide Total	**625,000**	**100.0%**	**$400,000**	**25,000**	**100.0%**	**$600,000**	**$1,000,000**	**$150,000**	**116.67%**	**$1,166,700**
General Public	350,000	56.0%	$224,000	15,000	60.0%	$360,000	$584,000		116.67%	$681,353
Senior Discount	25,000	4.0%	$16,000	1,000	4.0%	$24,000	$40,000		116.67%	$46,668
Medicaid	250,000	40.0%	$160,000	9,000	36.0%	$216,000	$376,000		116.67%	$438,679

Resulting Cost per Consumer Boarding by Service Type	Consumer Boardings	Allocated Operating Cost	Operating Cost per Consumer Boarding
Total	**118,500**	**$1,166,700**	**$9.85**
General Public	85,000	$681,353	$8.02
Senior Discount	11,500	$46,668	$4.06
Medicaid	22,000	$438,679	$19.94

Cost Allocation Uses and Analysis

Service Analysis

Table 9-11 shows the percentage of passenger boardings by service type for different transit services. Also shown are the total cost by service type and the cost-per-passenger boarding for each service type.

Because costs are allocated based on hours/miles of service, the proportion of costs can differ from the proportion of consumer boardings. For example, Medicaid represents 7 percent of consumer boardings but 15 percent of costs. The higher proportion of cost is reflective of more resources used in terms of service hours/miles.

Service Pricing

You can price services by using the unit cost measures. Understand that the allocated costs shown in Table 9-11 only include operating costs; they do not include the fair share of capital cost associated with providing services (e.g., vehicle capital costs). To price at the full-cost of providing the service, include vehicle capital costs in pricing.

Table 9-11. Sample Comparison of Costs by Service Type.

Trip Type	Passenger Boardings	% of Passenger Boardings	Total Operating Cost	% of Total Operating Cost	Operating Cost per Passenger Boarding
Total	293,500	100%	$2,916,700	100%	$9.94
Fixed Route/ Dedicated:					
Commuter Route	10,000	3%	$140,000	5%	$14.00
School Route	25,000	9%	$210,000	7%	$8.40
Local Routes	140,000	48%	$1,400,000	48%	$10.00
Demand Response:					
General Public	85,000	29%	$681,353	23%	$8.02
Senior Discount	11,500	4%	$46,668	2%	$4.06
Medicaid	22,000	7%	$438,679	15%	$19.94

Estimating the Full Cost of Services

Add capital costs to estimate the full cost of service. To add the vehicle cost into the price, use the vehicle cost per mile of service value. Table 9-12 provides an estimated vehicle cost per mile for different vehicle types.

Table 9-12. Example Capital Vehicle Cost Allocation.

Vehicle Type	Cost	Vehicle Life Miles	Per Vehicle Mile
Cutaway Van	$65,000	150,000	$0.43
Small Bus	$125,000	200,000	$0.63
Mid-Sized Bus	$225,000	350,000	$0.64

Estimating Vehicle Cost per Mile (Different Vehicle Types)

Table 9-12 shows sample estimates of vehicle costs per mile across vehicle types. The equation is

Vehicle cost per mile = total vehicle cost / expected life vehicle miles

Cutaway van vehicle cost per mile = $65,000 / 150,000 = $0.43 per mile

Add the vehicle capital cost to the service cost if you want to recoup the expense for using the vehicle as part of your cost allocation analysis.

Vehicle cost additive = vehicle cost per mile × annual vehicle miles

Cutaway van vehicle cost additive = $0.43 × 125,000 = $53,750

Example Service Pricing

For example, we want to determine a fair price for operating commuter bus services.

To estimate the full-cost pricing of the commuter service, we want to include the vehicle capital cost.

Estimating Annual Capital Cost of Commuter Service (Mid-sized Bus)

Using the cost-per-vehicle mile value from Table 9-12 and assuming the average annual vehicle miles are 108,000:

Step 1. Estimate Annual Vehicle Cost (without capital costs)

Annual vehicle cost = annual vehicle miles × vehicle cost per mile

Annual vehicle cost = 108,000 × $0.63 = $68,040

Assuming the annual operating cost is $140,000:

Step 2. Estimate Total Annual Cost (Capital Costs Included)

Total annual cost = Annual operating cost + Annual vehicle cost

Total annual cost = $140,000 + $68,040 = $208,040

You might want to determine the price on a per-boarding basis.

Determining the Price on a Per-Boarding Basis (Mid-sized Bus)

Assuming the total annual cost for using the vehicle is $208,040 (from our previous example) and the annual # of passenger boardings is 10,000:

Per-Boarding basis price = total annual cost / annual # of passenger boardings

Per-Boarding basis price = $208,040 / 10,000 =
$20.80 per passenger boarding

Allocation of Costs by Area Served

To determine quantity and cost of service provided in areas served (such as counties, cities, urban area), use the cost-allocation model to estimate costs based on services within the areas. You might receive funds to serve both urbanized and rural areas, so knowing how your resources are spent in each area can help you budget more accurately based on services offered. Use the cost-allocation model to determine costs indexed to consumer boarding origins or destinations.

Urban vs. Rural-Area Cost Allocation

Determine urban/rural trip designations using the consumer's origin or destination as the indicator. How you decide to classify a trip as urban or rural is up to you; the key is to use your classification system consistently.

The example below classifies trips as urban or rural based on the originating trip's (not the return trip's) destination. For example, if a consumer traveled in the morning into an urban area for work from his or her home in a rural area, then returned home in the evening, we would classify both legs of the trip as *urban*. The trips are classified as urban because the originating trip's *destination* is an urban area.

How you decide to classify a trip as urban or rural is up to you; the key is to use your classification system consistently.

To classify consumer trips as urban or rural, use a sample driver manifest to determine the number of passenger boardings, passenger miles, and passenger hours for those trips with destinations into the urban area. Table 9-13 shows an example of manifest data collected by drivers and the designation of each trip based on original trip destination.

Calculating Passenger Miles

Table 9-7 shows sample calculations of passenger miles. The equation is

Total passenger miles = passenger boardings × trip miles

Table 9-13 provides the sample summary of results.

Using the consumer miles and consumer hours based allocation model previously described, you can estimate rural and urban costs. Table 9-14 provides the urban and rural cost allocation for the example.

Table 9-13. Example Summary of Urban and Rural Results.

				Average Trip Lengths	
Sample Manifest	**Passenger Boardings**	**Passenger Miles**	**Passenger Hours**	**Miles**	**Hours (Minutes)**
Total	118,500	**625,000**	**25,000**	5	.21 (13 min)
Urban	29,625	293,750	10,500	10	.35 (21 min.)
Rural	88,875	331,250	14,500	4	.16 (10 min.)
Urban	25%	47%	42%		
Rural	75%	53%	58%		

Table 9-14. Example Urban and Rural Cost Allocation.

	Consumer Miles/Cost			Consumer Hours/Cost			Total Operating Cost (Variable + Fixed)			
Trip Type	Consumer Miles	% Consumer Miles	Miles-Driven Cost (Maintenance & Fuel/Tires)	Consumer Hours	% Consumer Hours	Hours-Driven Costs (Operating less fuel/ tires)	Total Variable Cost	Fixed Costs (Admin.)	Overhead Multiplier Rate	Operating Costs
Total	**625,000**	**100.0%**	**$400,000**	**25,000**	**100.0%**	**$600,000**	**$1,000,000**	**$150,000**	**116.67%**	**$1,166,700**
Urban	293,750	47.0%	$188,000	10,500	42.0%	$252,000	$440,000		116.67%	$513,348
Rural	331,250	53.0%	$212,000	14,500	58.0%	$348,000	$560,000		116.67%	$653,352

Resulting Cost per Consumer Boarding by Service Type	Consumer Boardings	Allocated Operating Cost	Operating Cost per Consumer Boarding
Total	**118,500**	**$1,166,700**	**$9.85**
Urban	29,625	$513,348	$17.43
Rural	88,875	$653,352	$7.35

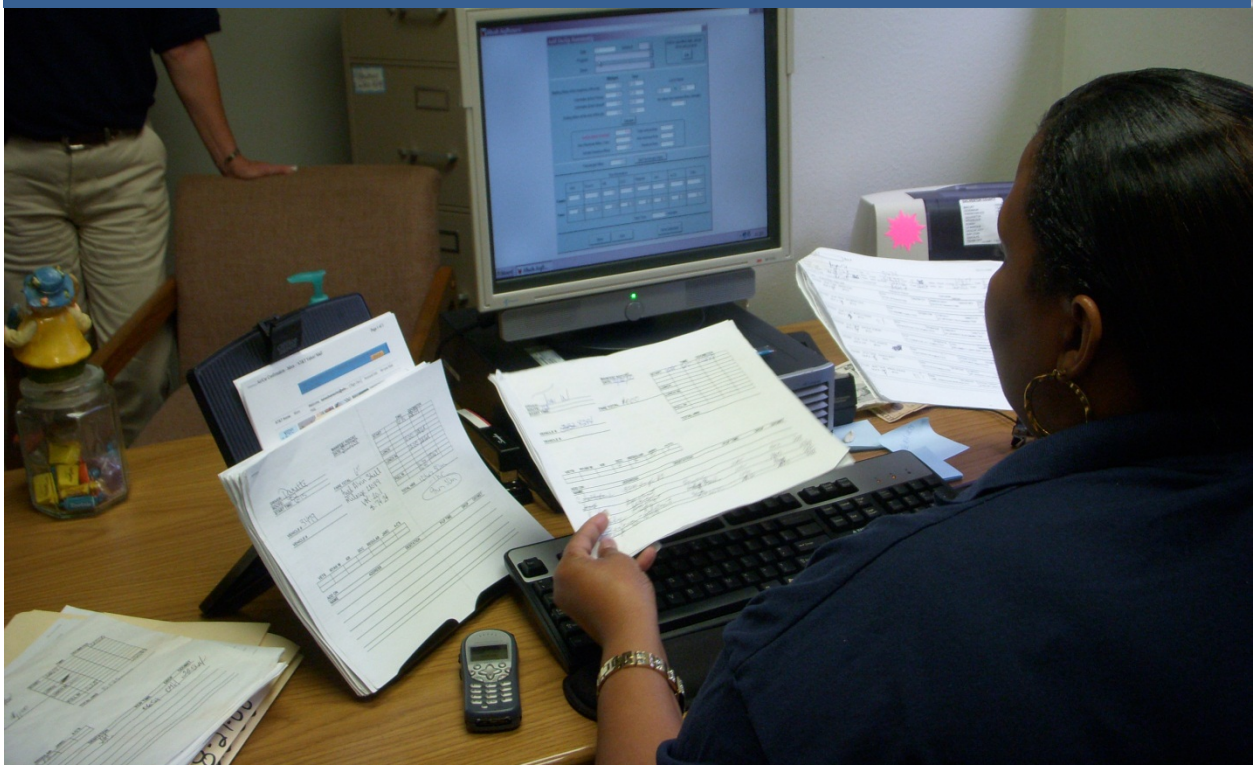
Chapter 9: What to Remember

Allocating costs by service type can help you equitably price services, make informed decisions about how to adapt future services, and better understand current cost drivers.

For fixed-route and dedicated services, allocate costs by *vehicle miles or hours* to capture how much it costs you to service those routes. In many shared-ride demand-response services, consumers are typically sponsored by a variety of funding sources, which makes it complicated to determine costs by type. To account for the various resources used by trip type, use the *passenger miles or hours* methodology in this chapter to allocate costs for these services.

To determine quantity and cost of service provided in areas served (such as counties, cities, or an urban area), use the cost-allocation model to estimate costs based on services within the areas. Knowing how you're spending resources per area type can help you better manage funding (allocation and needs) in the future. When pricing services using the methodology shown in this chapter, consider including vehicle capital costs in pricing to determine the *full cost* of providing a given service.

Chapter 10.
Leveraging What You Know



State-funded urban- and rural-transit agencies in Texas possess a wealth of information at their fingertips, and they might not even know it. A few examples of this valuable information include manifest data, fare revenue data, and staff expertise. Of course, the amount and type of information available varies among agencies.

This chapter seeks to help transit managers leverage existing information and data to help them make better decisions for their agencies. Review the material in this chapter while considering your agency's unique situation and needs. The authors hope the examples and discussion can help you think outside the box to create innovative, beneficial solutions for your agency.

Knowing What You Do, What You Don't, and What You *Should* Know

Every transit manager applies different professional experience and know-how in his or her work. Agencies participate in different planning processes, interact with different stakeholders, and have similar but unique training programs. Still, very generally speaking, all transit agencies have the same basic goal in serving their consumers: to provide quality, reliable transit services at a reasonable price.

If as the old axiom states "knowledge is power," then better understanding your agency can empower you to better manage its resources, reduce its costs, and serve its consumers better, faster, and smarter.

One of the first steps on the journey to leveraging your agency's information and human resources to their fullest extent is to *know what you know*. Figure 10-1 depicts what is commonly called the Conscious Competence Learning Matrix. The matrix depicts one way to think about the learning process (*1*).

While we often start out in the lower-right quadrant—an area identified as unconscious incompetence—by identifying what we know, what we don't know, and what we *should* know, we inevitably migrate toward conscious competence. If as the old axiom states "knowledge is power," then better understanding your agency can empower you to better manage its resources, reduce its costs, and serve its consumers better, faster, and smarter.

Table 10-1 provides an additional explanation for each stage of the matrix, as well as a tip for transit manager's applying the matrix in their work. Whether they realize it or not, everyone frequently moves through the four stages in order to continue to learn and grow.

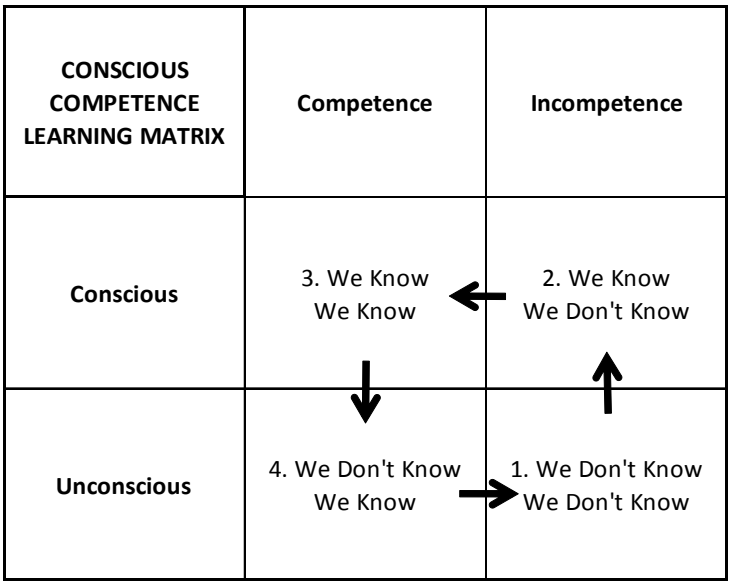


Figure 10-1. Conscious Competence Learning Matrix.

Table 10-1. Explaining the Conscious Competence Learning Matrix.*

Stage	Ignorance Level	Description	Manager's Tip
1	Unconscious Incompetence: *We Don't Know We Don't Know*	"At this level you are blissfully ignorant: You have a complete lack of knowledge and skills in the subject in question. On top of this, you are unaware of this lack of skill, and your confidence may therefore far exceed your abilities."	"As a manager, it's your job to encourage feedback to make people aware of their 'improvement opportunities' and kick start their learning and development journey."
2	Conscious Incompetence: *We Know We Don't Know*	"At this level you find that there are skills you need to learn, and you may be shocked to discover that there are others who are much more competent than you. As you realize that your ability is limited, your confidence drops. You go through an uncomfortable period as you learn these new skills when others are much more competent and successful than you are."	"Be aware of the confidence crisis the learner may be experiencing, and expedite the transition from stage 2 to stage 3."
3	Conscious Competence: *We Know We Know*	"At this level you acquire the new skills and knowledge. You put your learning into practice and you gain confidence in carrying out the tasks or jobs involved. You are aware of your new skills and work on refining them."	"It's useful to consolidate learning at this point, so consider teaching or presenting back to your team about your new-found skill."
4	Unconscious Competence: *We Don't Know We Know*	"At this level your new skills become habits, and you perform the task without conscious effort and with automatic ease. This is the peak of your confidence and ability."	"You can keep on top of your learning by creating your own personal development plan and regularly reviewing your progress."

* The authors adapted this table to the needs of transit agencies from two online sources. Stage 1-4 descriptions are from "The Conscious Competence Ladder" and the manager's tips and matrix design are derived from Lindsay Swinton's "Smooth Your Learning Journey with the Learning Matrix," both available at Mind Tools.com. http://www.mindtools.com/pages/article/newISS_96.htm.

Transit Agencies Are Information Rich

Transit agencies typically have one or more major types of information readily available (and several other potential sources close-at-hand). One source for easy access to this kind of data is the U.S. Census's Data Access Tools. Examples of the kind of information readily accessible from the government include:

- Internal transit information and analysis, like manifest data, transit survey data, and staff experience and knowledge.
- External transit information or sources, like stakeholders (e.g., educational institutions, economic development corporations), community plans and survey data, and population and demographic data.

This chapter would be a 100 pages long if we explored every aspect of every potential information source. To boil that knowledge down into something you can get started with fairly quickly, the next section presents sample information sources. Use these to begin thinking of information your own agency captures and how you can use it to improve agency performance and efficiency.

Resource

U.S. Census Data Access Tools
http://www.census.gov/main/www/access.html

Examples of Internal Transit Information and Analysis

Manifest Data

Manifest data are a transit agency's richest, most readily available source of information. In fact, most agencies use pieces of manifest data when reporting to other agencies and stakeholders. However, few agencies leverage the variety of information they regularly generate to the greatest extent possible.

You can use tables and charts about your services to help answer particular questions, yielding incredibly valuable benefits. The ease of manifest analysis depends largely on the condition of manifest records themselves.

Manifest data are a transit agency's richest, most readily available source of information.

Keeping Records Electronically

If you keep records electronically, leveraging the data for decision making is quite straightforward (especially after some practice). As mentioned elsewhere in this guidebook, many software programs used by transit agencies come with automatic reporting features that can help you easily and quickly identify trends in your manifest data. Your staff must ensure that records are accurate and learn how to either conduct analyses in the software itself or export data for analysis in a spreadsheet program like Microsoft Excel. **Note:** If you contract out

services for which you wish to analyze data, often third-party contractors can provide you with similar reports from their own software.

Keeping Records the Old-Fashioned Way

If you maintain records only in paper form, then more hands-on effort is necessary to turn the information into something useful. To expedite the process, you might choose to fill in a spreadsheet with only the pieces of information needed to answer a particular question. Or you might choose to digitize the entire manifest record for a sample period of time; if you do, the authors recommend sampling a week of days with routine transit services (i.e., do not include holidays, for example, since the data generated on these days will be atypical). **Note:** The kinds of information available from manifests will vary based on your agency's practices.

Example 1. Passenger Age

Use the age of passengers to determine reasonable expectations for fare collection. The most common type of discount fares are age related for either college students or persons aged 65 and over. Figure 10-2 shows the number of passengers served by Anytown Transit Agency (ATA) categorized by age group. What age-related questions does your agency face?

Example 2. Trip Purpose

Understanding why your passengers are going where they're going potentially enables you to better understand *them*. Knowing why people are taking their trips can also help you more effectively justify funding or particular service needs with stakeholders and sponsors. Figure 10-3 shows the various purposes of trips taken by ATA's passengers.

Example 3. Trip Origin/Destination

Knowing where passengers begin and end their trips is important for service coordination as well as evaluating how effectively your manifests are constructed. This information can also help you communicate funding needs and policies to stakeholders and sponsors. Figure 10-4 shows a map of where ATA's buses have provided services for a given period of time.

Note, for example, the cluster for vehicle #4 in the southern portion of the service area.

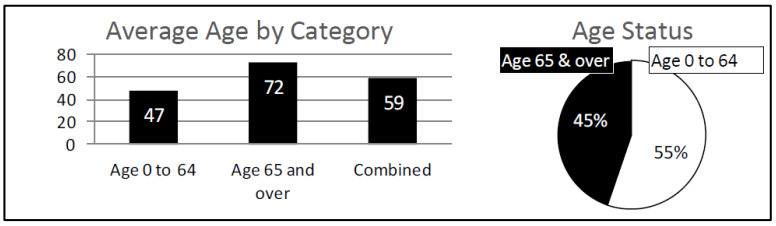


Figure 10-2. Anytown Transit Agency's Passengers, Categorized by Age Group.

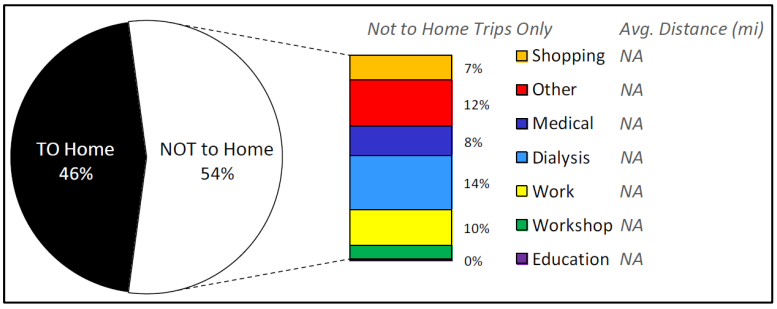


Figure 10-3. Anytown Transit Agency: Passenger Trip Purposes.

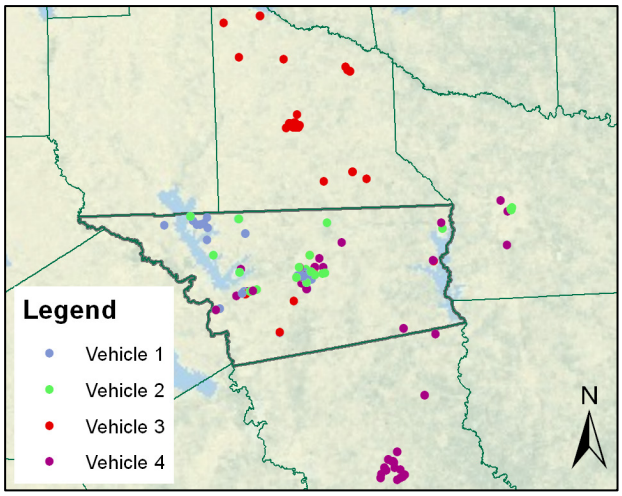


Figure 10-4. Anytown Transit Agency's Trips (by Vehicle).

Could analyzing the nature and frequency of these trips yield opportunities for improving efficiency and reducing slack time between trips? That is just one question that reviewing maps like these can help you answer.

Quickly creating maps of manifest data is perhaps the most challenging form of manifest analysis. However, free online tools are now making it much easier to create maps like the one in Figure 10-4. For example, if you have addresses in an Excel spreadsheet (an easy export format available in most transit software), Batchgeo's online tools enable you to copy and paste the addresses to *geocode* the addresses (i.e., map them) and view the results only seconds later.

Resource

Batchgeo
www.batchgeo.com

Example 4. Average Ride-Share (Slack Time Analysis)

Another complex but useful bit of manifest analysis involves slack time analysis. Identifying when and for how long a vehicle has experienced slack time allows you to identify opportunities for more service or cost reduction via route consolidation. (Refer to Chapter 3 of this guidebook for more information on reducing slack time.) Figure 10-5 shows an example for one of ATA's demand-response vehicle. Analyzing slack time for some or all of your own vehicle routes could help reduce your operating costs by making trips more efficient in terms of time, passengers served, and fuel spent.

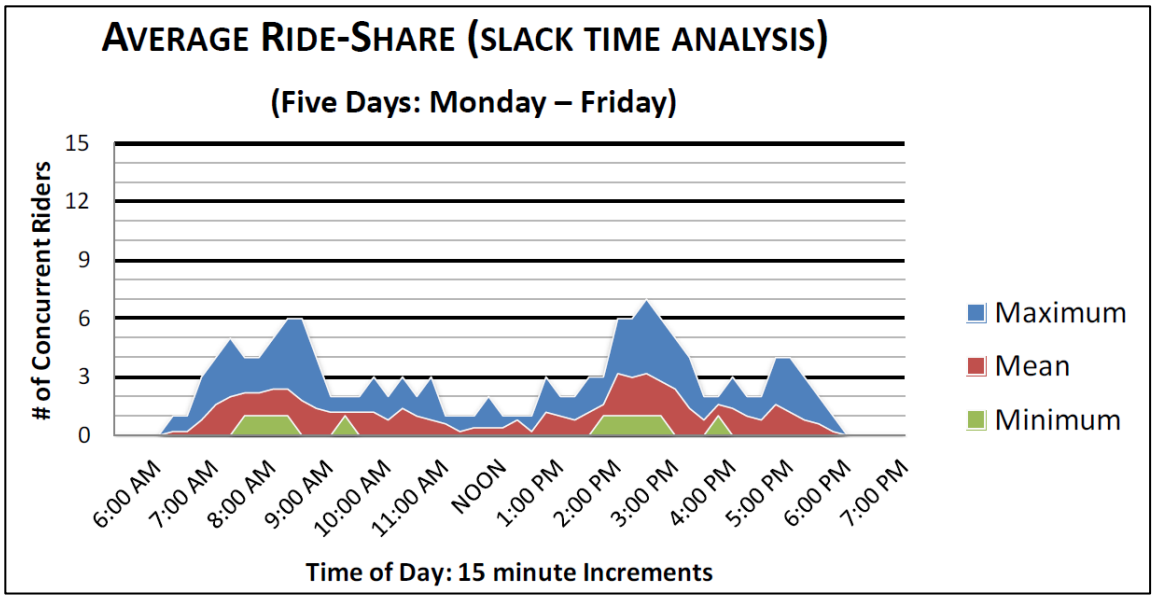


Figure 10-5. Analysis of Slack Time for ATA's Demand-Response Vehicle.

Example 5. Other Analysis: Ridership Characteristics, Productivity Measures

Sometimes all you need to begin to improve service is to look at the numbers. As described throughout this guidebook, you can readily combine manifest data in various ways to generate ridership statistics, productivity measures, or cost allocations. Figure 10-6 shows one vehicle's demand-response data for one week of operation by ATA. Likewise, by analyzing your own system's vehicles, you could review policies and procedures for areas of improvement.

WEEKLY RIDERSHIP

Number of Unlinked Trips:		105
Number of Unique Riders:		25
Average # of Trips per Rider:		4.2
Average Trip Length:	30 minutes	NA miles
Average Vehicle Speed:		NA mph

PRODUCTIVITY MEASURES

Passenger Trips per Vehicle Rev. Hour: 2.06
(Max 6.41, Min 0.69, Avg 1.68)
Passenger Trips per Vehicle Rev. Mile: 0.07
(Max 0.40, Min 0.04, Avg 0.08)

COST ALLOCATION (TRIP AVERAGE)

Cost based on Pass. Hours (2011 rate): $23.65
(Max $70.45, Min $7.62, Avg $29.05)
Cost based on Pass. Miles (2011 rate): $35.99
(Max $62.33, Min $6.28, Avg $30.60)

Figure 10-6. One Week's Operational Data for ATA's Demand-Response Vehicle.

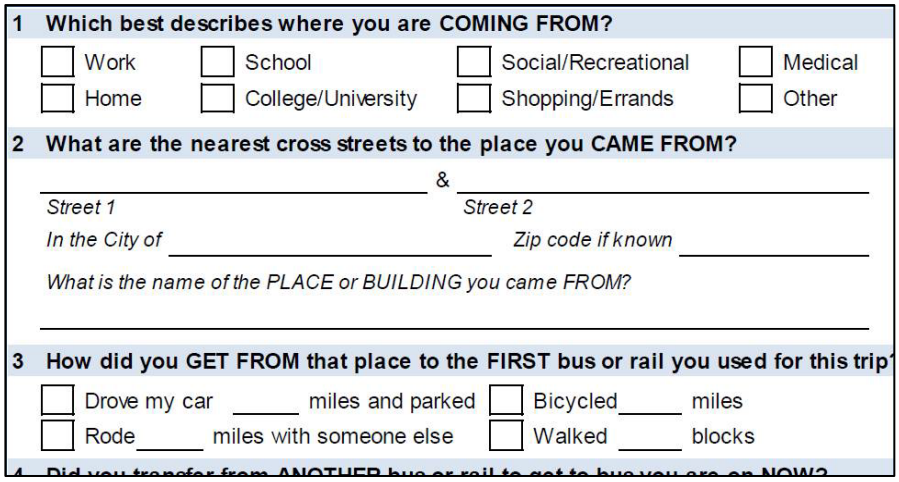
Transit Survey Data

Transit agencies use surveys to understand information about transit passengers, trip characteristics, travel patterns, and customer satisfaction. The types of questions and information garnered from survey efforts vary based on agency needs and types of services surveyed.

The size of a survey effort and how often it is conducted are typically determined by agency data needs, significant planned service changes, and existing dollars earmarked for transit planning and surveys. Rather than attempt to document every aspect of transit surveys, the authors suggest you leverage your existing survey data to answer current operating cost-related questions.

Figure 10-7 shows a partial sample of a transit survey conducted by ATA. (For complete example surveys, reach out to peers or contact the authors for reference materials and contacts.)

Transit agencies use surveys to understand information about transit passengers, trip characteristics, travel patterns, and customer satisfaction.



1 Which best describes where you are COMING FROM?

Work | School | Social/Recreational | Medical
Home | College/University | Shopping/Errands | Other

2 What are the nearest cross streets to the place you CAME FROM?

_____ & _____
Street 1 *Street 2*

In the City of _____ *Zip code if known* _____

What is the name of the PLACE or BUILDING you came FROM?

_____

3 How did you GET FROM that place to the FIRST bus or rail you used for this trip?

Drove my car _____ miles and parked | Bicycled _____ miles
Rode _____ miles with someone else | Walked _____ blocks

Figure 10-7. Sample Survey Form Used by Anytown Transit Agency.

Figures 10-8 and 10-9 show examples of transit survey results from ATA passengers. Questions ATA's transit manager might ask given the results:

- How can ATA use information about mode of access to plan for the future (e.g., think about installing bike racks on buses to encourage cyclists to use more transit)?
- How does the percent of riders needing a lift or ramp to access a vehicle impact both operating and capital costs?

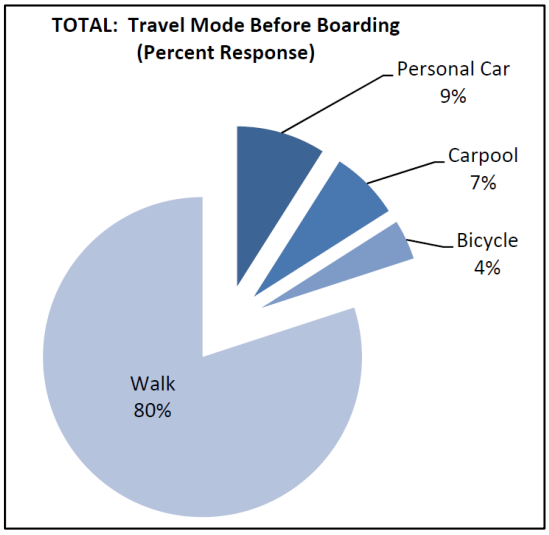


Figure 10-8. Sample Survey ATA Survey Data Regarding Pre-Boarding Travel Mode.

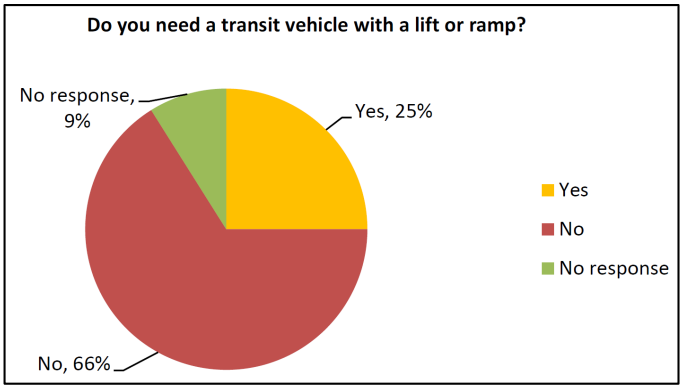


Figure 10-9. Sample Survey ATA Survey Data Regarding Special Needs Passengers.

Staff Experience and Knowledge

Do not be afraid to seek input from staff. Every transit-related job carries with it a differing perspective on operations. However, not all staff will have equal ability to objectively brainstorm and offer ideas. Prudent transit managers can quietly observe staff to assimilate much information, only seeking direct input when appropriate, in a non-threatening way, from staff that possess sincere interest in the organization and have the ability to think critically about transit operations.

Examples of External Transit Information and Analysis

Stakeholders (e.g., Educational Institutions, Economic Development Corp.)

Stakeholders have a vested interest in the success of your agency. Getting their input can provide valuable insight into how you can more effectively provide services.

Building positive working relationships based on trust with stakeholders benefits all involved.

Stakeholders bring a perspective to the table unique from your own. Stakeholders are beholden to their own consumers and often conduct surveys or fact-finding exercises to better serve those consumers. Some of those survey results might benefit your own agency.

Example

A workforce development provider learns from its constituency that greater access to transit would better motivate out-of-work individuals to seek employment. Knowing this information might help justify the opening of one or more transit routes within your district.

Economic development corporations (EDCs) are one stakeholder type common to many districts. EDCs stockpile information about employment in their respective jurisdictions. Figure 10-10 shows an example listing of employers in a region serviced by an EDC in Athens. Looking at that sample list, what potential sponsors for targeted transit services might exist in your service area?

Stakeholders have a vested interest in the success of your agency. Getting their input can provide valuable insight into how you can more effectively provide services.

More generally, what stakeholders have a vested interest in your agency? Reaching out to them can help you better understand the value of the services you provide and point up opportunities for expanding services to other consumers.

Major Employers

Employer	Industry	Number of Employees	Union Affiliation
Andrews Diversified	Assembly	48	None
Argon Medical	Medical Devices	310	None
Athens ISD	Education	525	None
Athens Park Homes	Modular Homes	119	None
Athens Steel Building	Steel Buildings	21	None
City of Athens	Government	121	None
Dallas Manufacturing	Pet Products	165	None
Dynamic Rubber	Rubber Bearing Pads	48	None
East Texas Medical Center	Healthcare	610	None

(Source: Athens TX Economic Development Corp., http://www.athenstexasedc.com/)

Figure 10-10. Sample Listing of Employers in Athens, Texas.

Community Plans and Survey Data

Community planning documents and survey data are other sources for information you might find useful. Planning efforts almost always include surveys or public outreach, which can yield valuable insights for your transit agency. How current the plans and survey results are for cities, counties, regions, and the state will vary. Given that this kind of information is public domain should mean it is readily accessible and free.

Population and Demographic Data

Public transit agencies and their stakeholders must understand service-area nuances. Population and demographic data are available for the entire United States and can help you develop a clearer picture of your own service area. Also, a transit agency making service changes can better understand stakeholders' needs by using available population and demographic data.

Resources

Decennial Census and American Community Survey
http://www.census.gov/

LEHD OnTheMap Analysis Tool
http://onthemap.ces.census.gov/

Decennial Census and American Community Survey

The two most common sources of population and demographic data—the Decennial Census (Census) and American Community Survey (ACS)—are both found on the U.S. Census Bureau's website. Census data are updated every 10 years and ACS is updated annually. The Census' website has user-friendly tools to view "quickfacts" about cities, counties, and states. Also, the website has "American FactFinder" for more detailed searches (e.g., percent of population in poverty by county in Texas). Figure 10-11 is a map created using ACS data and simple math to evaluate where need for transit may exist (i.e., based

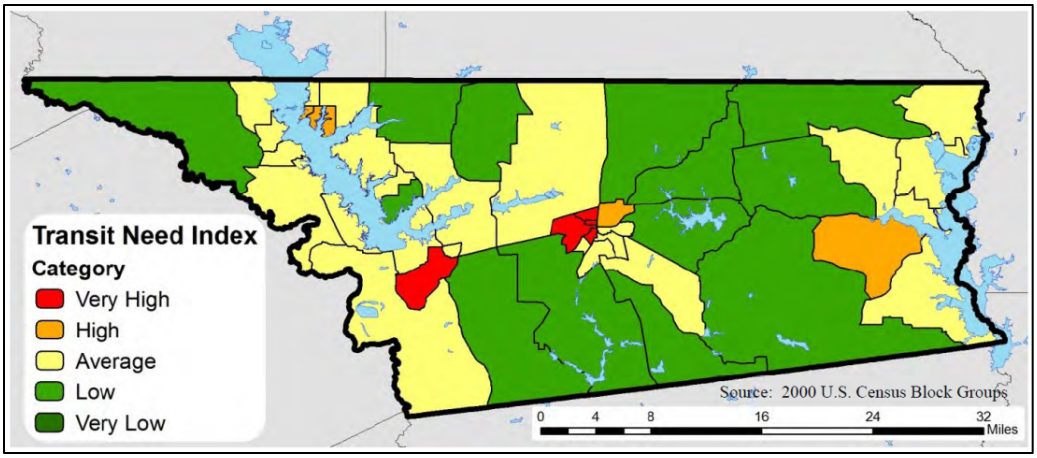


Figure 10-11. Demographic Data Used to Identify Transit Need

on where concentrations of populations exist with acute transportation needs, such as people with a disability, low-income individuals, or persons aged 65 and over).

Longitudinal Economic Household Dynamics (LEHD)

A relatively new and emerging source of data about the working population is LEHD data. Explaining LEHD data is a bit complicated—think of it as data synthesized from state employment records, IRS tax records, and other sources.

In geographic terms, LEHD can tell you about employment and travel from one census block to another. (A census block is basically a city block in an urban area and varies in size in a rural area.) Also, LEHD adds demographic information like income, race/ethnicity, age, educational attainment, earnings, and job sector regarding each work trip. Due to their complexity, LEHD data are difficult to manipulate manually in Excel or a database program. However, the Census created an online tool, called OnTheMap, to facilitate the public's use of the data for analysis.

Figure 10-12 shows a few of the capabilities of the OnTheMap tool. Please note that, while OnTheMap generated every chart, table, and map shown, the authors compiled them into the layout you see here. Looking at the information shown, how could your agency leverage OnTheMap's information?

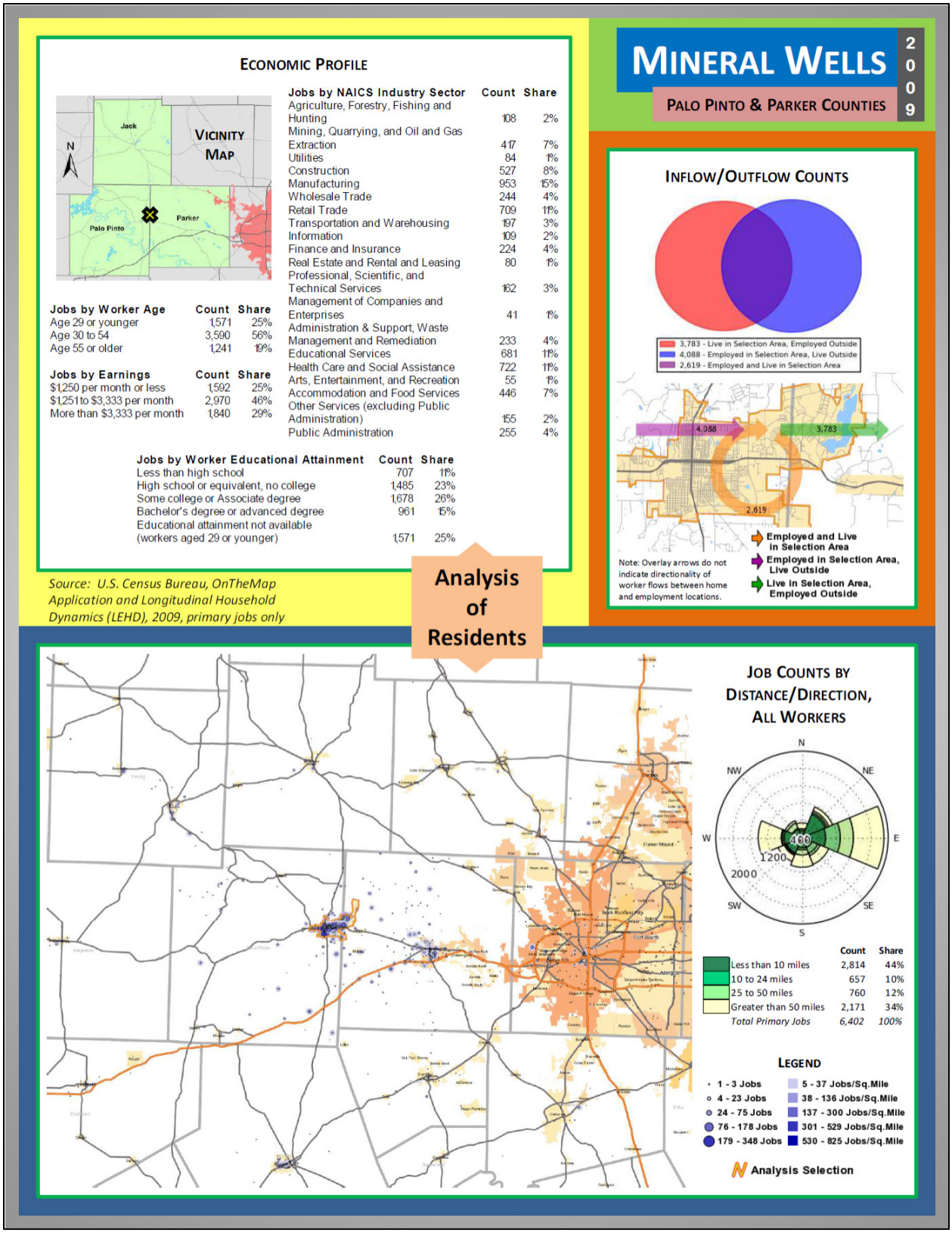


Figure 10-12. Compiled Information from OnTheMap.

Chapter 10: What to Remember

Though no one knows your agency as well as you do, the truth is, you might not know it as well as you think you do. Manifest data, public information sources, staff expertise, and customer and stakeholder input are all sources that can help you better understand—and, thereby, make better decisions for—your organization.

Use the Conscious Competence Learning Matrix to help you conceptualize how much (or how little) you know about your agency. Once you have a better idea of where your breaks in knowledge are, use available resources (e.g., U.S. census data, community planning documents, survey data) and manifest data to fill in the gaps.

Manifest data are a transit agency's richest, most readily available source of information. How easy it is to analyze depends largely on the condition of the records themselves. To facilitate analysis (and produce valid results based on reliable information), ensure record accuracy by encouraging good data capture practices by staff (e.g., drivers, dispatchers). Leverage software features to conduct analyses or export data for analysis to a spreadsheet program such as Microsoft Excel.

Populate tables and charts with manifest data about your services to visualize the state of your operation and help you identify areas needing improvement. Categories for analysis include passenger age, trip purpose, trip origin/destination, and average ride-share. Looking at the same data from multiple perspectives can help you not only identify areas for improvement, but also see where you're doing things right—these are the policies and procedures you'll want to replicate as you establish agency best practices. Surveying passengers, seeking input from staff, and soliciting feedback from stakeholders are all recommended for refining those best practices.

References

1. L. Swinton. Smooth Your Learning Journey with the Learning Matrix. http://www.mftrou.com/support-files/learning-matrix.pdf.

Chapter 11. Monitoring Costs: Peer Comparison and Benchmarking

> [Peer comparison] is an activity where an organization compares its performance to that of similar (peer) organizations. Benchmarking is the process of systematically seeking out best practices to emulate (*1*).

Peer comparison and benchmarking are tools to use in determining if your agency is performing most cost effectively. "Peers" are defined, in transit-agency terms, as agencies similar enough to your own that comparing operational performance yields results useful in improving your own operations.

Looking at peer operations provides a context in which to judge your own agency's performance. Are your costs for similar services out of line with peers? Have peer agencies figured a way to more efficiently manage resources than you? What lessons learned by peers can your agency benefit from knowing? All these questions are answerable by assessing peer operations and using your findings to establish performance benchmarks of your own. Specifically, you can use peer comparison and benchmarking to:

- Evaluate performance.
- Identify opportunities for improvement.
- Establish performance goals.
- Help guide expenditures and investments.

Once you've determined what best practices you can take away from that analysis to improve your own operation, you can then formulate strategies internally to implement those improvements. Setting reasonable goals for improvement and measuring your progress along the way are essential to

effectively implementing positive change. Tracking improvements can also be used to demonstrate to funding sources how cost effective their investment in your agency really is.

This chapter will assist transit managers with:

- Understanding fully the purpose and use of benchmarking.
- Understanding the difference between benchmarking and peer review.
- Gaining insight to ensure that benchmarking is in alignment with the agency's goals and objectives.

Benchmarking as a Tool

The purpose of benchmarking is to learn specifically how an industry peer achieved high performance in a given area. Benchmarking typically entails first identifying the industry's best transit agencies most similar to your own.

Which agencies you look at—and what specific operational areas you choose to gather data on—depend on what you want to improve. For example, you might want to evaluate if commuter routes are cost effective, so you would first identify peer agencies with highly cost-effective commuter routes, then determine what business processes employed by those agencies contribute to that success. There is no single established process for conducting benchmarking, but Figure 11-1 illustrates the approach generally followed.

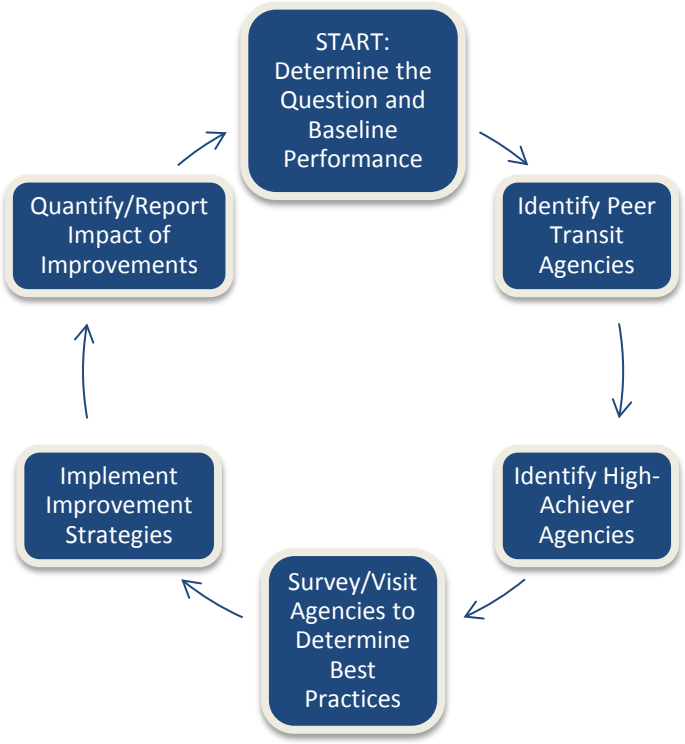


Figure 11-1. Typical Benchmarking Process.

Determining the Question and Baseline Performance

Questions can span all aspects of a transit agency's functions. They can be very detailed (such as how efficient the agency's wheelchair lift maintenance schedule is) or very broad (such as how cost effective the transit agency's operations are overall). Determining the right question to ask is the first step in developing an appropriate baseline of information to use later in creating your agency's performance measures for improvement.

Before identifying peers for comparison, gather current measurement data and create baseline values of potential performance measures. Although you might identify other measures for tracking performance during the benchmarking process, you can still use data you collected initially to develop other measures.

Example Measure for Study

You've determined your agency is spending 25 percent more on **wheelchair lift maintenance** than peers in similar agencies. An appropriate measure might be to look at the mean time between wheelchair lift failures at those sister agencies and compare them to your own wheelchair lift failure rate.

Selecting Performance Measures

Transit systems are complex. An enormous variety of statistics and myriad performance measures exist. Choosing the appropriate measurements based on what you want to evaluate is important. Examples of potential areas for evaluation include (*2*):

- Engaging a contract provider to ensure competitive performance.
- Determining what service mode is better for a new area.
- Evaluating whether or not a service reduction is necessary (while maintaining a number of options if implemented).
- Examining various expense categories as part of a budget-review process.
- Assessing the operational impact of a previous service or operational change.
- Documenting the operational impact of a service or its improvement as part of a funding arrangement.
- Convincing decision makers or funding sources that your agency is providing cost-effective transit services compared to industry peers.

Resources

TCRP Report 88: A Guidebook for Developing a Transit Performance-Measurement System
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_report_88/Guidebook.pdf

TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_124.pdf

TCRP Report 141: A Methodology for Performance Measurement and Peer Comparison in the Public Transportation Industry
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_141.pdf

TCRP Synthesis 56: Performance Based Measures in Transit Fund Allocation
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_56.pdf

A number of publications provide various performance measures for fixed-route and demand-response services.

TCRP Report 141 suggests identifying 6 to 10 outcome measures most applicable to the performance question, plus additional descriptive measures. *Outcome measures* indicate the performance achieved (e.g., ridership) given a set of inputs (e.g., revenue hours). *Descriptive measures* provide context and can be organized into five categories:

- Area characteristics.
- Transit service characteristics.
- Transit agency characteristics.
- Delivered service quality.
- Transit investment.

Descriptive measures are useful in understanding outcome measures and in selecting peer agencies.

Identifying Peers and High Achievers

Choosing which of your peers are most appropriate for comparison is one of the most difficult tasks in the benchmarking process. "Inappropriate peers may lead to incorrect conclusions or stakeholder refusal to accept a study's results" (*1*).

Example Selection of Peers

If the problem identified is the **cost of rural demand-response dispatch**, then appropriate peers would include transit agencies with similar demand-response markets and similar-size service area typology and demographics. Peers that operate urban ADA paratransit demand-response services would likely be inappropriate to identify best practices involving rural-demand response.

Selecting an appropriate peer group is also driven by the problem identified and the factors being compared for problem analysis. *TCRP Report 141* suggests selecting 8 to 10 transit agencies for peer grouping to provide "enough breadth to make meaningful comparisons without creating a burdensome data-collection or reporting effort."

To determine peer-agency performance, collect data from either available standardized data sources or requests for information. Some standardized general performance measures are available through the NTD and through the Texas Department of Transportation Public Transportation Division's PTN-128, the department's means for reporting the state's uniform public transit data.

For measures not available through standardized reporting, request data that includes the following (*1*):

- An explanation of how you plan to use the data and whether the peer agency's data and results can or will be kept confidential.
- A request for documenting how the peer agency defines the measures and, if appropriate, how the peer agency collects the data for the measures.

For each measure, compare performance to each peer agency's performance over a period of time to identify performance trends and avoid mislabeling an agency that performed well once as a high performer. If a peer's performance worsens over time, do not identify that agency as a high performer.

Resource

TxDOT's PTN 128
http://scopt.transportation.org/Documents/PTN-128%20Data-Elements%203-15-2010.pdf

Surveying and Visiting High-Performing Peers

After identifying peers that have scored high in terms of performance measures, you'll want to know how they did it. Interviews with peer agency staff can be beneficial in:

- Determining how performance was achieved.
- Identifying lessons learned and factors that might inhibit implementation or improvement.
- Providing a peer network to gain feedback and suggestions for future improvements.

Also, include your management, supervisory and operations staff in peer site visits and interviews to gain valuable insight from different perspectives. "Involving staff from multiple levels and functions within the transit agency helps increase the chances of identifying good practices or ideas, helps increase the potential for staff buy-in into any recommendations for change that are made as a result of the contacts, helps percolate the concept of continuous improvement throughout the transit agency, and helps provide opportunities for staff leadership and professional growth" (*1*).

Implementing Improvements

Studying your peers' successes and adapting them to your own needs is just the beginning. Implementing improvements requires a good strategy to improve your odds for effecting positive change within your agency. Your implementation strategy should include:

- Identifying what changes are needed and why.
- Setting realistic performance improvement goals and a timeline to reach them.
- Funding to support change implementation.
- Communicating clearly the benefits of proposed changes, as well as incremental improvements as they occur along your timeline to encourage continued support.

Clear communication is critical to encouraging staff buy-in. If your staff understands the benefits of proposed changes, they are much more likely to support the change initiative. Similarly, reporting improvements to stakeholders can yield dividends in the form of improved credibility through accountability and might even result in future funding increases.

Chapter 11: What to Remember

Determining the areas you want to improve is the first step in developing an appropriate baseline, or performance standard. That standard is what you'll ultimately compare your agency's performance to in order to demonstrate improvements over time.

Before identifying peers for comparison, gather current measurement data and create baseline values for potential performance measures. Areas you might want to improve include using a contractor for selected services, increasing or decreasing agency service levels, optimizing agency costs (e.g., fuel, labor), or getting the word out to potential or current funding sources. Once you've established areas for improvement, identify 6 to 10 outcome measures most relevant to the performance question, plus additional descriptive measures as you see fit. Use these measures to gauge progress as you implement change.

After identifying which agencies you wish to emulate, determine how they achieved their standards of excellence (a process known as *benchmarking*). To measure peer performance, collect data from either available standardized data sources (e.g., NTD, TxDOT's PTN-128) or via personal interviews. When interviewing peers, 1) ask them how they achieved their standard of performance excellence, 2) identify lessons learned and possible barrier to implementation, and 3) invite feedback on your own plans before implementing them. Include management, supervisory, and operational staff in peer site visits and

interviews to gain valuable insight from different perspectives.

Use the key strategies outlined in this chapter to successfully implement organizational change. Clear communication is critical to encouraging staff buy-in. If your staff understands the benefits of proposed changes, they are much more likely to support the change initiative. Similarly, reporting improvements to stakeholders can yield dividends in the form of improved credibility through accountability and might even result in future funding increases.

References

1. P. Ryus, K. Coffel, J. Parks, V. Perk, L. Cherrington, J. Arndt, Y. Nakanishi, and A. Gan. Report 141. *A Methodology for Performance Measurement and Peer Comparison in the Public Transportation Industry.* Transportation Research Board, Washington, D.C., 2010.

2. L. Radow and C. Winters. "Rural Transit Performance Management." http://www.ctaa.org/webmodules/webarticles/articlefiles/Rural_Transit_Performance_Measurement.pdf. Accessed August 30, 2012.

Appendix:
Sources by Cost Area

The Appendix comprises a matrix of sources for best practices organized by topic. These sources offer research evidence of the benefits of implementing cost containment strategies. In each case, titles are hyperlinks to the web-based document.

Table A-1. Matrix of Sources for Managing Transit Operations Costs.

Transit Operations Function	Sources for Cost Containment Strategies
Operations	
Operator wages and benefits (stability of staff)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 77: Managing Transit's Workforce in the New Millennium (TCRP Report 77, 2002) TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (TCRP Report 127, 2008)

Transit Operations Function	Sources for Cost Containment Strategies
Paid operator hours to revenue vehicle hour relationship (productive pay time relates to vacation, sick policies)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (TCRP Report 127, 2008)
Align operator shifts to meet service demand (peak to base ratio, split shifts, part-time/full-time mix)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
Other operations staff wages and benefits	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (TCRP Report 127, 2008)
Match reservationist staff shifts with call patterns and call demand	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)

Transit Operations Function	Sources for Cost Containment Strategies
Scheduling/Dispatch/Service Planning	
Skills in creating effective schedules (run-cut, manifest)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) Facilitating Creation of Transit System Technology User Groups (J. Arndt, 2011) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54) Creative Ways to Manage Paratransit Costs (Carapella, 2008)
Ability to impact operations in real-time (e.g., AVL, MDTs)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) Creative Ways to Manage Paratransit Costs (Carapella, 2008)
Skills in maximizing computer-aided scheduling and dispatching	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) Facilitating Creation of Transit System Technology User Groups (J. Arndt, 2011) Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (K. Palmer M. D., 2008) Impacts of Management Practices and Advanced Technologies on Demand Responsive Transit Systems (K. Palmer, 2004) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) Creative Ways to Manage Paratransit Costs (Carapella, 2008)

Transit Operations Function	Sources for Cost Containment Strategies
Matching revenue hours to demand	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
Reduce underutilized revenue hours through service span adjustments	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009)
Dwell time	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)

Transit Operations Function	Sources for Cost Containment Strategies
Deadhead time/miles	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
System speed	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
No shows and late cancels (demand response)	FTA Topic Guide 7: No-Shows in ADA Paratransit (Federal Transit Administration, 2010) TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (K. Palmer M. D., 2008) TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (TCRP Report 135, 2009) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54) Creative Ways to Manage Paratransit Costs (Carapella, 2008)

Transit Operations Function	Sources for Cost Containment Strategies
Vehicles and Vehicle Maintenance	
Vehicle type – fuel type, capacity, fuel efficiency, vehicle life	TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements (TCRP Report 146, 2011) TCRP Report 61: Analyzing the Costs of Operating Small Transit Vehicles (TCRP Report 61, 2000) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
Fuel cost	TCRP Report 156: Guidebook for Evaluating Fuel Purchasing Strategies for Public Transit Agencies (TCRP Report 156, 2012) TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements (TCRP Report 146, 2011) RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (RMC 0-6194, 2010) Rising Fuel Costs: Impacts on Transit Ridership and Agency Operations (American Public Transportation Association, 2008)
Vehicle condition and maintenance practices	Site Assessment Instrument for Regional Maintenance Center (M. G. Beruvides, 2010) TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements (TCRP Report 146, 2011) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54) TCRP Synthesis 54: Maintenance Productivity Practices (TCRP Synthesis 54, 2004)
Maintenance parts	Site Assessment Instrument for Regional Maintenance Center (M. G. Beruvides, 2010) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
Supplement difficult to service or peaks with non-dedicated service	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) Rising Fuel Costs: Impacts on Transit Ridership and Agency Operations (American Public Transportation Association, 2008)

Transit Operations Function	Sources for Cost Containment Strategies
Maintenance staffing wages and benefits	Site Assessment Instrument for Regional Maintenance Center (M. G. Beruvides, 2010) TCRP Synthesis 54: Maintenance Productivity Practices (TCRP Synthesis 54, 2004) TCRP Report 77: Managing Transit's Workforce in the New Millennium (TCRP Report 77, 2002)
Administration	
Staffing wages and benefits	TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 77: Managing Transit's Workforce in the New Millennium (TCRP Report 77, 2002) TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (TCRP Report 127, 2008)
Allocated central services	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 1 The Transportation Services Cost Sharing Toolkit (TCRP Report 144, 2011) TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 2 Research Report (TCRP Report 144, 2011)
Utilities	TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009)
Marketing and customer service	TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) TCRP Report 77: Managing Transit's Workforce in the New Millennium (TCRP Report 77, 2002)

Transit Operations Function	Sources for Cost Containment Strategies
Finance & Procurement (accounting, payroll, budget, purchasing)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 1 The Transportation Services Cost Sharing Toolkit (TCRP Report 144, 2011) TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 2 Research Report (TCRP Report 144, 2011)
Risk Management (claims, liability, safety planning)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)
General Activities (personnel, legal, insurance, IT, general management)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) TCRP Report 77: Managing Transit's Workforce in the New Millennium (TCRP Report 77, 2002) TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (TCRP Report 127, 2008) TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 1 The Transportation Services Cost Sharing Toolkit (TCRP Report 144, 2011) TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 2 Research Report (TCRP Report 144, 2011)
Purchased Transportation and Cooperative Agreements	
Use incentives/disincentives effectively	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (K. Palmer M. D., 2008) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54)

Transit Operations Function	Sources for Cost Containment Strategies
Consider alternative service delivery options as appropriate (e.g., partnerships with community agencies, same-day taxi, volunteer drivers/staff)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (RMC 0-6194, 2010) Creative Ways to Manage Paratransit Costs (Carapella, 2008)
Contracted service to private sector—types of contracts—market type, considerations in contract service requirements (management contracts, turn-key contracts, maintenance contracts, operations contracts)	TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (TCRP Report 124, 2008) Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (K. Palmer M. D., 2008) Impacts of Management Practices and Advanced Technologies on Demand Responsive Transit Systems (K. Palmer M. D., 2004) Effects of Contracting on Cost Efficiency in US Fixed-Route Bus Transit Service (Iseki, 2010) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) Special Report 258: Contracting for Bus and Demand-Responsive Transit Services: A Survey of U.S. Practice and Experience (Special Report 258, 2001) RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (RMC 0-6194, 2010) TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (TCRP Report 54) Creative Ways to Manage Paratransit Costs (Carapella, 2008)
Consider cooperative purchasing and contributed service	Economies of Scale in Bus Transit Service in the USA: How Does Cost Efficiency Vary by Agency Size and Level of Contracting (Iseki, 2008) Effects of Contracting on Cost Efficiency in US Fixed-Route Bus Transit Service (Iseki, 2010) TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (TCRP Report 136, 2009) Special Report 258: Contracting for Bus and Demand-Responsive Transit Services: A Survey of U.S. Practice and Experience (Special Report 258, 2001) RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (RMC 0-6194, 2010)