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16. Abstract

Rural and small urban transit providers across the United States face fiscal challenges caused by the growing gap between the cost of providing transit service and available federal, state, and local funding. In Texas, the fiscal challenges facing rural and small urban transit providers are compounded by an increasing population and growth in urbanization in some counties and declining population with increasing demand for transit service for an aging population in other counties. The research report examines the drivers of operating costs, approaches to containing costs, transit agency priorities for tools needed to better contain costs, and methodology used to develop the guidebook and workshop.

There are five primary documents produced in this research project: research report, guidebook entitled Managing Operating Costs for Rural and Small Urban Transportation Systems, workshop participant workbook, workshop instructor's guide, and a PowerPoint™ presentation to support the workshop.

Researchers found that transit agency staff indicated a priority need for guidance and training in the following topics: managing staff, maintenance and state of good repair, buying and managing fuel, contracting for service, minimizing no-shows, and innovations in technology and service design. Also, researchers found a need to provide information on fundamentals of reporting, allocating, and tracking costs. The resulting guidebook and corresponding workshop incorporates the findings of the research.

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# IDENTIFYING BEST PRACTICES FOR MANAGING OPERATING COSTS FOR RURAL AND SMALL URBAN TRANSPORTATION SYSTEMS: TECHNICAL REPORT

by

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# DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

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# CHAPTER 1. INTRODUCTION

Rural and small urban public transit is the lifeblood of millions of Americans living in areas with populations of fewer than 200,000. Transit will become even more important in these areas based on demographic trends indicating a growth in the number of people age 65 or older and individuals with disabilities, coupled with an expected decrease in population density in many rural areas. Rural and small urban transit providers face the growing challenge of providing increased demand to connect people with jobs, healthcare, affordable housing, fresh food, and education with limited resources.

Many rural and small urban transit service areas are faced with changes in the built-environment, demographic and economics of their communities served. The built-environment trend in many areas is a trend away from town centers to regionalized shopping, medical services, and employment centers, which challenges the effectiveness of transit service. Decreased density affects travel patterns and increases transportation costs. In rural and small urban areas, there is a larger share of the population that is age 65+, population has increased in scenic landscape areas such as lakes and park areas often located in rural/small urban areas, and the largest population increases are found in "fringe" communities on the outskirts of major metropolitan areas. Employment centers have changed in many communities where manufacturing plants have been relocated or centralized. Transit agencies must match the changing trends to the most cost effective service delivery—commuter service for fringe communities, shuttles for employment centers or recreation, demand response for healthcare trips for example.

Rural and small urban transit providers across the United States face fiscal challenges to serve transit demand caused by the growing gap between the cost of providing transit service and available federal, state, and local funding. Public transportation providers find it is increasingly important to maintain and grow current transit systems in order to meet the needs of the changing demographics. Many of the providers are struggling to balance service demand in a changing economic environment, facing limited funding, and needing to provide more service with fewer resources. Thus, it is critical for public transportation managers to manage operating costs.

## THE PROJECT

The stated objective of the research project was to develop a guidebook and corresponding workshop to better equip public transportation provider staff in understanding, managing, and predicting operating costs. Researchers produced five primary documents in this research project: research report, guidebook entitled *Managing Operating Costs for Rural and Small Urban Transportation Systems*, workshop participant workbook, workshop instructor's guide, and a PowerPoint™ presentation to support the workshop.

The approach for the research was to begin with the end objective in mind—developing a guidebook and workshop to manage operating costs for small urban and rural public transportation agencies. To meet the project objectives, the research team followed a defined plan, which included the following efforts:

- Conduct a review of the literature.
- Analyze factors that may impact operating costs—by line item, by functional area (operating, maintenance, administration, purchased transportation), and by transit agency organizational structure.
- Identify innovative technology and service delivery approaches to containing costs.
- Develop a matrix of resources for cost containment strategies by transit operations function.
- Identify transit agency priorities for cost containment topics to include in the guidebook.
- Develop six primary topics using actual transit agency examples providing information and tools to manage operating costs.
- Develop guidebook.
- Develop and conduct pilot workshop.

Researchers used the results of the research efforts to develop the guidebook and workshop. Researchers produced five primary outputs from this research project: research report, guidebook entitled *Managing Operating Costs for Rural and Small Urban Transportation Systems,* workshop participant workbook, workshop instructor's guide, and a PowerPoint™ presentation to support the workshop. Each of these documents or presentations is provided separately.

## ORGANIZATION OF THE RESEARCH REPORT

The organization of the research report follows the research efforts. This report consists of seven chapters. Chapter 1 is the introductory chapter. Chapter 2 through Chapter 7 provides the body of the report and follows the research efforts:

- Chapter 2 examines the drivers of rural and small urban transit agency operating costs.
- Chapter 3 examines how the service environment may impact operating costs and provides tools for assessing the environment to design cost effective services.
- Chapter 4 explores how technology, social media, service design, and fleet mix decisions can be used to contain operating costs.
- Chapter 5 provides a matrix of existing tools and resources by cost topic area that are available to help transit staff manage operating costs.
- Chapter 6 provides an overview of the methodology used to meet the project objective to develop a guidebook and pilot workshop.
- Chapter 7 of the report summarizes recommendations to support rural and small urban transit agencies in ongoing management of operating costs.

# CHAPTER 2. DRIVERS OF OPERATING COST

In order to better understand what drives transit agency operating costs, researchers analyzed operating costs summarizing costs by line item, by organizational structure, and by transit functional area.

## ANALYZING COSTS BY LINE ITEM

One method of analyzing costs is to summarize costs by line item. A line item is another word for object class in transit accounting and annual reporting. Line-item cost driver analysis organizes expenses so that discrepancies in expenditures by an agency are identifiable.

The chart of accounts is used as a baseline to analyze, budget, and compare costs to other transit agency peer groups. Table 1 illustrates a chart of accounts with line-item operating costs for an example transit agency using the Federal Transit Administration recommended Uniform System of Accounting (USOA) expense class categories. Line-item costs are categorized into major class categories such as labor, fringe benefits, and services. Ideally, the standardized chart of accounts should include these elements (*1*):

- Labor.
- Fringe benefits.
- Services.
- Materials and supplies.
- Utilities.
- Casualty and liability costs.
- Taxes.
- Purchases transportation.
- Miscellaneous expenses.
- Leases and rentals.
- Depreciation and amortization.

The proportion or percent of each line item can be calculated to identify where the largest and smallest proportion of the transit budget is spent. Evaluating current operating costs by line item and historical trends is helpful in explaining budgets to stakeholders and identifying where costs might be escalating or decreasing. Understanding the largest drivers of line-item operating costs is the first step in managing cost.

**Table 1. Example Chart of Accounts.**

| USOA Object Class Expenses | Total | % of Total |
|---|---|---|
| Total Operating Costs | $1,312,000 | 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% |

For example in RMC 0-6194, *Quantifying the Purchasing Power of Public Transportation in Texas,* expense levels and proportion of expenses by line item are examined by rural and small urban transit agencies in Texas (Table 2) (*2*). Agencies and researchers can use this data to develop a current picture of the proportion of small urban and rural transit expenses by line item (or object class) category. The highest cost line items may be the most critical focus areas for agency cost containment practices. However, any line item, especially unexpected proportional anomalies, may need cost containment practices applied. Salaries and fringe benefits are the highest proportion of a transit agency operating cost—over 60 percent of the total operating costs. Fuel and lubricants is second highest.

**Table 2. Small Urban and Rural–Operating Expense by Object Class Percent of Total.**

| Operating Expense by Object Class | Small Urban | Rural |
|---|---|---|
| Salaries and Wages | 43% | 49% |
| Fringe Benefits | 19% | 18% |
| Fuel and Lubricants | 12% | 12% |
| Services | 10% | 3% |
| Tires and Tubes | 1% | 1% |
| Other Materials and Supplies | 7% | 7% |
| Utilities | 2% | 1% |
| Casualty and Liability Costs | 2% | 2% |
| Miscellaneous Expenses | 2% | 6% |
| Leases and Rentals | 3% | 0.3% |

Source: (*2*)

### Percent Distribution of Costs by Line Item

Transit agencies may want to compare line-item costs across peer transit agencies. Researchers grouped transit agencies into the following categories for comparison purposes:

- State-funded urban transit districts.
- State-funded urban transit districts serving individuals with disabilities and persons who are age 65 and older (limited eligibility providers).
- Dual urban and rural transit districts serving both urbanized areas and rural (non-urbanized) areas.
- Rural transit districts.

A researcher further sub-categorized by whether the agency purchases transportation service or directly operates service. Researchers separated transit agencies that purchase transportation because expenses such as operator salaries, maintenance wages, fuel cost, etc. are included in the purchased transportation price. Therefore, labor, maintenance, and fuel costs may not be comparable across agencies that purchase transportation to agencies that operate service directly.

Researchers compared 2010 line-item costs using Urban National Transit Database (NTD) data and a sample of rural transit agency data. The comparison excludes five transit agencies that did not file a detailed NTD report in 2010 as they received a waiver for operating fewer than 10 vehicles. These five transit districts include Longview, Texarkana, Tyler, Wichita Falls, and Northeast Transportation Service (NETS).

Rural transit agencies do not report operating expense by line item to the Rural NTD. To obtain the rural transit agency percent line-item comparison, a sample of rural transit agencies provided the percent of operating expense by line-item category. Rural transit operating expense by line-item data was obtained directly from a sample of Texas rural transit agencies.

**Transit Districts That Directly Operate Transportation**

Researchers provided a summary of transit agency expenses by line item for transit agencies that directly operate transportation in Table 3. The four largest line-item categories for these transit agencies are salaries and wages, fringe benefits, services, and fuel and lubricants. Together these four classes of expense represent approximately 70 to 90 percent of a transit agency's budget.

*Salaries and Wages*

Because of the labor-intensive nature of transit, salaries and wages are the most significant driver of a transit agency's operating budget. Salaries and wages are 45 percent of state-funded urban, 44 percent of dual urban/rural, 57 percent of urban limited eligibility providers (LEP), and 52 percent of rural operating expense.

*Fringe Benefits*

Fringe benefits (which include health insurance) are one of the highest drivers of costs– 19 percent for state-funded urban, 16 percent of dual urban/rural, 20 percent of urban LEP and 14 percent of rural operating expense. Rural transit districts appear to provide a lower amount of benefits.

*Services*

Services include contract maintenance costs and often reflect the amount of maintenance conducted outside of the transit district. State-funded urban and dual rural/urban have a higher percent of services (11 percent and 13 percent) than do urban LEP and rural (both 2 percent).

*Fuel and Lubricants*

Fuel and lubricants represent a higher proportion of overall costs for rural transit districts reflecting the longer distances traveled. Fuel and lubricants represent 10 percent of state-funded urban, 12 percent of dual rural/urban, 13 percent of urban LEP, and 17 percent of rural.

**Table 3. Transit Agencies That Directly Operate All Service.**
(FY10 NTD Urban and Sample of Rural)

| Operating Expense Category | State-Funded Urban (10 Agencies) | Dual Rural/Urban (5 Agencies) | LEP (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% | 33.6% | 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 a sample of rural transit districts

## ANALYZING COSTS BY TRANSIT FUNCTION

Researchers summarized operating expense by functional area classifications commonly used in transit:

- Operations.
- Scheduling, dispatch, and service planning.
- Vehicles and vehicle maintenance.
- Administration.
- Purchased transportation and cooperative agreements.
- Planning.

Transit staff supervisors are often held accountable for costs by functional area. An understanding of the factors that drive costs by functional area provides a useful perspective to understand cost containment strategies. Figure 1 provides operating expense elements by function.

### Operations

Transit operations expense includes all expenditures associated with activities to dispatch and operate vehicles in revenue service to carry passengers, including direct supervision and clerical support. The operating function includes fuel cost. Operations expenses are typically the largest expense function.

**Operating**

- Transportation Administration & Support
  - Garage & Station Supervision
  - Safety & Training
  - Field Supervision
  - Accident Investigation
- Revenue Vehicle Movement Control
  - Starters
  - Dispatching
  - Technology Support (AVL, Signal Priority)
- Scheduling of Transportation Operations
  - Data Collection Activities (Ride/Time Checks)
  - Scheduling & Runcutting
  - Development of Schedule Summaries
- Revenue Vehicle Operation
  - Operators
  - Fuels & Lubricants (& related taxes)
  - Tires
  - Vehicle Licensing & Registration
  - Lease & Rental Costs (Facilities, Vehicles)
- Ticketing & Fare Collection
  - Producing Fare Media
  - Distributing Fare Media
  - Pulling Vaults
  - Counting Cash
  - Processing Debit/Credit Card Transactions
- System Security
  - Patrolling Buses & Stations
  - Securing Operating Facilities
  - Monitoring Closed Circuit TV
  - Court Appearances

**Maintenance**

- Vehicle Maintenance (including Service Vehicles)
  - Maintenance Administration
    - Maintaining Vehicle Databases
    - Accumulating Performance Data
    - Providing Technical Training
    - Scheduling & Recording Maintenance Activities
    - Engineering Maintenance Activities
  - Vehicle Servicing
    - Interior & Exterior Washing/Cleaning
    - Refueling
    - Adding Engine Oil or Water
    - Movement of Vehicles for Servicing
  - Vehicle Inspection & Maintenance
    - Schedule preventive maintenance
    - Minor Repairs & Fluid Changes
    - Road Calls/Towing
    - Component Rebuild/Overhaul
    - Major Repairs
    - Major Unit Replacement
    - Accident Repair
    - Vandalism Repair
- Non-Vehicle Maintenance
  - Vehicle Movement Control Systems
  - Fare Collection & Counting Systems
  - Structures, Tunnels, Subway; Roadway & Track
  - Passenger Stations
  - Operating Stations (Garages), Grounds & Equipment
  - Vandalsim & Accident Repair of Buildings, Grounds & Equip.
  - Operations & Maintenance of Electrical Power Towers
  - Administrative Supervision & Clerical Support

**Purchased Transportation**

- Expenses that are billed by the seller of service (invoiced)
- Does not include:
  - Seller's expenses that are not billed
  - Expenses in support of purchased transportation

**Administrative**

- Finance & Procurement
  - Accounting
  - Payroll
  - Budgeting & Financial Reporting
  - Purchasing
  - Storing & Issuing Materials
  - Inventory Management
  - Real Estate Management
- Marketing & Customer Service
  - Telephone Information
  - Complaint Lines
  - Distributing Information to Facilities
  - Promotions
  - Media Relations
  - Market Research
- Risk Management
  - Claims Management
  - Payments for Injuries & Damages
  - Defending Liability Cases
  - System Safety Planning
- General Activities
  - Personnel
  - Legal Services
  - Insurance
  - Information Technology
  - Office Management
  - General Management

**Planning**

- Service Development
  - Researching Demographics & Technology
  - Identifying Route Configurations
  - Identifying Service Levels
  - Regional Planning
  - Long-Range Planning
  - Coordination Planning

## Financial Reporting Expenses

**Figure 1. Operating Expense Reference by Function.**

Transit Cooperative Research Program (TCRP) Report 124 identifies transit costs as controllable, uncontrollable, and partially controllable costs. Table 4 contains examples of operations cost drivers indicating the degree to which transit providers typically can control the expense (*3*).

**Table 4. Examples of Operations Cost Drivers.**
(Controllable (C), Uncontrollable (U), and Partially Controllable (PC) Costs)*

| Functional Area and Cost Driver Examples | C | U | PC |
|---|---|---|---|
| Operations | | | |
| Operator wages and benefits (stability of staff) | | X | X |
| Paid operator hours to revenue vehicle hour relationship (productive pay time relates to vacation, sick policies) | X | | |
| Align operator shifts to meet service demand (split shifts, part-time/full-time mix) | X | | |
| Other operations staff wages and benefits | | X | X |
| Match reservationist staff shifts with call patterns and call demand | X | | |

Source: (*3*)

## Scheduling, Dispatch, and Service Planning

Table 5 contains examples of scheduling, dispatch, and service planning cost drivers indicating the degree to which transit providers can control the expense.

**Table 5. Examples of Scheduling, Dispatch, and Service Planning Cost Drivers.**
(Controllable (C), Uncontrollable (U), and Partially Controllable (PC) Costs)*

| Functional Area and Cost Driver Examples | C | U | PC |
|---|---|---|---|
| Scheduling/Dispatch/Service Planning | | | |
| Skills in creating effective schedules (run-cut, manifest) | X | | |
| Ability to impact operations in real-time (e.g., automatic vehicle location, mobile data terminals) | X | | |
| Skills in maximizing computer-aided scheduling and dispatching | X | | |
| Matching revenue hours to demand | X | | |
| Reduce underutilized revenue hours through service span adjustments | X | | |
| Dwell time | | | X |
| Deadhead time/miles | | | X |
| System speed | | | X |
| No-shows and late cancels (demand response) | | | X |

Source: (*3*)

### Vehicles and Vehicle Maintenance

Vehicles are not an operating cost but are included alongside vehicle maintenance as operating cost drivers in the sense that the efficient management of vehicle fleet and capacity affects operating cost. Effective management of vehicle fleet and vehicle maintenance are important operating expense cost drivers. Maintenance is included in this expense category. Although maintenance is eligible for *reimbursement* as a capital expense, maintenance is an operating expense by definition. Transit providers report all maintenance expenses (including the portion eligible for capital reimbursement) as an operating expense. Table 6 contains examples of vehicles and vehicle maintenance cost drivers indicating the degree to which transit providers typically can control the expense.

**Table 6. Examples of Vehicles and Vehicle Maintenance Cost Drivers.**
(Controllable (C), Uncontrollable (U), and Partially Controllable (PC) Costs)*

| Functional Area and Cost Driver Examples | C | U | PC |
|---|---|---|---|
| Vehicles and Vehicle Maintenance | | | |
| Vehicle type–fuel type, capacity, fuel efficiency, vehicle life | | X | X |
| Fuel Cost | | X | X |
| Vehicle condition and maintenance practices | X | | |
| Maintenance parts | | | X |
| Supplement difficult to service or peaks with non-dedicated service | X | | |
| Maintenance staffing wages and benefits | | X | X |

Source: (*3*)

### Administration

Administration expenses are all expenditures associated with activities (other than operating and maintenance activities) supporting the provision of transit service. If a transit provider is part of a larger organization, many of the supporting services may be provided by the larger organization. Table 7 contains examples of administration functional area cost drivers with a mark to indicate the degree to which transit providers typically can control the expense.

**Table 7. Examples of Administration Cost Drivers.**
(Controllable (C), Uncontrollable (U) and Partially Controllable (PC) Costs)*

| Functional Area and Cost Driver Examples | C | U | PC |
|---|---|---|---|
| Administration | | | |
| Staffing wages and benefits | | X | X |
| Allocated central services | | | X |
| Utilities | | X | X |
| Marketing and Customer Service | X | | |
| Finance & Procurement (accounting, payroll, budget, purchasing) | X | | |
| Risk Management (claims, liability, safety planning) | X | | |
| General Activities (personnel, legal, insurance, IT, general management) | X | | |

Source: (*3*)

## Purchased Transportation and Cooperative Agreements

Purchased transportation expenses are expenses incurred and billed by purchased transportation providers (sellers) in the operation of the contracted transit services. The expenses are equal to the payments or accruals made to the transit provider (net of fare revenues the seller may have collected) and all purchased transportation fare revenues associated with the service (fare revenues collected by both the buyer and seller).

In purchased transportation, the provider (seller) is obligated in advance to operate public transportation services for a public transit provider or governmental unit (buyer) for a specific monetary consideration, using its own employees to operate revenue vehicles. Purchased transportation agreements to operate transit service may or may not include an agreement to provide maintenance, vehicles and facilities. Table 8 contains examples of purchased transportation and cooperative agreements cost drivers with a mark to indicate the degree to which transit providers typically can control the expense.

**Table 8. Examples of Purchased Transportation and Cooperative Agreements Cost Drivers.**

(Controllable (C), Uncontrollable (U) and Partially Controllable (PC) Costs)*

| Functional Area and Cost Driver Examples | C | U | PC |
|---|---|---|---|
| Purchased Transportation and Cooperative Agreements | | | |
| Use incentives/disincentives effectively | X | | |
| Consider alternative service delivery options as appropriate (e.g., partnerships with community agencies, same-day taxi, volunteer drivers/staff) | | | X |
| Contracted service to private sector–types of contracts–market type, considerations in contract service requirements (management contracts, turn-key contracts, maintenance contracts, operations contracts) | X | | |
| Consider cooperative purchasing and contributed service | | | X |

Source: (*3*)

Functional areas represent a set of line-item expenses and cost drivers. Table 9 illustrates the assignment of operating costs by function for an example transit agency. Assigning operating costs to each function is helpful to the transit staff overseeing each function to identify those costs that are the largest drivers in their area. Transit staff can also use the cost by function to determine budgets and track costs against the budget.

## Table 9. Assigning Costs to Functions.

| USOA Object Class Expenses | Total | Operating | Maint. | Admin. | Purchased Transp. | Planning |
|---|---|---|---|---|---|---|
| Total Operating Costs | $1,312,000 | $892,500 | $176,500 | $230,000 | $0 | $13,000 |
| 501. LABOR | | | | | | |
| 01. Operator Salaries and Wages | $400,000 | $400,000 | | | | |
| 02. Other Salaries and Wages | $235,000 | $90,000 | $35,000 | $100,000 | $0 | $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 | $121,000 | | $121,000 | | | |
| 99. Other Services | $10,000 | $9,000 | | $1,000 | | |
| 504. MATERIALS/SUPPLIES | | | | | | |
| 01. Fuel and Lubricants | $250,000 | $250,000 | | | | |
| 02. Tires and Tubes | $15,000 | $15,000 | | | | |
| 99. Other Materials and Supplies | $26,000 | $3,000 | $10,000 | $13,000 | | |
| 505. UTILITIES | | | | | | |
| Telecommunication | $20,000 | | | $20,000 | | |
| Utilities | $25,000 | $15,000 | | $10,000 | | |
| 506. CASUALTY/LIABILITY | | | | | | |
| 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 | | | | | | |
| Purchased Transportation | $0 | | | | | |
| 509. MISCELLANEOUS | | | | | | |
| 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 | | |

### Percent Distribution of Costs by Function

Researchers summarized rural and small urban operating cost by function. Table 10 provides the distribution of operating expense by function for rural and small urban transit agencies.

**Table 10. Percent Distribution of Costs by Function.**

| | Operations | Maintenance | Administration & Planning | Purchased Transportation |
|---|---|---|---|---|
| **Total Rural** | 62% | 6% | 16% | 17% |
| With Purchased Transportation | 53% | 5% | 14% | 27% |
| Without Purchased Transportation | 75% | 7% | 17% | 0% |
| | | | | |
| **Total Urban** | 62% | 18% | 10% | 11% |
| With Purchased Transportation | 51% | 13% | 9% | 27% |
| Without Purchased Transportation | 69% | 20% | 11% | 0% |

## ANALYZING COSTS BY ORGANIZATION TYPE

Another method to analyze operating costs is to explore the influence of the organization structure on costs. Researchers specifically explored whether a transit agency's organizational structure impacts *administration* costs. Researchers wanted to analyze whether there is an overhead cost impact associated with whether a transit is operated as part of a larger organization or as an independent agency. Policies such as indirect cost allocation rates for employees that may be set by the larger organization may impact costs negatively or positively. Transit agencies that are part of a larger organization may over or underestimate the true labor costs of labor expenses shared with other departments. Transit agencies that are independent (not part of a larger organization) may not gain the administrative efficiencies of being part of a larger organization.

State-funded urban and rural transit districts in Texas can be classified into four organizational structure categories:

- County or City Department (CD).
- Council of Governments or Regional Planning Commission (COG/RPC).
- Community-Based (CB).
- Independent (I).

Of the 68 state-funded urban and rural transit districts in Texas, the majority (or 78 percent) are part of a larger organization—a city/county government, council of governments/regional planning commission or community-based organization. Table 11 provides the transit districts in each organizational structure category.

## Table 11. Transit District Organizational Structure Classification.

| Texas Transit Districts | Part of a Larger Organization: County or City Department (CD) | Part of a Larger Organization: Council of Governments or Regional Planning Commission (COG/RPC) | Part of a Larger Organization: Community-Based (CB) | Independent (I) |
|---|---|---|---|---|
| Total All Transit Districts | 26 | 10 | 17 | 15 |
| State-Funded Urban: | | | | |
| Abilene–Citylink | CD | | | |
| Amarillo–Amarillo Transit Company | CD | | | |
| Beaumont–Beaumont Transit System | CD | | | |
| Brownsville–Metro | CD | | | |
| Galveston–Island Transit | CD | | | |
| Laredo–El Metro | CD | | | |
| Longview–COLT | CD | | | |
| Lubbock–Citibus–McDonald | CD | | | |
| Midland-Odessa–EZ Rider | CD | | | |
| Port Arthur–Port Arthur Transit | CD | | | |
| Texarkana–T Line | | | | I |
| Tyler–Tyler Transit System | CD | | | |
| Waco–Waco Transit System | CD | | | |
| Wichita Falls–Wichita Falls Transit | CD | | | |
| Limited Eligibility Providers: | | | | |
| Arlington | CD | | | |
| Grand Prairie | CD | | | |
| Mesquite–MTED | CD | | | |
| North East Transportation Service (North Richland Hills) | | | | I |
| Rural: | | | | |
| Alamo Area Council of Governments | | COG/RPC | | |
| Ark-Tex Council of Governments | | COG/RPC | | |
| Aspermont Small Business Dev. Ctr. | | | CB | |
| Bee Community Action Agency | | | CB | |
| Capital Area Rural Transportation Sys. | | | | I |
| Central Texas Rural Transit District | | | | I |
| Cleburne, City of | CD | | | |
| Colorado Valley Transit | | | | I |
| Community Act. Council of South Texas | | | CB | |
| Community Council of Southwest Texas | | | CB | |
| Community Services, Inc. | | | CB | |
| Del Rio, City of | CD | | | |
| East Texas Council of Governments | | COG/RPC | | |
| El Paso County | CD | | | |
| Fort Bend County | CD | | | |

**Table 11. Transit District Organizational Structure Classification (continued).**

| Texas Transit Districts | | Part of a Larger Organization: County or City Department (CD) | Part of a Larger Organization: Council of Governments or Regional Planning Commission (COG/RPC) | Part of a Larger Organization: Community-Based (CB) | Independent (I) |
|---|---|---|---|---|---|
| Heart of Texas Council of Governments | | | COG/RPC | | |
| Kaufman– STAR Transit | | | | | I |
| Kleberg County Human Services | | CD | | | |
| Panhandle Community Services | | | | CB | |
| Public Transit Services | | | | | I |
| Rolling Plains Management Corp. | | | | CB | |
| Rural Economic Assistance League, Inc. | | | | CB | |
| Sr. Ctr. Resources Public Transit Srv. | | | | CB | |
| South East Texas Regnl. Planning Comm. | | | COG/RPC | | |
| South Padre Island–The Wave | | CD | | | |
| South Plains Community Action Assoc. | | | | CB | |
| Services Program for Aging Needs | | | | CB | |
| Transit System Inc., The | | | | | I |
| Webb Co. Community Action Agency | | CD | | | |
| West Texas Opportunities, Inc. | | | | CB | |
| Dual Urban/Rural Provider: | | | | | |
| | College Station–Bryan (Urban) | | | | I |
| | The Woodlands (Urban) | | | | I |
| The District | Brazos Transit (Rural) | | | | I |
| | McKinney (Urban) | | | CB | |
| | Collin County Committee on | | | | |
| CCART | Aging (Rural) | | | CB | |
| | San Angelo (Urban) | | COG/RPC | | |
| | Concho Valley | | | | |
| Concho Transit | (Rural) | | COG/RPC | | |
| | Copperas Cove–Killeen & Harker Heights (Urban) | | | | I |
| | Temple (Urban) | | | | I |
| Hill Country Transit District | Hill Country Rural Transit District (Rural) | | | | I |

**Table 11. Transit District Organizational Structure Classification (continued).**

| Texas Transit Districts | | Part of a Larger Organization: County or City Department (CD) | Part of a Larger Organization: Council of Governments or Regional Planning Commission (COG/RPC) | Part of a Larger Organization: Community-Based (CB) | Independent (I) |
|---|---|---|---|---|---|
| Lower Rio Grande Valley Development Council | Valley Metro Harlingen–San Benito (Urban) | | COG/RPC | | |
| | Valley Metro (Rural) | | COG/RPC | | |
| | Metro McAllen (Urban) | CD* | | | |
| Gulf Coast Center | Lake Jackson–Angleton (Urban) | | | CB | |
| | Texas City LaMarque (Urban) | | | CB | |
| | Gulf Coast Center (Rural) | | | CB | |
| TAPS | Sherman–Denison (Urban) | CD | | | |
| | Texoma Area Paratransit System (Rural) | | | | I |
| Golden Crescent Regional Planning Commission | Victoria (Urban) | CD/Metropolitan Planning Organization | | | |
| | Golden Crescent Regional Planning Commission (Rural) | | COG/RPC | | |

*Metro McAllen receives funding through the Lower Rio Grande Valley Development Council but is operated as a department of the City of McAllen

Researchers analyzed fiscal year 2011 transit district administration and planning costs by organization type. For purposes of this analysis, researchers analyzed administration and planning costs that include indirect costs allocated from the larger organization. Administration costs include finance and procurement, marketing and customer service, accident and general activities as shown in Figure 2.

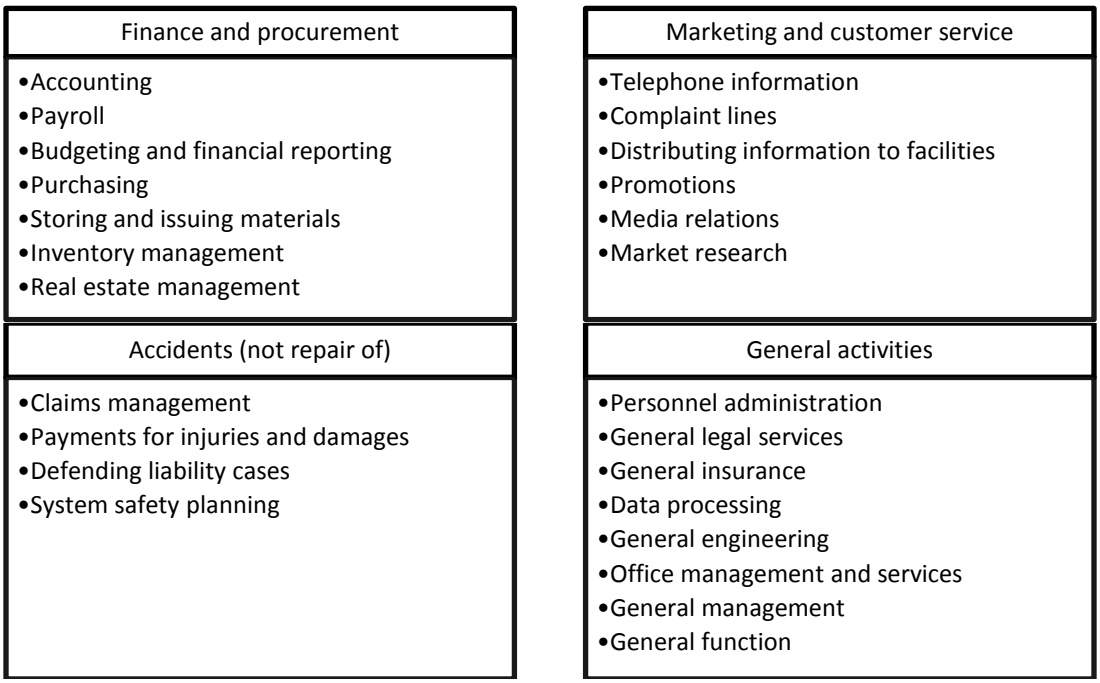



**Figure 2. Administrative Function Reference.**

The administration and planning costs are divided by total operating cost to calculate a fixed-cost overhead rate. Transit districts were grouped by organizational structure. Figure 3 illustrates the percent range of fixed-cost overhead by organizational structure for transit districts. Organizational type did not have a clear influence on overhead costs. For all organizational types, transit districts had an average fixed-cost overhead rate of approximately 17 percent and a median of just under 15 percent. Transit district fixed-cost overhead rates ranged from a low of 6 percent to a high of 34 percent.

Although organizational type did not have a clear influence, what is apparent is that a few transit district fixed-cost overhead rates are well above or well below the median. The overhead cost analysis illustrated in Figure 3 may be useful in identifying further peer and benchmarking analysis needs. For example, for transit districts with fixed-cost overhead rates of over 25 percent a comparison of the sub-functions of administration costs (marketing, general activities, risk management, and finance/procurement) may be useful in revealing the specific areas that are drivers of the cost. For example, further investigation may reveal that a marketing campaign may have been implemented during the fiscal year, which may be a one-time cost to gain ridership or that the number of general activity staff and/or rates of salaries may be higher than peer agencies.

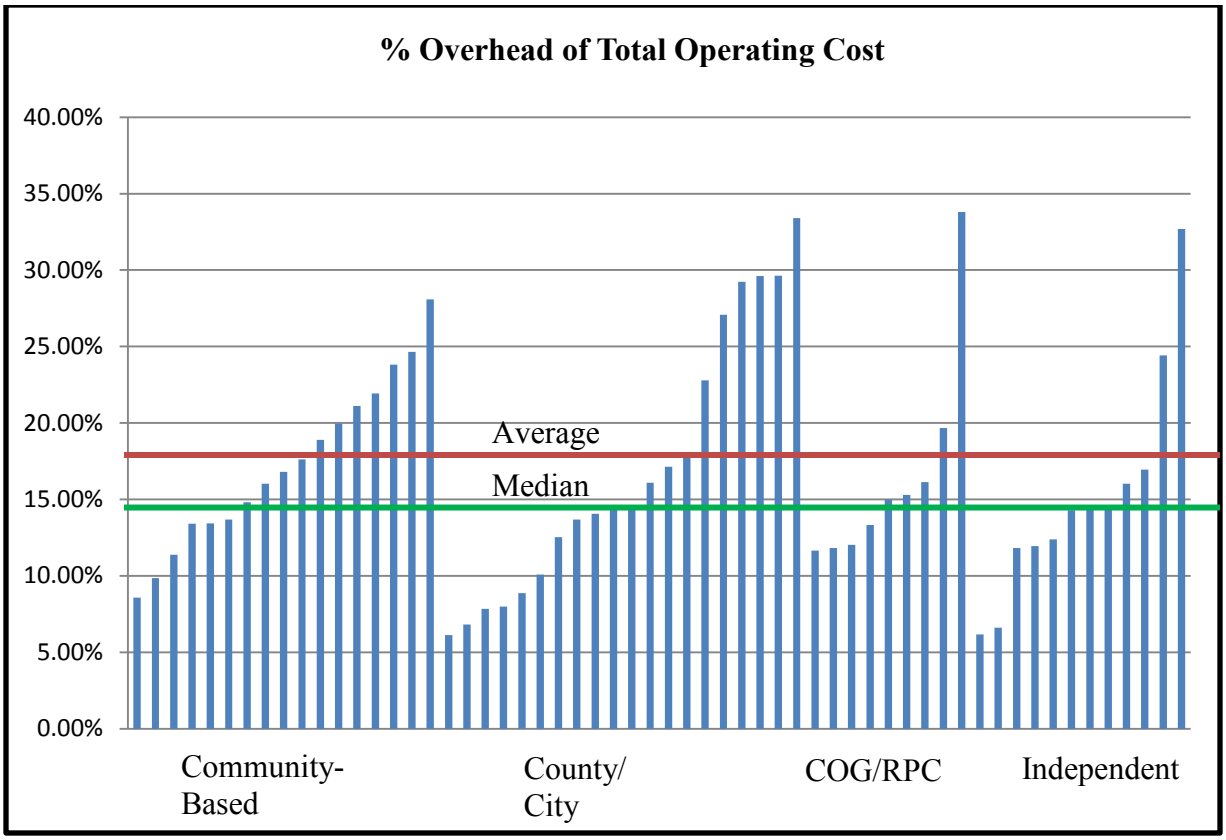



**Figure 3. Percent Overhead Cost by Organizational Structure.**

# CHAPTER 3. SERVICE ENVIRONMENT IMPACT ON COST

Researchers identified service environment factors (uncontrollable costs) that may influence transit-operating costs. A transit agency service area environment directly influences the operating expense of the transit service. The service environment can be defined as the built and natural environment, economic environment, and demographic environment. The service environment factors are typically uncontrollable by the transit agency in that the transit agency does not have direct influence to change; however, the transit agency can make planning decisions based on the environment factors. The purpose of this research is to explore tools to evaluate the service environment in order to make service-planning decisions that are cost effective.

## BUILT AND NATURAL ENVIRONMENT FACTORS

The built and natural environment can impact the cost of providing service. The built and natural environment factors that impact transit service include service area size, land uses, topography, water features, road design, household density, proximity to large urban areas, proximity to the Texas/Mexico border, and distribution to desired destinations. Geographic barriers influence the productivity of transit, which translates to the cost of providing service. More vehicles, miles, and hours of transit service may be required to meet rider needs where distances are greater between origins and destinations, where the roadway networks are limited, and where topography of the service area is difficult to navigate.

Transit staff can document destinations of transit riders—commonly referred to as transit attractors. Transit attractors are destinations where transit passengers want to go. The most typical categories of common transit destinations are:

- **Education**–high schools, vocational schools, community colleges.
- **Government**–social services, public, and governmental agencies.
- **Medical**–hospitals, clinics, dialysis centers, doctors' offices, etc.
- **General Business**–businesses engaged in any one of several types of manufacturing, raw material handling, and business services (e.g., legal, banking).
- **Restaurant, Retail, Lodging**–grocery stores, retail-shopping areas, pharmacies, etc.
- **Senior Living Facilities**–residences and centers for elderly persons.

The purpose of documenting transit destinations, or attractors, is to investigate the nexus of current or future transit services to cost effectively plan for service. Common sources of transit destination data include the following:

- Demand response transit manifests.
- Local chapters of the Chambers of Commerce.
- Council of governments.
- Economic development entities.

## ECONOMIC ENVIRONMENT FACTORS

The type, location, and size of industry in the transit service area or the region impacts the ability to provide transit service cost effectively for workers to access jobs. The economy also impacts the average household income and ability to own and maintain an automobile. When an industry is geographically concentrated and offers lower-wage positions public transit service between or within communities for employees may be cost effective and desirable service.

### Strength of Industry Employment

A good source for economic analysis is the Bureau of Labor Statistics (BLS). BLS collects a Quarterly Census of Employment and Wages from state workforce departments. Quarterly Census of Employment and Wages data is used throughout the federal government to calculate unemployment and many other economic health indicators. The BLS online location quotient calculator may be used to compare the concentration of a resource or activity, such as employment, in a defined area to that of a larger area or base. In other words, a location quotient is the percentage employment in an industry divided (compared to) by the percentage employment in the same industry in a larger geography. A location quotient value greater than one means the study area possesses more employment in the industry than expected when compared with the base area: the industry is likely a primary economic activity whose output is exported to other places. The link to the BLS online location quotient calculator can be found at the following link: http://www.bls.gov/cew/cewlq.htm.

### Work Trip Travel Patterns

Work trip patterns illuminate the relationships of county populations in a region. Large numbers of work trips traveling to or from the same location in a county or city may represent a market, or demand, for tailored public transit services. The purpose of analyzing work travel is to identify the potential demand for commute transit services. Common work-related transit services include carpool programs, vanpool programs, and park-and-ride services. Examining work travel patterns may identify patterns within and between counties sufficient to support one or more of work-related type transit service. Also, adjacent transit operators may discover a heretofore unrecognized inter-dependence; motivation to establish more coordinated services to support residents' needs. There are several data sources for work-related travel.

The first and most common are the inter-county workflows produced from Census and ACS data as part of Census Transportation Planning Products (CTPP), a program at AASHTO. The Census Bureau released inter-county work travel flows for all counties based on the 2000 Decennial Census. CTPP released 2006–2008 ACS data-based inter-county workflows for all counties with population 20,000 or more (ACS data has particular population thresholds). The data include information on three types of work trips: 1) work trips made by residents of a county to a job within their residence county, 2) work trips made by residents of one county to a job in another county, and 3) work trips made by residents of other counties into one of the transit agency county.

Another source of work travel data from the Census Bureau is the Longitudinal Economic Household Dynamics (LEHD) data products. LEHD data is data synthesized from state employment records, Internal Revenue Service tax records, and other sources. LEHD contains essentially the same information as the CTPP inter-county flows, but with a few differences. LEHD is travel from census block to census block (a census block is basically a city block in an urban area and varies in size in a rural area). Also, LEHD adds income, race/ethnicity, age, educational attainment, earnings, and job sector to the information available about each work trip. LEHD data is difficult to manipulate manually in Excel or a database program due to its complexity; however, the Census created an online tool to facilitate the public's use of the data for analysis. The LEHD online tool is called OnTheMap and the web address is http://lehdmap.did.census.gov/.

## DEMOGRAPHIC ENVIRONMENT FACTORS

Demographic categories of population information can identify geographic concentrations of transit need and, therefore, demand for transit service. Identifying these concentrations enables transit staff to: 1) provide transit service to those who need it most, and 2) provide transit service cost effectively. Table 12 lists the demographic factors that typically indicate higher transit need.

**Table 12. Demographic Factors.**

| Category | Characteristic(s) |
|---|---|
| Demographic Need | *Concentrations of persons with a disability* |
| | *Concentrations of households with persons age 65 and over* |
| | *Concentrations of single parents with children age 18 and under* |
| | *Concentrations of civilian veterans* |
| Household Income | *Concentrations of people in poverty* |
| | *Concentrations of people living alone and in poverty* |
| Auto Availability | *Concentrations of homeowners with no vehicle available* |
| | *Concentrations of renters with no vehicle available* |
| Educational Enrollment | *Concentrations of population enrolled in grades K-12* |
| | *Concentrations of population enrolled in college* |
| Employment | *Concentrations of employed persons (do not work at home)* |

The following bulleted list provides an explanation as to why these demographic factors are included in determining transit need.

- ***Persons with a disability*** depend more on transit service, in part because vehicles are wheelchair accessible.
- ***Households with persons age 65 and over*** depend more on public transit for medical and non-medical access to community and regional resources.
- ***Single parents with children age 18 and under*** depend more on transit as a means for children to independently travel to school or as a less-expensive transportation option for the parent.
- ***People in poverty*** depend more on transit for mobility and access.
- ***People living alone in poverty*** are especially dependent on transit due to poverty exacerbated by lack of a live-in social network of support.
- Homeowners with no vehicle available depend more on public transit.
- Renters with no vehicle available depend more on public transit.
- ***Population enrolled in grades K-12*** represents the younger student population.

- ***Population enrolled in college*** is a common market for public transit services in urban and often in rural areas.
- ***Employed persons (do not work at home)*** may represent the target market for commute services and other services for concentrated work trip needs.

Data for the demographic factors can be downloaded and compiled from the Census and American Community Survey (ACS) data file for census block groups in the service area or at the county level. Census block groups are the smallest geography for which data are available in the United States. The current data for persons with a disability are Census 2000 values because more recent disability data will not be available for rural areas at the block group level until the year 2013. The data source for the other factors is the 2005–2009 ACS. The 2005–2009 ACS are aggregate values for all survey samples collected during the five-year period: without the five-year range of survey responses the ACS would not have a large enough sample to protect the identity of participants and release data at a small geography like census block groups.

## EXAMPLE ENVIRONMENTAL FACTOR ANALYSIS

Analyzing the environmental factors in a transit agency service area is helpful to planning service that is cost effective and in managing costs. To illustrate an environmental factor analysis, Parker County and the City of Weatherford within Parker County are used as an example.

### Example Environment Profile

Parker County is situated west of Tarrant County, the City of Fort Worth, and the Dallas Fort Worth Arlington (DFWA) urbanized area. The proximity of Parker County to larger neighbors to the east means that Parker County has the most ready access to the economy and services of DFWA. Population in Parker County grew from 88,295 in 2000 to 116,927 in 2010—32.4 percent growth (Census) (Table 13). The fastest growing population is persons age 65 and over (Table 14). Parker County consists of 903.5 square miles with a population density of 129 persons per square mile. The county seat and city with the largest population in Parker County is Weatherford with 25,250 persons, or 21.6 percent of the population. The second most populous city is Willow Park with 3,982 persons, or 3.4 percent of the population. The majority of the population, 60.4 percent, lives outside of a town or city in rural territory (Table 13).

The City of Weatherford was incorporated in 1858 and is the county seat. Weatherford is built in a grid-like street system with the county court house located in the town square. Weatherford is a hub for the region for medical, retail, school, and employment services. Weatherford is located approximately 30 miles from Fort Worth along Interstate 20. Many residents work in the DFWA urbanized area and enjoy the small-town lifestyle and amenities of Lake Weatherford. The following page profiles the City of Weatherford based on demographic, built and natural environment, and economic characteristics (Figure 4 provides images of sites located in Weatherford).

**Table 13. Example City and Town Population Proportion and Difference.**

| | 2000 Population | | 2010 Population | | Difference | |
|---|---|---|---|---|---|---|
| Aledo city | 1,726 | 2.0% | 2,716 | 2.3% | 990 | 57.4% |
| Annetta North town | 467 | 0.5% | 518 | 0.4% | 51 | 10.9% |
| Annetta South town | 555 | 0.6% | 526 | 0.4% | -29 | -5.2% |
| Annetta town | 1,302 | 1.5% | 1,288 | 1.1% | -14 | -1.1% |
| Azle city (part) | 1,548 | 1.7% | 1,765 | 1.5% | 217 | 14.0% |
| Cool city | 195 | 0.2% | 157 | 0.1% | -38 | -19.5% |
| Cresson city | n/a | n/a | 406 | 0.3% | 406 | 100.0% |
| Hudson Oaks city | 1,637 | 1.8% | 1,662 | 1.4% | 25 | 1.5% |
| Millsap town | 353 | 0.4% | 403 | 0.3% | 50 | 14.2% |
| Mineral Wells city (part) | 2,164 | 2.4% | 2,144 | 1.8% | -20 | -0.9% |
| Reno city | 2,441 | 2.8% | 2,485 | 2.1% | 44 | 1.8% |
| Sanctuary town | 256 | 0.3% | 329 | 0.3% | 73 | 28.5% |
| Springtown city | 2,062 | 2.3% | 2,658 | 2.3% | 596 | 28.9% |
| Weatherford city | 19,000 | 21.5% | 25,250 | 21.6% | 6,250 | 32.9% |
| Willow Park city | 2,849 | 3.2% | 3,982 | 3.4% | 1,133 | 39.8% |
| Balance - Population Outside of a City or Town | 51,940 | 58.7% | 70,638 | 60.4% | 18,698 | 36.0% |
| **Total Parker County Population** | **88,495** | **100.0%** | **116,927** | **100.0%** | **28,432** | **32.1%** |

Source: 2000 and 2010 Decennial Census, 2020 projection based Texas State Data Center (TSDC), Scenario 3 (2010-2020, 31.91%)

**Table 14. Example Population Age Difference.**

| Parker County | 2010 | 2020 | Difference | % Difference |
|---|---|---|---|---|
| Total Population (Census) | 116,927 | 154,233 | 37,306 | 32% |
| Age 17 and under | 29,816 | 34,465 | 4,649 | 16% |
| Age 18 to 64 | 73,079 | 97,080 | 24,001 | 33% |
| Age 65 and over | 14,265 | 22,688 | 8,423 | 59% |

The county contains several large reservoirs, including Lake Mineral Wells and Lake Weatherford, and gently rolling hills and plains. Mineral Wells Lake and State Parkway is west of Weatherford, has 1,095 acres of parkland, a 646-acre lake, and a 20-mile hike, bike, and equestrian trail to Weatherford.

**Weatherford, Texas**

Demographic:

- 25,250 Census 2010 population (33 percent growth from Census 2000).
- 15 percent (3,840) age 65 and over (Census 2010).
- 9 percent with no personal vehicles (ACS 2005-9).
- $48,413 median household income (ACS 2005-9).
- 13 percent of individuals live in poverty (ACS 2005-9).
- 12 percent civilian veteran population (ACS 2005-9).
- Largest city population in Parker County.

Built/Natural Environment:

- 30 miles west of Fort Worth.
- Interstate 20 runs along the southern boundary.
- Incorporated in 1858–traditional main street, town square, and street grid.
- Farmers market a block from town square.
- Lake Weatherford located to the northeast.

Economic:

- Three dialysis centers.
- Weatherford Regional Medical Center Weatherford College–5,700 students (47 percent students reside in Parker County).
- Known as Cutting Horse Capital of the World–home to professional horse trainers.

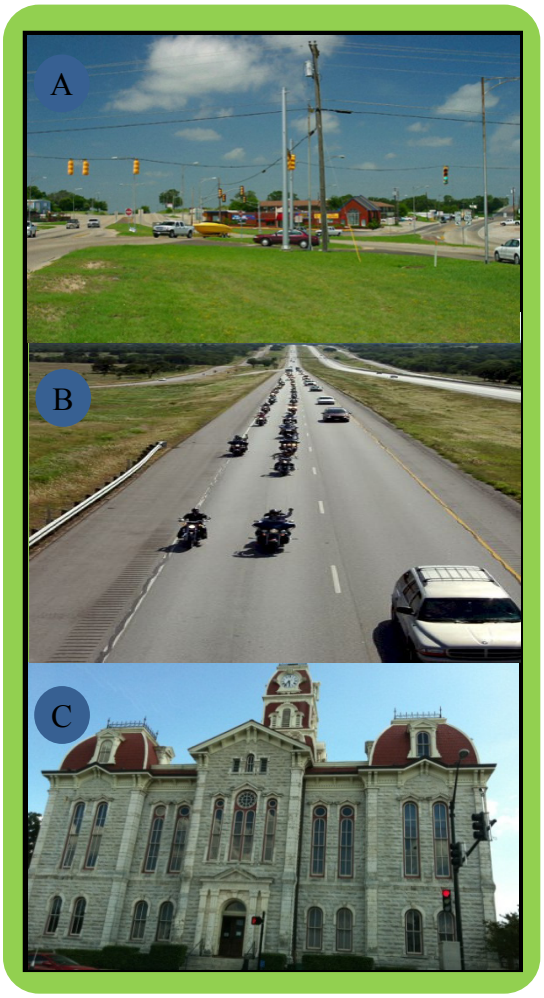
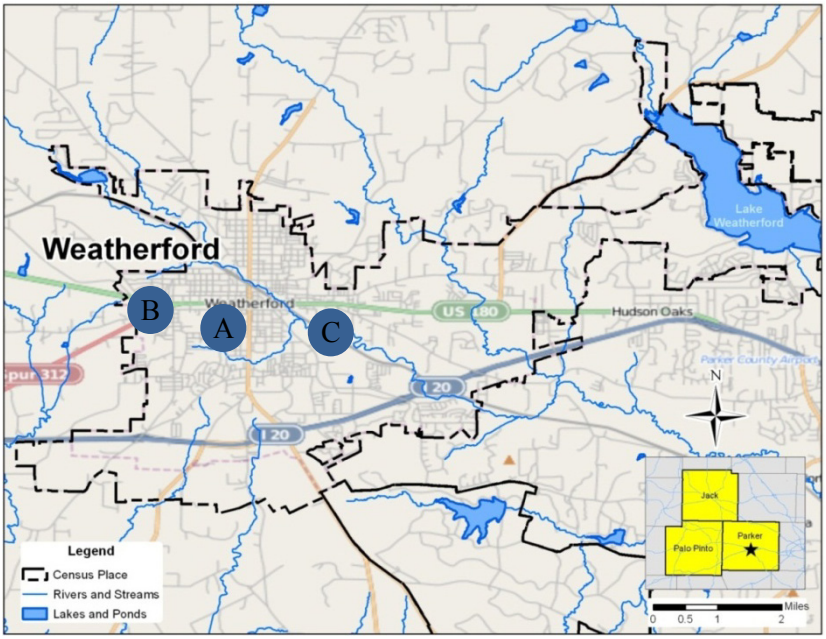



**Figure 4. Sites in Weatherford.**



## Example Industry Analysis

Parker County's top five private industries have location quotients near 1: a location quotient near 1 means that the industry is serving a local need, as opposed to exporting a basic economic output. Parker County residents are near to the DFWA metropolitan area. The data in Table 15 appear to support the assumption that Parker County industries are primarily services for residents that themselves work in DFWA (primarily).

**Table 15. Example Top Industries.**

| | Industry | Location Quotient | Change 2005-2010 |
|---|---|---|---|
| 1 | Trade, transportation, and utilities | 1.16 | + |
| 2 | Education and health services | 0.93 | + |
| 3 | Leisure and hospitality | 1.19 | + |
| 4 | Manufacturing | 1.12 | - |
| 5 | Construction | 1.30 | - |

## Example Transit Attractor Analysis

The location and distribution of transit attractors are important for transit service planning. The most efficient and effective services are those that connect riders with the attractors. Table 16 provides an example of the number of transit attractors in Parker County and City of Weatherford by category. Figure 5 provides an example of Parker County mapping of transit attractors.

**Table 16. Example Transit Attractors.**

| | NUMBER OF IDENTIFIED LOCATIONS BY CATEGORY | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Eductn. | Business Services | Govt. | Medical | Manuf. | Natural Resources & Mining | Restaurant, Retail, Lodging | Senior Living Facilities | Total |
| COUNTY | | | | | | | | | |
| Parker | 41 | 7 | 3 | 10 | 17 | 5 | 37 | 14 | 134 |
| CITY | | | | | | | | | |
| Weatherford | 18 | 8 | 3 | 7 | 9 | 2 | 30 | 13 | 90 |

Note: This table is representative of locations from available public information and may not include all locations that generate or attract transit trips.
Sources: North Central Texas Council of Governments, Chambers of Commerce, and City of Weatherford Economic Development Department.

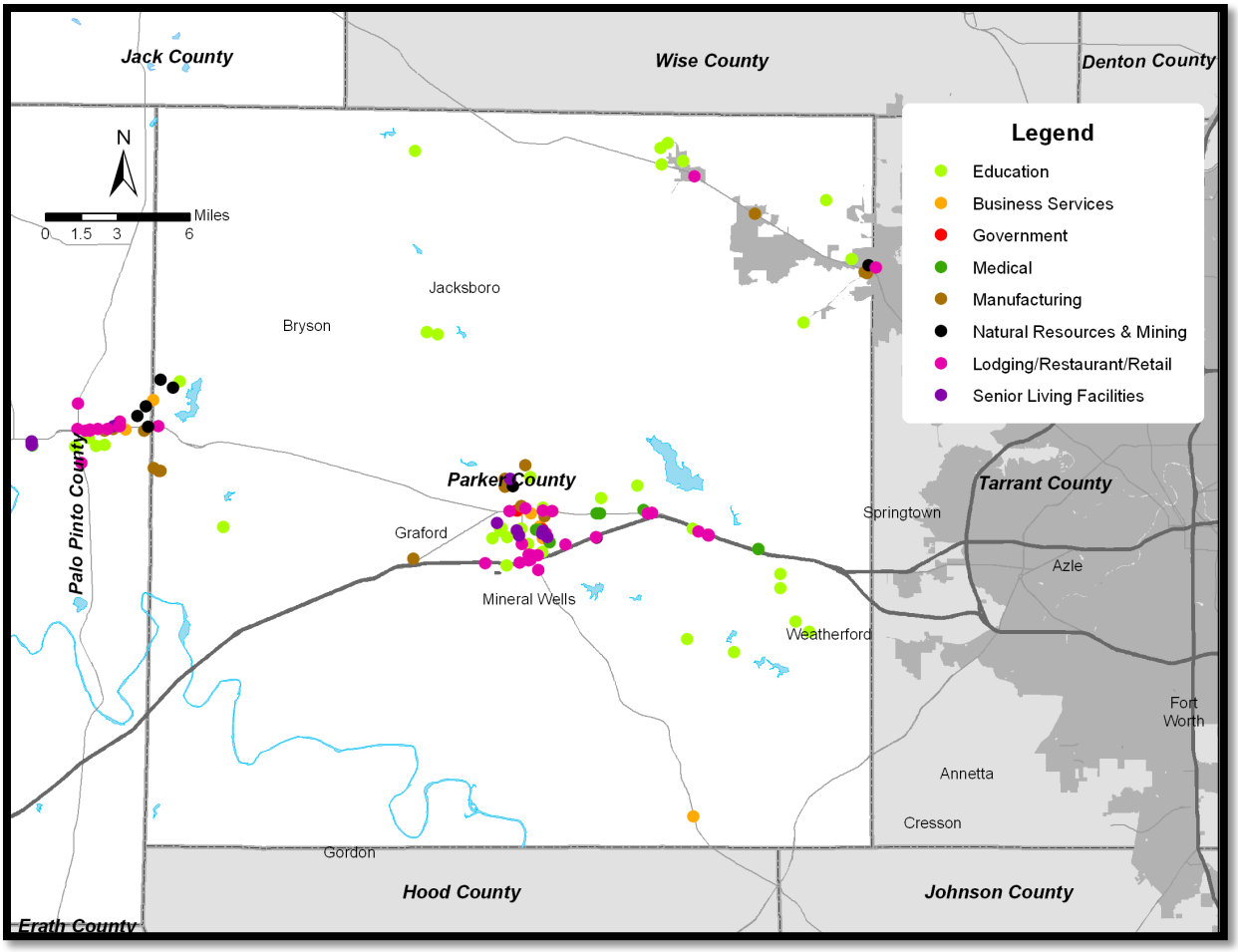



**Figure 5. Example Transit Attractors Map.**

## Example Work Trip Flow Analysis

Table 17 summarizes work trip flow types and the change between the 2000 Census and the 2006–2008 ACS for Parker County. As shown in the 2006–2008 category in Table 17, Parker County drew in the most workers from outside as well as had the most residents commuting to other counties for work. Figure 6 and Figure 7 depicts the following using the web based tool at http://lehdmap.did.census.gov/:

- County resident jobs by distance.
- Job counts by work place.

**Table 17. Example Work Trip Flow.**

| | 2000 | | 2006-2008 | | Change 2000 to 2006-2008 | |
|---|---|---|---|---|---|---|
| PARKER COUNTY | | | | | | |
| Live and work local | 16,675 | 35% | 23,315 | 40% | 6,640 | 40% |
| Live local and work out-of-county | 24,137 | 50% | 25,559 | 44% | 1,422 | 6% |
| Live out-of-county, work in Parker | 7,087 | 15% | 9,395 | 16% | 2,308 | 33% |
| Total | 47,899 | | 58,269 | | 10,370 | |

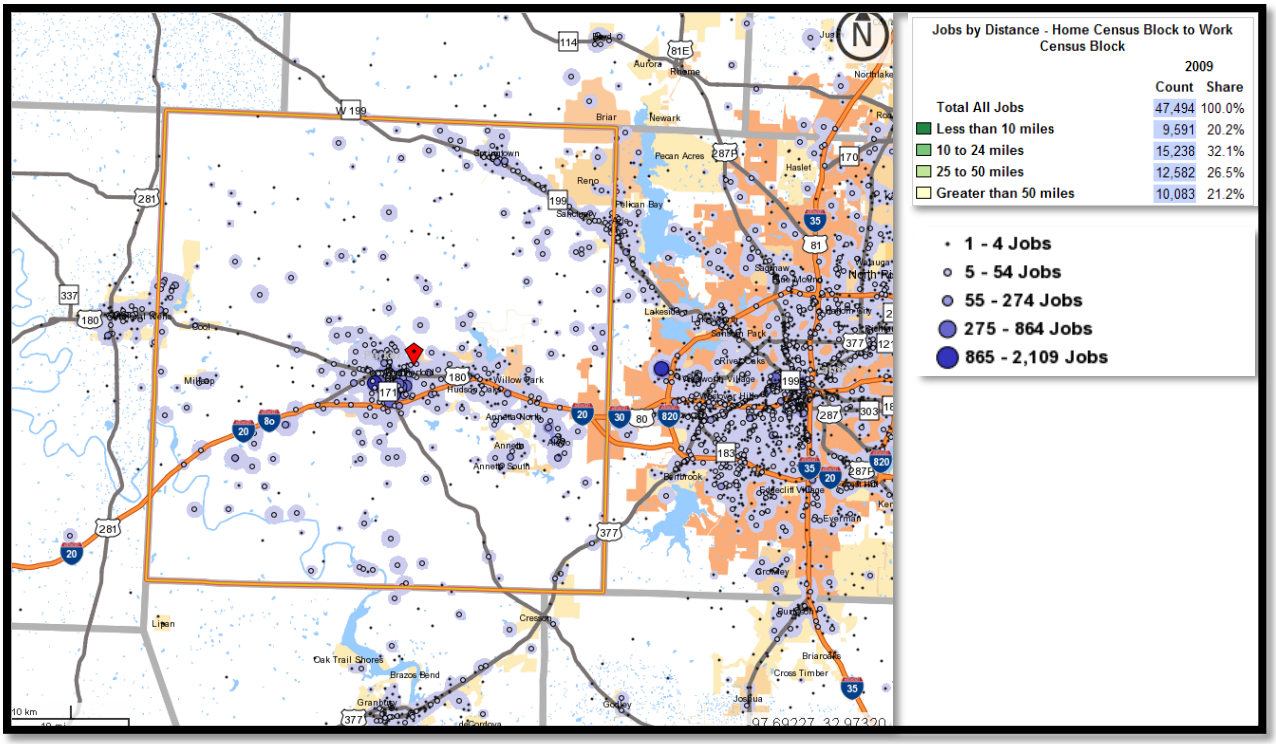



**Figure 6. Example Jobs by Distance.**
Parker County 2009

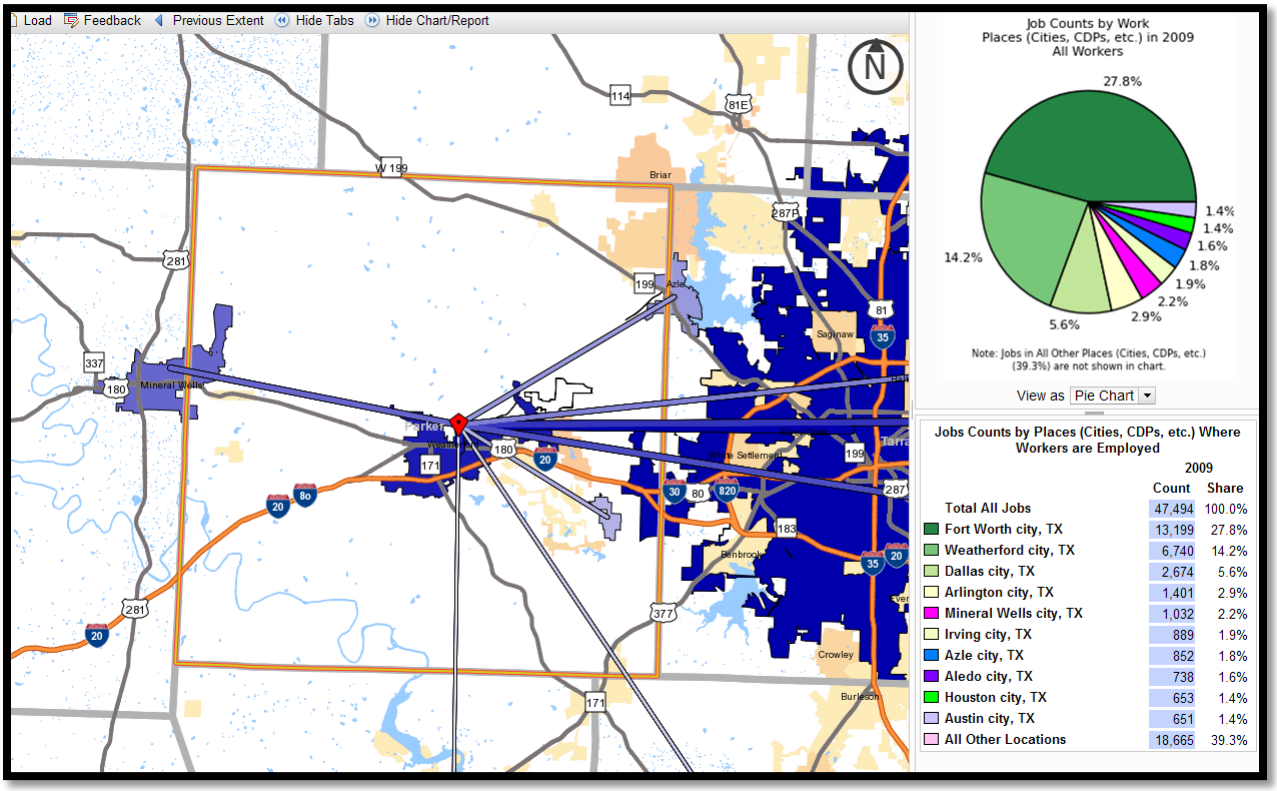



**Figure 7. Job Counts by Work Places.**
Parker County

### Example Transit Need Analysis

Table 18 aggregates values for all block groups in Parker County. Figure 8 is a map of the combined demographic factors to visualize where the most need occurs in Parker County. Transit staff should map each characteristic so as to investigate whether or not one or a few variables distorts, exaggerates, or confounds other variables when combined.

**Table 18. Example Transit Need.**

Aggregate for Parker County

| Source | Year | Needs Variable | Category of Need Variable | Parker County |
|---|---|---|---|---|
| ACS | 2005–2009 | Percent of Households with One or More Persons Age 65 and Over | Demographic | 23% |
| ACS | 2005–2009 | Percent of Households That Are Single Parents with People Under 18 Years Old | | 3% |
| Census | 2000 | Percentage of the Population 5 Years and Over with a Disability (any category) | | 19% |
| ACS | 2005–2009 | Percent of Individuals Whose Income in Past 12 Months Was Below Poverty Level | Income | 11% |
| ACS | 2005–2009 | Percent of Individuals in Poverty That Live Alone | | 21% |
| ACS | 2005–2009 | Percent of Homeowners with No Vehicle Available | Vehicle Availability | 3% |
| ACS | 2005–2009 | Percent of Renters with No Vehicle Available | | 11% |
| ACS | 2005–2009 | Percent of Population Enrolled in Grades K-12 | Education | 20% |
| ACS | 2005–2009 | Percent of Population Enrolled in Undergraduate and Postgraduate Degree Programs | | 4% |
| ACS | 2005–2009 | Percent of Population Employed and Working Out of Home | Employment | 44% |

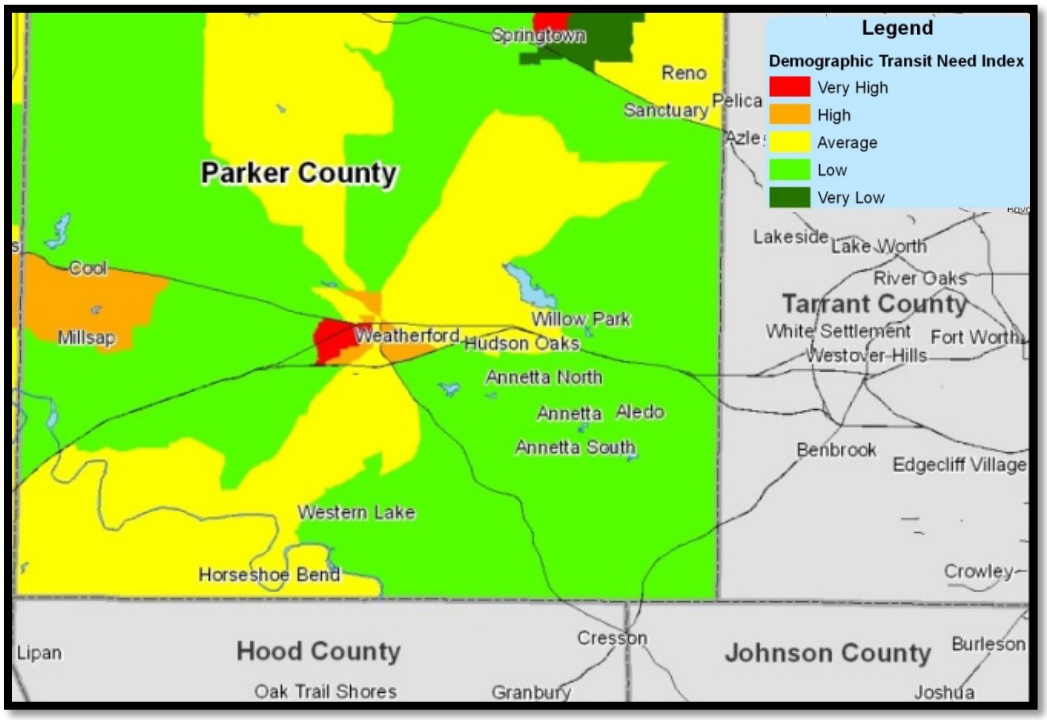



**Figure 8. Example Demographic Transit Need.**

Parker County Block Groups

### Example Environment Analysis Results

The example environmental analysis is useful in assessing conditions and trends where planning for transit service may be most productive or where information is useful to identify where transit services may be most needed. The following provides highlights of the outcomes found in the environmental analysis for Parker County example:

- Fastest growth in fringes of DFWA–32 percent growth in Parker County as a whole.
- Fastest growing population is 65+ throughout service area and significant growth in Parker County younger family populations.
- Population growth in proximity to scenic landscapes–natural amenities and recreational areas.
- High percent of workers commute longer distance.
- Major roadway configuration oriented to freight and intercity needs–eases access to DFWA.
- Activity centers clustering along major trade routes.
- Local plans focus on town centers and main streets.
- Good number of dialysis centers and existence of regional hospital.
- Weatherford College–significant student body.

## TEXAS TRANSIT DISTRICT ENVIRONMENTAL FACTORS

Texas transit districts costs may be impacted if the transit district operates in more than one county, are in close proximity to a major metropolitan area, and are in proximity to the Texas/Mexico border. Transit districts that operate over multiple counties may increase or decrease cost effectiveness by better coordinating trips across counties. However, serving multiple counties may also mean longer trip lengths. Proximity to a major metropolitan area for rural and state-funded transit districts influences trip lengths and therefore cost effectiveness depending on the number of persons carried. Transit districts may not have major medical facilities, dialysis centers, colleges, or a significant number of jobs located within the service area. Therefore, transit services may provide trips to connect people to these destinations. The Texas/Mexico border for many border towns generates a high number of persons traveling daily across the border as pedestrians and then use transit to access services and jobs.

Table 19 and Table 20 provide the rural and state-funded urban transit districts that operate service across multiple or single counties, in proximity to the Texas/Mexico border and/or in proximity to a major metropolitan area.

**Table 19. RTDs Operating in Multiple Counties and Proximity to Texas/Mexico Border or Major Metropolitan Area.**

| Rural Transit Districts | Service Area (Single or Multi-county) | Proximity to Texas/Mexico Border or Major Metro |
|---|---|---|
| Alamo Area Council of Governments (San Antonio) | Multi | Metro |
| Ark-Tex Council of Governments (Texarkana) | Multi | |
| Aspermont Small Business Development Ctr. (Aspermont) | Multi | |
| Bee Community Action Agency (Beeville) | Multi | |
| Brazos Transit–The District (Bryan) | Multi | Metro |
| Capital Area Rural Transportation System (CARTS) (Austin) | Multi | Metro |
| Central Texas Rural Transit District (Coleman) | Multi | |
| Cleburne City of (Cleburne) | Single | Metro |
| Collin County Committee on Aging (McKinney) | Single | Metro |
| Colorado Valley Transit (Columbus) | Multi | |
| Community Act. Council of South Texas (Rio Grande City) | Multi | Border |
| Community Council of Southwest Texas (Uvalde) | Multi | Border |
| Community Services, Inc. (Corsicana) | Multi | Metro |
| Concho Valley Transit District (Rural) | Multi | |
| Del Rio, City of (Del Rio) | Single | Border |
| East Texas Council of Governments (Kilgore) | Multi | |
| El Paso, County of | Single | Both |
| Fort Bend County | Single | Metro |
| Golden Crescent Regional Planning Commission (Victoria) | Multi | |
| Gulf Coast Center (Galveston) | Multi | Metro |
| Heart of Texas Council of Governments (Waco) | Multi | |
| Hill Country Rural Transit District (San Saba) | Multi | |
| Kaufman Area Rural Transportation | Multi | Metro |
| Kleberg County Human Services (Kingsville) | Multi | Metro |
| Lower Rio Grande Valley Develop. Council | Multi | Border |
| Panhandle Community Services (Amarillo) | Multi | |
| Public Transit Services (Mineral Wells) | Multi | Metro |
| Rolling Plains Management Corp. (Crowell) | Multi | |
| Rural Economic Assistance League, Inc. (REAL) (Alice) | Multi | |
| Senior Center Resources and Public Transit Service | Single | |
| South East Texas Regional Planning Comm. (Beaumont) | Multi | |
| South Padre Island, Town of (South Padre Island) | N/A | Border |
| South Plains Community Action Assoc. (Levelland) | Multi | |
| SPAN (Denton) | Single | Metro |
| Texoma Area Paratransit System/TAPS (Sherman) | Multi | |
| Transit System Inc., The (Glen Rose) | Multi | |
| Webb Co. Community Action Agency (Laredo) | Single | Border |
| West Texas Opportunities, Inc. (Lamesa) | Multi | |

**Table 20. State-Funded Urban Transit Districts Operating in Proximity to Texas/Mexico Border or Major Metropolitan Area.**

| Small Urban Transit Districts | Proximity to Texas/Mexico Border or Major Metro |
|---|---|
| Abilene | |
| Amarillo | |
| Arlington* | |
| Beaumont | |
| Brownsville | Border |
| College Station-Bryan | |
| Copperas Cove-Killeen & Harker Heights | |
| Galveston | Metro |
| Grand Prairie* | |
| Harlingen-San Benito | Border |
| Lake Jackson-Angleton | Metro |
| Laredo | Border |
| Longview | |
| Lubbock | |
| McAllen | Border |
| McKinney | Metro |
| Mesquite* | |
| Midland-Odessa | |
| North East Transportation Service* | |
| Port Arthur | |
| San Angelo | |
| Sherman-Denison | |
| Temple | |
| Texarkana | |
| Texas City LaMarque | Metro |
| The Woodlands | Metro |
| Tyler | |
| Victoria | |
| Waco | |
| Wichita Falls | |

## TRANSIT MODE INFLUENCE ON COST

Transit modes offered by transit agencies influence the operating cost and performance of the agencies. Demand response transit (DRT) innately has a higher cost per passenger than fixed route transit. This is because a DRT bus carries fewer passengers at one time than a fixed route bus. However, the cost per mile and cost per hour may be lower than fixed route transit. DRT trips may be longer, therefore driving down the operating cost per mile for the service. More fuel-efficient vehicles (vans and small buses) are typically used in DRT. The annual American Public Transportation Association (APTA) fact book provides nationwide modal statistics. Table 21 provides statistics found in the 2011 APTA Fact Book shows the nationwide differences in fixed route and DRT. Cost per passenger is much higher for DRT, but cost per mile and hour are higher for fixed route. The effectiveness measure–passengers per mile, is much higher for fixed route transit service.

**Table 21. APTA 2011 Fact Book (2009 data).**

| Mode | Operating Cost per Passenger | Operating Cost per Mile | Operating Cost per Hour | Passengers per Hour | Passengers per Mile |
|---|---|---|---|---|---|
| Fixed Route | $3.43 | $9.30 | $116.68 | 34.01 | 2.71 |
| DRT | $26.14 | $3.76 | $53.93 | 2.06 | 0.14 |

Source: http://www.apta.com/resources/statistics/pages/transitstats.aspx

Table 22 and Table 23 provide the modes of service provided by rural and state-funded urban transit districts. Twenty-seven of the 38 rural transit districts in Texas operate only DRT. Nine of the districts operate both DRT and fixed route transit. The remaining districts, El Paso County, contracts for fixed route and vanpool transit service, and South Padre Island operates only fixed route. All small urban agencies in Texas operate both DRT and fixed route transportation except for two of the Limited Eligibility Providers–City of Mesquite and City of Grand Prairie.

## Table 22. RTD Modes of Service (2011).

| Rural Transit Districts | Modes* |
|---|---|
| Alamo Area Council of Governments (San Antonio) | DR |
| Ark-Tex Council of Governments (Texarkana) | DR |
| Aspermont Small Business Development Ctr. (Aspermont) | DR |
| Bee Community Action Agency (Beeville) | DR |
| Brazos Transit–The District (Bryan) | DR/FR |
| Capital Area Rural Transportation System (CARTS) (Austin) | DR/FR |
| Central Texas Rural Transit District (Coleman) | DR |
| Cleburne, City of (Cleburne) | DR |
| Collin County Committee on Aging (McKinney) | DR |
| Colorado Valley Transit (Columbus) | DR |
| Community Act. Council of South Texas (Rio Grande City) | DR/FR |
| Community Council of Southwest Texas (Uvalde) | DR |
| Community Services, Inc. (Corsicana) | DR |
| Concho Valley Transit District (Rural) | DR |
| Del Rio, City of (Del Rio) | DR/FR |
| East Texas Council of Governments (Kilgore) | DR/FR |
| El Paso, County of | FR/VP |
| Fort Bend County | DR/FR |
| Golden Crescent Regional Planning Commission (Victoria) | DR |
| Gulf Coast Center (Galveston) | DR/FR |
| Heart of Texas Council of Governments (Waco) | DR |
| Hill Country Rural Transit District (San Saba) | DR |
| Kaufman Area Rural Transportation | DR |
| Kleberg County Human Services (Kingsville) | DR |
| Lower Rio Grande Valley Develop. Council | DR |
| Panhandle Community Services (Amarillo) | DR |
| Public Transit Services (Mineral Wells) | DR/FR |
| Rolling Plains Management Corp. (Crowell) | DR |
| Rural Economic Assistance League, Inc. (REAL) (Alice) | DR |
| Senior Center Resources and Public Transit Service | DR |
| South East Texas Regional Planning Comm. (Beaumont) | DR |
| South Padre Island, Town of (South Padre Island) | FR |
| South Plains Community Action Assoc. (Levelland) | DR |
| SPAN (Denton) | DR |
| Texoma Area Paratransit System/TAPS (Sherman) | DR |
| Transit System Inc., The (Glen Rose) | DR |
| Webb Co. Community Action Agency (Laredo) | DR/FR |
| West Texas Opportunities, Inc. (Lamesa) | DR |

* DR = Demand Response, FR = Fixed Route, and VP = Vanpool

**Table 23. State-Funded Urban Transit District Modes of Service (2011).**

| Small Urban Transit Districts | Modes* |
|---|---|
| Abilene–Citylink | DR/FR |
| Amarillo–Amarillo Transit Company | DR/FR |
| Arlington* | DR/FR |
| Beaumont–Beaumont Transit System | DR/FR |
| Brownsville–Brownsville Urban System | DR/FR |
| City of Temple–Hill Country Transit District–The HOP | DR/FR |
| College Station–Bryan–Brazos Transit District | DR/FR |
| Collin County Committee on Aging | DR/FR |
| Concho Valley Transit District–San Angelo (Urban) | DR/FR |
| Copperas Cove-Killeen & Harker Heights | DR/FR |
| Galveston–Island Transit | DR/FR |
| Grand Prairie* | DR |
| Harlingen-San Benito–Lower Rio Grande Valley Dev. Council | DR/FR |
| Lake Jackson-Angleton | DR/FR |
| Laredo–El Metro | DR/FR |
| Longview–COLT | DR/FR |
| Lubbock–Citibus | DR/FR |
| McAllen Express–Lower Rio Grande Valley Dev. Council | DR/FR |
| Mesquite–MTED* | DR |
| Midland-Odessa Urban Transit District–EZ Rider | DR/FR |
| North East Transportation Service (North Richland Hills)* | DR |
| Port Arthur–Port Arthur Transit | DR/FR |
| Sherman–Denison | DR/FR |
| Texarkana Urban Transit District–T Line | DR/FR |
| Texas City LaMarque | DR/FR |
| The Woodlands | DR/FR |
| Tyler–Tyler Transit System | DR/FR |
| Victoria | DR/FR |
| Waco–Waco Transit System | DR/FR |
| Wichita Falls–Wichita Falls Transit System | DR/FR |

* DR = Demand Response, FR = Fixed Route, and VP = Vanpool

Table 24 provides cost effectiveness, efficiency, and service effectiveness measures for rural transit districts operating DRT only and those that operate a combination DRT and Fixed Route. Rural transit districts operating only DRT operate more efficiently than agencies that operate both DRT and fixed route. However, agencies operating both DRT and fixed route are more cost effective, having a lower cost per passenger measure. El Paso County was left out of the comparison table due to its unique operating characteristics (only operates fixed route and vanpool). Additionally, South Padre Island was omitted because the district only operates fixed route transit. Passengers per mile for agencies operating both fixed and DRT have a higher passenger per mile.

**Table 24. Texas Rural Transit District Modal Performance.**

| | Cost Effectiveness Measure | Efficiency Measure | | Service Effectiveness Measure | |
|---|---|---|---|---|---|
| Modes | Operating Cost per Passenger | Operating Cost per Mile | Operating Cost per Hour | Passengers per Hour | Passengers per Mile |
| DRT only | $22.56 | $2.82 | $50.10 | 2.69 | 0.16 |
| DRT and Fixed Route | $18.00 | $3.14 | $59.95 | 3.94 | 0.21 |

Source: PTN-128 2011

Table 25 provides cost effectiveness, efficiency, and service effectiveness measures for state-funded urban transit districts operating DRT only and those that operate a combination DRT and Fixed Route. Urban transit districts are likely to have a higher passenger per mile performance than rural transit districts because the density of the households is typically higher in urban areas. Urban transit districts operating both DRT and fixed route have a much higher passenger per mile performance measure. The cost per mile and cost per hour are lower for transit districts only operating DRT, but cost per passenger is higher.

**Table 25. Texas Small Urban Transit District Modal Performance.**

| Modes | Operating Cost per Passenger | Operating Cost per Mile | Operating Cost per Hour | Passengers per Hour | Passengers per Mile |
|---|---|---|---|---|---|
| DRT only | $14.16 | $4.38 | $60.60 | 7.44 | 0.49 |
| DRT and Fixed Route | $9.49 | $3.99 | $58.42 | 10.16 | 0.72 |

Source: PTN-128 2011

# CHAPTER 4. INNOVATIVE APPROACHES TO CONTAIN COSTS

Researchers explored innovative approaches to cost containment. With the current economic environment, transit agencies will benefit from fresh perspectives and new thinking in order to face these fiscal challenges.[1] Specifically, researchers explored technology, service delivery, and transit fleet innovations.

Researchers conducted a fact-finding exercise with individual rural and small-urban transit agencies in Texas, and conducted a round-table fact-finding exercise with members of the FTA Region 6 rural and small-urban service providers conducted at the Community Transportation Association of America's 2012 Expo. Rural and urban service providers were selected to provide a representative balance between both service types, while providing examples of service providers in close proximity to growing urban areas. The questions used during fact finding were developed based on information found in the literature review.

A scan of transit providers was performed using the fact-finding questions to determine a state of practice which could be linked back to examples identified in the literature review and previous research findings, or which demonstrated replicable innovative state of practice. In some cases, additional literature was identified which might aid transit agencies in these three areas of study. Seven transit agencies in Texas participated in the fact-finding exercise. Because several of these agencies operate both urban and rural transit systems, they comprised four rural systems (Table 26) and five urban systems (Table 27). Summary information from both tables is derived from 2010 Texas Transit Statistics (*4*).

**Table 26. Rural Transit District Fact-Finding Participants.**

| Rural Transit System | Head-quarters | Total Vehicles | Operating Cost/Vehicle Revenue Hour | Operating Expense/Passenger Trip | Pass. Trips/ Rev Hour | Vehicle Revenue Miles | Unlinked Passenger Trips | Rev/Veh System Failures |
|---|---|---|---|---|---|---|---|---|
| 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 |
| East Texas Council of Governments–Go Bus | 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 |

[1] The Texas Statewide Long-Range Transportation Plan for 2035 (*13*) 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.

**Table 27. Urban Transit District Fact-Finding Participants.**

| Rural Transit System | Head-quarters | Total Vehicles | Operating Cost/Vehicle Revenue Hour | Operating Expense/Passenger Trip | Pass. Trips/ Rev Hour | Vehicle Revenue Miles | Unlinked Passenger Trips | Rev/Veh System Failures |
|---|---|---|---|---|---|---|---|---|
| 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 |

## INNOVATIVE TECHNOLOGY AND SOCIAL MEDIA

Expecting cost containment through the deployment of technology requires preparation. Knowing what is available; what each technology is capable of providing; and, knowing what skill sets are required to increase the chance of a successful deployment are all important aspects of using technology to contain costs. Two additional resources were identified by the researchers, which 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* (*5*) provides guidance in the selection of technology that is appropriate for the needs, size, and type of transit operations and may be useful in technology procurement. Though this report is 10 years old, much of the overview for types of products and selection criteria processes are still valid. Readers may find that recommendations for best fit for system size 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* (*6*) provides a more recent screening of available transit technologies, addresses prerequisites within a transit agency to increase deployment success, and identifies emerging technologies and addresses their potential value to transit providers.

### Dispatching and Scheduling Software

Dispatching and scheduling software is used by a large number of service providers for even small fleets of 8-10 vehicles. This software aids schedulers in developing more efficient demand-response routes, and dispatchers in 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 which will also be addressed); Automatic Vehicle Location hardware to allow dispatchers real-time visual contact with vehicles, and passengers with real-time arrival information; and geographic information system software for more robust planning and scheduling of subscription bus routes or real-time dispatching.

*Deployment Example: Hill Country Transit District*

Use of dispatching and scheduling software has been seen by most service providers as limited to benefiting their demand-response services. Hill Country Transit District (HCTD) uses Streets software for their fixed route systems in Killeen and Temple, Texas. The product has helped them reduce or eliminate duplicative or redundant services such as excessive trips to transfer

sites or downtown centers and has helped identify route paring opportunities. As a result, they have been able to merge several small inefficient routes resulting in time savings; this has allowed HCTD to maintain service hours constant while expanding route service into previously unserved areas resulting in overall ridership increases (increase in vehicle boardings/revenue vehicle hour).

These changes did not come overnight or easy. When HCTD began to use computers to increase efficiency, the first step was building a foundation of employees with requisite computer literacy. This required training existing employees and assuring that new hires had the skills required to fully utilize available technological upgrades. They have seen this as an ongoing educational process (through training, hiring standards, and retraining), which continues to net increases in administrative efficiencies, but one which still needs close monitoring to remain successful.

*Deployment Example: Southwest Michigan Regional Planning Commission*

Kim Gallagher from Southwest Michigan Regional Planning Commission has worked with four counties over the last five years to purchase and deploy a web-based routing and scheduling system used by seven service providers. One of the goals was to allow multiple human service sub-contractors access to their client schedules while retaining client privacy between other service providers.

Some of their service providers are using a portion of the system software; using the report functions to better understand passenger demand and cost for their ridership base. While the software came with different levels of deployment, no user yet trusts the system enough to fully deploy some features. The most notable untapped feature would allow for price to be adjusted based on demand or same-day booking.

No provider has actually sited a reduction in operating cost as a result of deploying new dispatching and scheduling software. However, they did indicate more detailed recording resulted. One operator indicated the software (which allows for the storage of standing-order information) allows for them to 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, their operators report increased administrative customer service and productivity.

**Mobile Data Terminals or Mobile Data Computers (MDT or MDC)**

MDTs and the more recent adaptation of tablet computers such as the iPad have allowed a low cost alternative for deployment of software such as demand-response dispatch, fare collection tracking, fixed route passenger counting, and English translation. Much like cell phone plans, tablet computers are also being used by dispatch and scheduling software vendors for between $0–200/bus, depending on the length of contract and the number of buses in the plan.

*Deployment Example: Fort Smith Transit*

Ken Savage from Fort Smith Transit, Arkansas, was investigating the addition of Mobil Data Computers on their demand response bus fleet. Their system has an Information Technology

Department; they called for a further investigation of alternatives, which led to the purchase of tablet computers.

For the price deferential (in this case, they purchased a $700/tablet compared to $3,000/MDC), they were able to purchase a table for each driver (instead of each vehicle). Drivers all have individual email addresses; schedules are dispatched directly to the driver's tablet instead of an assigned vehicle. As a result, demand response drivers are able to receive updated schedules in real time and send information back to central dispatch as their trips are completed in the same manner. Extra units were purchased for relief drivers and as spare units. Computer tablets can be quickly reprogrammed to replace a defective unit or for reassignment. Fixed route drivers are now able (through the installation of a low-cost software application) to submit their ridership (including by stop), mileage, and fuel data with direct reporting to dispatch. All units have installed a language translator that allows drivers to conduct basic communication with Spanish speaking riders. Given that units are assigned to drivers instead of vehicles, the drivers may take the tablets home after their shift; this can become a low-cost and efficient method of communication between dispatch and drivers.

Because they have opted to use off-the-shelf applications, their costs were limited to the upfront investment of the tablet and applications; monthly operational costs are limited to the cell data plans for each tablet. Their system has been able to allow them to more accurately track riders per hour and more efficiently schedule trips per driver resulting in an average savings of 2.5 hours per route/day.

They have also used a locator application to allow dispatchers to find specific vehicles on duty. It is not as rich as an automatic vehicle location/geographic information system package, which can locate all vehicles in a system or allow dispatchers to track specific routes, but is a great low-cost starter system.

Their system employed drivers who had "never turned on a computer," but they were able to successfully train and transition all drivers to the "paperless system" using the multiple applications installed on the tables. Tablet technology is still new, and it is too early to show hardware reliability; however, this is a low-cost method for smaller systems to deploy technology and can serve as an entry into development of a paperless dispatch system.

*Deployment Example: CARTS*

When CARTS was using a paper manifest every day, they would have to devote a larger number of employee hours to auditing the data against the computerized schedules; making changes to the manifests; then deploy that information via fax machine to each remote transit facility. Since deployment of the MDCs, that audit is performed automatically and deployed directly to the driver's MDC device; updates over the course of the day may also be delivered directly to the driver as they occur. The multiple steps once required to deliver information to drivers (and redeliver information as schedules were updated) was replaced with one direct delivery to the driver in their vehicle; one that can be updated as the day progresses.

Removing the facsimile machine (once a hi-tech tool) from the equation reduced costs through the removal of a, now slow by comparison, dissemination device. Likewise, data for completed

trips are returned directly to central dispatch as those trips are performed providing faster data turn-round and therefore more efficient passenger billing, and more effective use of driver time as central dispatch can monitor the progress of passenger pick-up and drop-off in real time.

**Communications**

Communication systems are comprised of various types, but primarily built on radio frequency or cell tower coverage, and are dependent on coverage and availability 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, and other real-time applications through a central dispatch center.

*Deployment Example: Capital Area Rural Transportation System*

Their greatest technological leap was when CARTS was able to centralize their radio and data system with the Lower Colorado River Authority (LCRA)[2]. CARTS used to run three or four call centers, because limitations based on radio coverage was such that they could not piece together one system to delivery radio coverage to the entire service area. LCRA's radio system allowed CARTS to centralize call and dispatch functions into one location and have voice coverage; what later became more important was a clear digital data stream so that they could begin to deploy other technologies. The successful deployment of a central radio center over a large service area was seen as a sea change moment. Because of the LCRA's robust radio system and because CARTS was their first customer, they were adopted with a mind toward delivering a successful beta service which could then be marketed to others in central Texas. Successful deployment of a digital radio stream has served as a backbone to develop and deploy other technologies such as MDT and a uniform fare card (the RideCARTS card). The efficiencies gained through the automation of dispatch and fare collection have allowed CARTS to move toward an elimination or manipulation of paper over their service area and have reduced the need to collect cash fares. The ability to deploy these technologies has been made possible by building on the backbone of a central voice and digital radio communications system.

**General Transit Feed Specifications (GTFS)**

GTFS was developed by Google and several partners to provide a layer of map-based information specific to transit. Used by Google Transit, and other map-based services, it enables real-time online transit route information to be sharing for fixed route public transit schedules. Placing a system's routes in this format for sharing allows persons searching sites such as Google to plan a trip on public transit between multiple transit agencies where connections exist with a one-stop solution. None of the transit agencies participating in the fact-finding or round-table indicated that they had completed the process of uploading their route information in this format to Google or any other online transit information program; several said they had programs under development. Those who have programs under development indicated they

[2] The LCRA operates a telecommunications network that supports (among other purposes) public safety and community development functions throughout their service territory. They provide 900- megahertz (MHz) 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.

anticipate ridership gains through connecting service with other providers; and improved customer service support through better route information availability to non-riders planning trips online.

For those who have already developed GTFS, shared data has provided increased productivity. While there were no examples of transit systems that have fully deployed GTFS, there are examples of a basic use of Google Maps to design "Mash-ups." These are a good starting point, which can make riders and developers comfortable with what the technology is capable of.

*Deployment Example: Brazos Transit District–Bryan/College Station*

Brazos Transit has developed a fixed route mash-up, which allows them to display route corridors in each of the urban areas where they provide fixed route service. Figure 9 shows how they have used this tool to display routes for their Bryan/College Station service area.

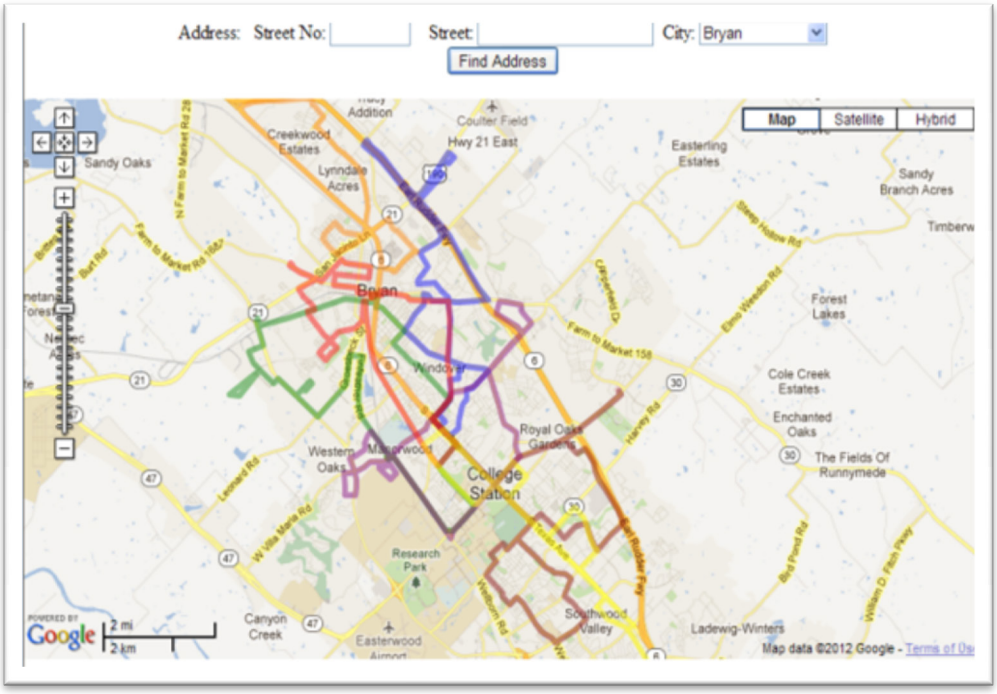



**Figure 9. Brazos Transit GTFS Example.**

Users can type in their street address and street name, and then select "Find Address." By doing so, the map will then zoom to the selected area to identify the route closest to that address point.

Adding GTFS data to this platform can further enhance a mash-up for prospective riders by adding schedule table links to each bus stop within a fixed route system.

Text (such as a table of contents or legend) can be added to a mash-up map, which would provide both information for each route, and allow for a link to schedule information. However, legend information is not as user friendly as users could not link directly to stop or route-table content from the map. However, an added benefit of providing both the mash-up and GTFS is that mash-ups provide a good overview of where all routes are located within a service area

(small scale); use of GTFS to link stop and route information provides precise information at large scale (as users zoom in on a service area).

Developing maps for use to define service routes similar to Brazos can be accomplished using free Google tools online. Start at http://support.google.com/maps/ to gain an understanding of how mapping tools work and to set up an account. Users can then go to https://maps.google.com/ to set up their own user specific maps, which define each of the fixed routes in their service area. GTFS can then be used to define stop locations, which can include more detailed route tables, stop numbers, and photos of each stop location.

**Social Media**

Social media has exploded in recent years and provided new channels for traditional communications. The popularity of web–based networking sites such as Facebook, Twitter, and blogs have led private enterprise and government to embrace these devices as a way to convey information (*7*). This research indicates that social media is here to stay, and that these resources can be used to better engage citizen feedback, enlighten bus riders with more details route and schedule information, and provide prompt updates regarding service changes or disruptions. While no transit providers identified their systems as engaging in the use of Social Media as a tool to communicate with riders or potential riders during fact finding, rural service areas are beginning to deploy their use across the country.

Understanding how to apply social media can allow small organizations to better reach a portion of their citizenry to educate riders and provide a low-cost conduit for service feedback. Several rural transit providers and service planners came together to discuss this issue (*8*). Central to the discussion for systems who believe they are ready to use these tools to promote their system or receive feedback were:

1. Make sure you have a plan; assigned staff must be proficient in using the selected media outlets.
2. Keep your content fresh; if you post route changes to a blog, update that content as routes change.
3. 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.

**Technology Conclusions**

Numerous rural and small urban transit providers have already begun to take advantage of high-end technological advances once available only to large metropolitan transit districts. Most of these technologies have scalable cost entry and provide increased operational efficiencies. Recurring examples include:

- Fleet maintenance software which has allowed transit systems to better track and schedule preventive maintenance inspections; understand actual operating costs through development of periodic reports; and has been an aid in development of centralized maintenance scheduling and repair (including regional maintenance sites shared by multiple transit providers).
- Dispatch and scheduling software which has allowed several providers to increase passenger boardings per vehicle trip; Provided better real-time information from satellite

service centers to centralized dispatch centers; increased the ability of a central dispatch facility to update driver schedule information in real-time; and provided the ability of planning staff to extract trip reports to help evaluate route performance.

- Mobile data computers and similar devices have been installed in vehicles (and in some cases dispatched as computer tablets directly to drivers) to convey scheduling information directly to drivers. This has allowed a more efficient communication of schedule information; made it easier to reassign drivers (remove or cancel trips and add new trips) on short notice; and has allowed trip report information to flow directly back to central dispatch as trips are performed. Most transit providers using this technology have the ability to see where their driver is in real-time; one provider indicated they are pushing this information out to their riders so they can automatically check to see how soon a scheduled bus will arrive at their location.[3]
- Communication systems are the backbone for many other forms of technology. The transit providers, which have developed the richest use of available technology, have built on a regional radio or cell tower platform capable of linking their entire service area to allow for centralized control of dispatch and scheduling.

## INNOVATIVE SERVICE DESIGN

*TCRP Synthesis 94* (*9*) indicates the difficulty of identifying innovative service through direct fact-finding among service providers as they either don't realize that what they are doing is innovative, or believe their practices are just "common sense." However, their true innovations are that they can adapt and re-invent themselves to meet changing demographics, new technology, and economic factors.

An additional research document, *TCRP Synthesis 53: Operational Experiences with Flexible Transit Services* (*10*) provides additional details for flexible transit services (those services which are 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 flexible service 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. Deployment example is CARTS.

### Example Service Design Innovations

In the last 10 years, CARTS has seen several portions of their service area shrink or disappear as urbanized areas grow, or new urbanized areas develop. This has left the overall rural area with less funding, but has not reduced the distances required by passengers to travel to vital services.

CARTS has been working with Capital Metro to design a regional fare structure on their Elgin route feeding into Austin's Capital Metro service. Passengers would pay one fare when they

[3] The proliferation of mobile phones, smart phones, and access to the Internet has resulted in a high reliance on these devices to provide 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, and social media (53) is the next logical platform to disseminate this information.

board and be able to ride into Austin and connect with Capital Metro service with one seamless fare media. The two service providers (CARTS and Capital Metro) would each receive a portion of the fare from a pre-determined agreement; the passengers would need only one fare media device to ride both systems.

CARTS has worked with Capital Metro to develop a bus which is marked with Capital Metro branding, further implying or advertising the connectivity which exists when a passenger boards an Elgin route to Austin.

Moving beyond the nomenclature of "coordination" often deployed by transit operators and government, this is identified by CARTS management as passenger "connectivity." While this often still implies a need to coordinate with other service providers (such as the integration of fare systems), the goal is to develop a regionally connected transit infrastructure which enables riders to expand their trip alternatives. These connectivity strategies (seamless fare payment; connecting service between rural and urban providers using similar bus branding; service frequency; and enhanced route information to allow for trip planning) are tools, which decrease mode barriers and can increase ridership. These steps can also lead to greater farebox recovery and lower route subsidies.

*Deployment Example: East Texas Council of Governments–Go Bus*

Go Bus has expanded a fixed route, which used to travel from Kilgore College and Kilgore, Texas, into Longview. A year ago they expanded that route to connect to the Longview urban transit system. Recent Job Access and Reverse Commute funding has allowed them to expand the route again to connect to Tyler, Texas. Each addition to route service was an attempt to meet demand (identified through census demographics and survey) and utilize new revenue streams to provide additional service for the marginal cost of route extension vs. development of new routes with additional equipment.

They are also taking a second look at a 2008 transfer study by TTI, which identified potential locations where their rural systems could feed passengers into urban service areas at identified transfer locations. Little was done with the results at the time. However, ridership demand and population between the rural and urban service areas has grown to the point that they now believe a modified flexible-route segment[4] service could be developed to serve these transfer locations. The goal is to develop routes, which would be demand-response at their origin and feed into an urban transfer point at scheduled times to correspond with the urban fixed route provider's schedule.

[4] Flexible-route segments were identified in *TCRP Synthesis 53* as one of the operational alternatives which 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.

*Future Trends: Wichita Falls–Falls Ride*

Intercity bus service and rural service by Sharp Lines both provide bus service into Wichita Falls, but Falls Ride had no location to make passenger transfers between bus systems. They are in the process of building an intermodal transfer center, which will allow intercity operators, the rural provider, and city bus service to all use one location. Transfer facilities will help support more efficient service alternatives such as fixed-schedule designs used by CARTS, leaving the rural provider able to increase passenger effectiveness by providing additional low-density trips in the urban area before picking up outbound transfers.

*Metrics to Evaluate Service Design: Waco Transit*

The urban provider works to identify trip generators as new development occurs in the urbanized area (employment centers, medical facilities, schools, high-density residential, etc.) to see if routes need to be adjusted to link new generators to existing routes or whether new routes are justified. Each route is evaluated annually both against itself (from prior year) and against the fleet average to see how well each route is performing. They also track fuel consumption for each route using yearly comparisons to determine if changes in the way a route is structured have contributed to operational costs. Their greatest challenge is getting good response during public feedback as performance metrics are developed and published for comment.

*Challenges and Future Opportunities*

Coordination might seem a poor choice of words to transit providers when many have deployed exemplary regional service designs, including links or transfers to other service providers while (in the words of one transit provider) ignoring the 800 pound guerilla in the room with more transit funding than TxDOT; that guerilla was identified as Medicaid. If coordination were a means to an end (as implied), then service design could greatly improve efficiency and service delivery if all transit funding (including Medicaid) were fully coordinated into all State transit service providers. The challenge identified is to find a way to better coordinate all public transit services *including* Medicaid resources which (if fully coordinated instead of firewalled) could provide a more developed regional transit system for all riders.

*Service Design Conclusions*

In developing and updating route service design, nearly all transit systems that were a part of the fact-finding process identified using portions of the four-step transportation model to improve efficiency on both demand and fixed route systems. These primarily focused on identification of trip generators and maximizing route assignments using trip generation and trip distribution data. Providers rely on surveys; data collected by local Metropolitan Planning Organizations and Council of Governments; and data reports now available from dispatch and scheduling software. Most transit systems using computerized dispatch and scheduling software have begun to rely more on the reports, which can be generated to help them increase 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, funded service areas cannot always provide essential trips between desired origins and destinations inside the neat confines of their service area; oftentimes they involve traveling across boundaries between rural service areas or more commonly between and rural and urban service areas. *Connectivity* was identified by one service provider as a more accurate representation of how service design should be developed to consider the needs of their riders. This includes the ability to assure that the entire transit network of trip origins and destinations is accessible to riders in an affordable and accessible and easy to use manner. While not all transit providers identified their development of service in this way, many used tools that were designed to reach this objective.

## INNOVATIVE FLEET MANAGEMENT

Available research did little to assist in the development of fact-finding questions for the rural and urban transit providers who were a part of this research. Specifically, determining optimum fleet size focused on Paratransit service and was highly analytical while providing few concrete observations or solutions that could be applied by existing service providers.

Research and fact-finding sessions identified several similar and intuitive observations:

1. Optimal vehicle size is positively correlated with level of demand.
2. Larger vehicle size allows for more ride-sharing opportunities.
3. Fleet size and mix should take into account future travel demand.

Earlier research (*11*) determined 103 vehicles were required for an optimum fleet mix, however, only two rural or small urban operators in the state of Texas have fleets this large; they also indicated that factors other than service efficiency figure into the appropriate mix of vehicles used by a transit provider.

### Regional Maintenance and Fleet Mix

Several Operators indicated they are working on developing a Regional Maintenance Facility; are contracting with another government or transit provider to provide service at their Maintenance Facility; or are looking to expand their ability to provide maintenance in-house to reduce reliance on original equipment manufacturer (OEM) dealer service, which is available on the vendor's time schedule and which is seen as less knowledgeable in providing repair and maintenance beyond engine and drive-train (to transit specific components).

[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.

Input from fact-finding research suggested that most operators are looking at three criteria when developing a fleet mix, the first related to fleet maintenance and the second two related to fleet mix:

1. Ability to maintain the fleet in-house; purchasing vehicles which can meet their service demands with standardized engine, drive train, heating, ventilation, air conditioning (HVAC), and other major components.
2. Lift-type (low-floor ramps vs. lifts). In both Paratransit and larger fixed route buses, multiple operators have begun to shift fleets to ramp equipped buses and vans due to their lower maintenance and repair costs and quicker boarding times.
3. Homogenous Fleet Design (seen in nearly all systems observed; prevalent among Demand Response and Fixed Route fleets; less so among medical transit and Paratransit) to reduce parts inventory and mechanic training and allow for standardized Preventive Maintenance (PM) Inspection processes.

*Deployment Example: Waco Transit*

**Regional Maintenance**. Waco Transit is the first in the state of Texas to fully deploy a regional maintenance facility to provide maintenance for transit fleet's in the region including the Heart of Texas Rural Transit District's fleet (the rural provider also based in Waco). They saw the regional maintenance facility as a win-win. Drawing from the larger combined fleet and two maintenance budgets allowed them to pay mechanics a more competitive wage, and enabled them to distribute the capital costs of the facility between two transit systems.

The City of Waco received funding for the facility from FTA 5309 funding in 2002, and built the facility in 2005. The facility was proposed as a center capable of handling the needs of both systems (the City of Waco and Heart of Texas) and was constructed at a cost was $5.2 million. Initial discussions with the rural system were in place when the facility was proposed and constructed, but an Interlocal Agreement was not finalized until September of 2010; that is the point at which a regional maintenance system was formed. Benefits have only just begun to accrue to the rural provider; therefore, they don't have a large enough dataset yet to quantify exact savings, but the installation of a holistic maintenance program has allowed the rural provider to begin to identify and address capital maintenance processes which have increased the state of good repair or reliability of their fleet. The metric for Waco Transit's maintenance program is miles between road calls; again, while there is only a brief history at this point, Waco Transit saw a 117 percent increase in miles traveled between road calls (TxDOT 2009 and 2010 report data).

A challenge in this process was making sure all parties understood the existing state of their fleets; the costs and benefits of bringing those fleets up to an acceptable operating standard by identifying and addressing all repairs and by implementing standardized PM procedures. This led to an initial increase in the cost of maintenance for the rural provider, but these costs have leveled out after the first 18 months, and they have seen an improvement in reliability of their fleet.

**Fleet Mix.** The urban provider worked to identify one vehicle model which was best suited to use for all urban fixed route services and chose an Opus low-floor which lowered maintenance costs due to fleet uniformity; mechanic training; and simple ramp vs. lift reducing maintenance and repair costs. The ramp system on low-floor has also reduced boarding times for persons in wheelchairs and ambulatory passengers formerly limited in their ability to board high profile vehicles with steps. The urban and rural provider have worked together to limit the number of vehicles types used in demand response and medical transportation; again, to reduce the need for mechanic training; and spare parts inventory.

*Deployment Example: Hill Country Transit District*

**Regional Maintenance.** While there has been more interest expressed in developing Regional Maintenance Centers, the layout of service corridors and required fleet distribution figure heavily in the potential for regional centers. Both CARTS and HCTD indicated that development of local maintenance solutions is still the most viable strategy for large rural service districts. HCTD relies on local vendors for basic maintenance and repairs and performs fleet specific functions (such as lift maintenance) using a Rural Fleet Manager.

Within their urban service areas of Killeen and Temple, they have developed and 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 allow for the sharing of fleet service resources between their two urban service areas.

The third step is ongoing. Unlike the Waco example, HCTD did not see a regional maintenance center as a benefit to their rural district given the miles required to relocate vehicles for fleet repairs. Their urban centers are closely located allowing for economies of scale. One size does not fit all; each service area needs to weight costs to benefits; the results will depend highly on service area and the availability of central infrastructure, which can support fleet size and repair needs.

*Deployment Example: CARTS*

**Fleet Mix.** They summed up their fleet development with "we're like Southwest airlines. Southwest uses a 737 to do the majority of our work, we use a Body-On-Chassis (BOC) built on an E450 chassis using a 20-30' body." Standardizing their fleet (approximately 80 percent of their fleet fit the previous vehicle type) reduces the cost of parts inventory; and decreases repair and maintenance costs.

A large portion of that BOC fleet is propane (their goal is for 40 percent of their fleet to operate on propane). CARTS have used propane as a fuel source to varying degrees of success since 1981. In the last three years, they have developed their own propane fueling stations that have allowed them to negotiate larger quantity purchases with vendors to control cost; provide on-site

refilling at local facilities; and control the quality of the fuel delivered and used. In addition to the air quality or emissions variable (important for a transit operator providing service in an Environmental Protection Agency (EPA) near-nonattainment area); the use of propane has also saves them money over the use of other fuels.

Since 2006 (when major changes to Medicaid service required), CARTS began to maintain a small sub-fleet of Crown Victoria autos. These vehicles fit the need to transport smaller groups or single passenger trips with higher gas mileage; lower repair and maintenance costs; and are dual-fuel capable of burning E85. Several transit providers of Paratransit or medical transit services indicated a need for a less standardized fleet to give them more choice on deployment related to capacity and economy given the small number of boardings per hour of these service types.

*Deployment Example: Wichita Falls–Falls Ride*

**Fleet Mix.** Their fleet is currently comprised of 14 buses total fleet; and 8 at peak (8 low-floor Gillig, and 6 El Dorado XHF). All buses are 35' purpose built transit buses with a mix of low and high floor configuration. They have been working to transition toward one bus type (the low-floor Gillig) and are due to replace two XHF buses within the month. The fleet will be fully transitioned to low-floor within the next four years.

Given their service type is route-deviation,[6] they always anticipate the need for multiple lift deployments over the course of a 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 they transport have limited mobility and can benefit from the ability to quickly deploy a ramp to the curb making boarding and debarking far easier than the high-floor which (without deployment of the lift) can only kneel to the curb, but still require passengers to climb the last few steps.

Ramps in the low floor have had far lower maintenance costs and breakdowns as well; when the ramps do have problems, manual deployment is much quicker and easier than with a high-floor lift, and have required no service calls on route.

Finally, moving toward a one-model low-floor fleet as a single vehicle type has begun to lower costs of repair parts stock and made it easier to train mechanics which can now focus on one engine and drive train; one HVAC system; and is reducing (and will eventually eliminate) the need to make hydraulic repairs to lifts.

**Bicycle Access on Transit Fleets**

Similar to research identified during the literature review (*12*), it was challenging to identify or relate a great deal of development among small urban and rural fleets as it relates to bicycle and pedestrian infrastructure. While the research may be a good guide for future development among small urban and rural service providers, developments have occurred primarily in large urban areas and the initial investment may be a financial barrier. While bicycle amenities have

[6] Route deviation is a scheduled route corridor with scheduled stops, which 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.

been developing in large urban and university systems over the past five years to counter the limitations of bike capacity on buses, no such demand was readily identified among the small urban or rural providers during fact finding. With limited exception, few providers were linking large numbers of passengers on developed routes between their rural service areas and large trip-generator destination points on first-shift commuter bus routes (routes supported by investment in bicycle infrastructure). While first-mile and last-mile transportation is often well served by bicycle, the service characteristics and demographics of the study group may have more to do with the lack of observed demand.

Pedestrian and bicycle access was identified as an important aspect of route development for Longview Transit. During route evaluation, they have begun to collect data on bus stop inventory, including amenities such as benches, signage, and bike racks as well as pedestrian access. These are seen as important elements to help grow access to transit routes for more persons living along route corridors.

Bicycle racks on buses (BOB) are also installed on all fixed route buses and commuter bus routes in the CARTS system. 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 the type of service links likely to see usage increases in the near future. BOB overloads or left-behinds are already common for Texas State's commuter bus route between Austin to San Marcos. Riders (predominately students) commonly using their bicycle to get to a bus stop in Austin, can find themselves waiting for the next bus to depart campus in the afternoon if all bus bike rack positions are taken. Over time, risk-averse riders who do not need a bicycle at their destination will park them in Austin at a bus stop. As CARTS and other rural and small urban providers continue to connect their passengers to larger systems, they are likely to see an increase in rack utilization on their buses and at connecting bus stops. Making sure these amenities are developed as connections are made will be an important asset in customer service and ridership development.

*Regional Maintenance and Fleet Mix Conclusions*

The mix or number of different types of service vehicles was proportional to the number of different service types (demand-response, fixed route, Medicaid contract service) provided by each transit agency. Most transit providers did prefer developing one vehicle model for each service type to standardize parts inventory and lower repair costs (e.g., a fixed route service provider shifting their fleet to all Gillig buses to lower parts inventory and ease PM procedures). Several systems (both Demand and Fixed) indicated a deliberate move to low-floor vehicles as a standard to lower maintenance and repair costs while decreasing passenger boarding times.

One transit provider has finished a Regional Central Maintenance facility that provides service to their urban and rural transit systems and several others are working to develop a similar arrangement. The two greatest challenges are funding and distance:

1. Basic funds for replacement capital and operations eat up most rural and small urban budgets; there is no set-aside specific to capital construction; and, funding which is available is usually limited and highly competitive across the U.S. In the interim, most

transit systems are working to maximize fleet life with computerized fleet maintenance systems that centralize control of fleet maintenance.
2. Rural providers with large service areas see small regional maintenance facilities placed throughout their service area as their first step in providing better maintenance control.

Rural and small urban transit providers have been, and will need to continue to be, savvy in their use of scare dollars. 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 (*13*). Using the tools identified in this report can help transit operators cope with the challenges of limited funding by taking steps to raise efficiencies to help meet the needs of an increasingly transit dependent population base.

# CHAPTER 5. COST DRIVER AND COST CONTAINMENT MATRIX

Researchers developed a matrix of sources for best practices organized by cost topic and by transit operations function (Table 28):

- Operations.
- Maintenance.
- Administration.
- Purchased Transportation.

These sources offer transit agency staff information and guidance on cost containment strategies. In each case, titles are hyperlinks to the web-based document.

**Table 28. 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 (*14*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 77: Managing Transit's Workforce in the New Millennium (*16*)<br>TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (*17*) |
| 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 (*14*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (*17*) |
| 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 (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| Other operations staff wages and benefits | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (*17*) |
| Match reservationist staff shifts with call patterns and call demand | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |

**Table 28. Matrix of Sources for Managing Transit Operations Costs (continued).**

| 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 (*14*)<br>Facilitating Creation of Transit System Technology User Groups (*20*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*)<br>Creative Ways to Manage Paratransit Costs (*21*) |
| Ability to impact operations in real-time (e.g., automatic vehicle location, MDTs) | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>Creative Ways to Manage Paratransit Costs (*21*) |
| Skills in maximizing computer-aided scheduling and dispatching | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>Facilitating Creation of Transit System Technology User Groups (*20*)<br>Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (*22*)<br>Impacts of Management Practices and Advanced Technologies on Demand Responsive Transit Systems (*23*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>Creative Ways to Manage Paratransit Costs (*21*) |
| Matching revenue hours to demand | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| Reduce underutilized revenue hours through service span adjustments | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*) |
| Dwell time | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |

**Table 28. Matrix of Sources for Managing Transit Operations Costs (continued).**

| 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 (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| System speed | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| No-shows and late cancels (demand response) | FTA Topic Guide 7: No-Shows in ADA Paratransit (*24*)<br>TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (*22*)<br>TCRP Report 135: Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Scheduling (*18*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*)<br>Creative Ways to Manage Paratransit Costs (*21*) |
| 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 (*25*)<br>TCRP Report 61: Analyzing the Costs of Operating Small Transit Vehicles (*26*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| Fuel cost | TCRP Report 156: Guidebook for Evaluating Fuel Purchasing Strategies for Public Transit Agencies (*27*)<br>TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements (*25*)<br>RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (*2*)<br>Rising Fuel Costs: Impacts on Transit Ridership and Agency Operations (*28*) |
| Vehicle condition and maintenance practices | Site Assessment Instrument for Regional Maintenance Center (*29*)<br>TCRP Report 146: Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements (*25*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*)<br>TCRP Synthesis 54: Maintenance Productivity Practices (*30*) |

**Table 28. Matrix of Sources for Managing Transit Operations Costs (continued).**

| Transit Operations Function | Sources for Cost Containment Strategies |
|---|---|
| Maintenance parts | Site Assessment Instrument for Regional Maintenance Center (*29*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| Supplement difficult to service or peaks with non-dedicated service | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>Rising Fuel Costs: Impacts on Transit Ridership and Agency Operations (*28*) |
| Maintenance staffing wages and benefits | Site Assessment Instrument for Regional Maintenance Center (*29*)<br>TCRP Synthesis 54: Maintenance Productivity Practices (*30*)<br>TCRP Report 77: Managing Transit's Workforce in the New Millennium (*16*) |
| Administration | |
| Staffing wages and benefits | TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 77: Managing Transit's Workforce in the New Millennium (*16*)<br>TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (*17*) |
| Allocated central services | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 144: Sharing the Costs of Human Services Transportation: The Transportation Services Cost Sharing Toolkit (*31*) |
| Utilities | TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*) |
| Marketing and customer service | TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>TCRP Report 77: Managing Transit's Workforce in the New Millennium (*16*) |
| Finance and procurement (accounting, payroll, budget, purchasing) | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 1 The Transportation Services Cost Sharing Toolkit (*31*)<br>TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 2 Research Report (*31*) |
| Risk management (claims, liability, safety planning) | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| General activities (personnel, legal, insurance, IT, general management) | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>TCRP Report 77: Managing Transit's Workforce in the New Millennium (*16*)<br>TCRP Report 127: Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (*17*)<br>TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 1 The Transportation Services Cost Sharing Toolkit (*31*)<br>TCRP Report 144: Sharing the Costs of Human Services Transportation: Volume 2 Research Report (*31*) |

**Table 28. Matrix of Sources for Managing Transit Operations Costs (continued).**

| Transit Operations Function | Sources for Cost Containment Strategies |
|---|---|
| Purchased Transportation and Cooperative Agreements | |
| Use incentives/disincentives effectively | TCRP Report 124: Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation (*14*)<br>Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (*22*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*) |
| 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 (*14*)<br>RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (*2*)<br>Creative Ways to Manage Paratransit Costs (*21*) |
| 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 (*14*)<br>Factors Influencing Productivity and Operating Cost of Demand Responsive Transit (*22*)<br>Impacts of Management Practices and Advanced Technologies on Demand Responsive Transit Systems (*23*)<br>Effects of Contracting on Cost Efficiency in US Fixed Route Bus Transit Service (*32*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>Special Report 258: Contracting for Bus and Demand-Responsive Transit Services: A Survey of U.S. Practice and Experience (*33*)<br>RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (*2*)<br>TCRP Report 54: Management Toolkit for Rural and Small Urban Transportation Systems (*19*)<br>Creative Ways to Manage Paratransit Costs (*21*) |
| 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 (*34*)<br>Effects of Contracting on Cost Efficiency in US Fixed Route Bus Transit Service (*32*)<br>TCRP Report 136: Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance (*15*)<br>Special Report 258: Contracting for Bus and Demand-Responsive Transit Services: A Survey of U.S. Practice and Experience (*33*)<br>RMC 0-6194: Quantifying the Purchasing Power of Public Transportation in Texas (*2*) |

# CHAPTER 6. GUIDEBOOK AND WORKSHOP DEVELOPMENT

Researcher's main objective in this research project was to develop a guidebook and pilot workshop. Chapter 6 provides the methodology and outcomes of the guidebook and pilot workshop development effort.

## GUIDEBOOK DEVELOPMENT

TTI researchers determined topics to include in the guidebook based on results of a transit agency questionnaire. Researchers developed a questionnaire to gain feedback on cost factors that would be beneficial to include in the *Managing Operating Cost for Rural and Small Urban Transit Guidebook*. The questionnaire was presented in the form of a Survey Monkey questionnaire to 18 rural and state-funded urban transit agency managers representing a cross-section of agencies. The objective of the questionnaire was to determine the current industry priorities for containing transit costs. Based on the results, researchers identified cost containment topics to include in the final guidebook.

### Questionnaire Respondents

Researchers sent the questionnaire to a cross-section of 18 rural and state-funded small transit agency managers. A total of 13 or 72 percent responded. Table 29 provides the list of respondents.

**Table 29. Transit Agency Manager Respondents.**

| Name | Agency | Title |
|---|---|---|
| Terry Reeves | Hill Country Transit District | Assistant General Manager/Financial Dir. |
| John O. Hedrick | East Texas Council of Governments | Director of Transportation |
| Vince Huerta | Project Amistad | Director of Transportation |
| Gary Rushing | Heart of Texas Council of Governments | Transportation Manager |
| Julie Floyd | City of Cleburne, City/County Transportation | Transportation Manager |
| James Oliver | Alamo Area Council of Governments | Economic Development |
| Ben Herr | Abilene, CityLink | General Manager |
| Karen Faulkner | West Texas Opportunities, Inc. | Transportation Director |
| Brian Baker | SPARTAN Public Transportation | Director |
| Charlotte Clower | Community Services, Inc. | Transportation Director |
| Sarah Cook | Community Council of Southwest Texas, Inc. | Transit Director |
| John J. Burns | City of Del Rio Transportation | Transportation Director |
| Bob Johnson | City of Arlington, Handitran | Transit Manager |

### Questionnaire Topics

Researchers structured the questionnaire into four topic areas by transit cost function: operating costs, maintenance costs, administrative costs, and purchased transportation costs. Each topic area included a list of factors that drive costs for the function. For example, factors influencing the function of maintenance include determining a vehicle spare ratio, maintaining vehicles/state of good repair and buying parts. Researchers asked participants to rate on a scale of 1 to 7 the

interest for each factor, where 1 is "Not Interested" and 7 is "Most Interested." Researchers used the responses to prioritize topics to include in the final guidebook.

### Questionnaire Responses

Table 30 provides a high-level summary of the ranking of cost topics, and Table 31 provides considerations/comments and suggestions. Table 30 provides the average ranking and the number of respondents that ranked the topic as a 6 or 7.

**Table 30. Cost Containment Strategy/Topic Ranking.**

| Strategy/Topic | Average | No. Responding 6 or 7 |
|---|---|---|
| Decreasing no-shows and late cancels (demand response) | 6.23 | 11 |
| Aligning driver shifts to meet service demand (peak to base ratio, split shifts, part-time/full-time mix) | 6.08 | 11 |
| Matching reservationist/dispatch staff shifts with call patterns and call demand (demand response) | 6.23 | 10 |
| Using technology to increase cost effectiveness (e.g., automatic vehicle location, MDTs) | 6.15 | 10 |
| Conducting risk management (claims, liability, safety planning) | 6.08 | 10 |
| Creating cost-effective manifests (demand response) | 5.92 | 10 |
| Buying fuel (fuel cards, agreements, bulk purchases) | 6.08 | 9 |
| Maintaining vehicles (impacts of vehicle condition and processes for state of good repair) | 6.08 | 9 |
| Providing marketing and customer service | 6.00 | 9 |
| Choosing vehicle types to effectively deliver service–fuel type, capacity, fuel efficiency, vehicle life | 5.85 | 9 |
| Buying maintenance parts | 5.62 | 9 |
| Developing contracts for service to private sector–types of contracts–market type, considerations in contract service requirements (management contracts, turn-key contracts, maintenance contracts, operations contracts) | 5.31 | 7 |
| Using incentives/disincentives effectively | 5.31 | 7 |
| Providing competitive wages | 5.54 | 6 |
| Developing cooperative purchasing agreements | 5.38 | 6 |
| Determining contributed service agreements | 5.38 | 6 |
| Managing pay time off (vacation, sick policies, etc.) | 5.08 | 6 |
| Providing alternative service delivery options where appropriate (e.g., partnerships with community agencies, same-day taxi, volunteer drivers/staff) | 4.85 | 6 |
| Creating cost-effective fixed route schedules | 4.83 | 6 |
| Providing competitive benefits (health insurance, retirement, etc.) | 4.69 | 6 |
| Supplying administrative contributed services | 5.08 | 5 |
| Determining spare ratio | 5.00 | 4 |
| Paying for agency central services | 4.85 | 4 |

**Table 31. Cost Containment Questionnaire Considerations/Suggestions/Comments.**

| Suggestions/Comments on Factors Related to Costs: |
|---|
| Consider control overtime and fuel costs. |
| Reduce fuel consumption by monitoring idling. |
| On two items, we checked "not interested" only because we already have a good system of employee benefits and are very pleased with the return on this investment. |
| Delays in getting Medicaid schedules to dispatch and manifest from. |
| Managing idling vehicles needed to maintain cabin environment. Is there a cost-effective alternative? |
| Participating in regional maintenance program. Joint procurements when feasible. Regional vehicle procurements to set the stage for regional maintenance program. |
| Rural agencies rarely have the opportunity to seek outside services |

## Guidebook Topic Selection

Based on the questionnaire results, transit agency interest for case study, information relating to each strategy/topic and research committee feedback, researchers selected the following strategies/topics to include in the guidebook development.

- Maintenance: Vehicles and State of Good Repair.
  - Maintaining vehicles (impacts of vehicle condition and processes for state of good repair).
- Fuel: Buying Fuel and Managing Consumption.
  - Buying fuel (fuel cards, agreements, bulk purchases).
- No-Shows: Minimizing No-Shows and Late Cancels.
  - Decreasing no-shows and late cancels (demand response).
- Staff: Managing Shifts to Manage Costs.
  - Aligning driver shifts to meet service demand (peak to base ratio, split shifts, part-time/full-time mix).
  - Matching reservationist/dispatch staff shifts with call patterns and call demand (demand response).
- Contracts: Cost Savings in Contract Development.
  - Developing contracts for service to private sector (types of contracts, market type, considerations in contract service requirements).
- Future Trends and Forward Thinking Approaches.
  - Implementation of technology.
  - Service design and impact of changing demographics.
  - Fleet mix and fuel efficiency.

## Guidebook Structure

To develop the contents of the guidebook, researchers used the research results presented in this report. Researchers also queried representatives from agencies across Texas–both rural and small urban transit agencies–to determine lessons learned for each of the six selected topics. A team of researchers developed each of the guidebook chapters. The guidebook presents real-world examples derived from respondents' anecdotes to illustrate best practices.

Researchers developed the guidebook in three parts. Part 1introduces 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. Part 3 provides practical tools to help managers allocate costs by service type and conduct market analyses to improve services offered consumers. Table 32 provides the guidebook organization.

**Table 32. Guidebook Organization.**

| | |
|---|---|
| Part 1. Understanding Transit Cost Fundamentals | Chapter 1. Fundamentals of Transit Costs<br>Chapter 2. Calculating Transit Cost Drivers |
| Part 2. Strategies for Optimizing Transit Costs | Chapter 3. Staff: Managing Shifts, Manage Costs<br>Chapter 4. Maintenance: Vehicles and State of Good Repair<br>Chapter 5. Buying Fuel and Managing Consumption<br>Chapter 6. Contracting for Transit Services<br>Chapter 7. No-Shows: Minimizing No-Shows/Late Cancellations<br>Chapter 8. Future Trends and Forward Thinking Approaches |
| Part 3. Tools and Resources | Chapter 9. Allocating Costs by Service Type<br>Chapter 10. Leveraging What You Know<br>Chapter 11. Peer Comparison and Benchmarking<br>Appendix: Sources by Cost Area |

## Guidebook Topic Development

Researchers worked with transit agencies to develop each of the six main topics. Researchers answered the following series of questions to develop the topic chapter:

1. How do I know if my agency could more efficiently manage _____?

Researchers provided tools to analyze needs for each topic. Researchers created a checklist of questions to ask as a self-assessment regarding how well the transit agency currently manages the topic costs.

2. How do I gather and use information to manage _____?

Researchers used example information from a high-performing agency providing data reporting examples, trend analysis, performance goals, and tracking tools. Researchers used examples for how to gather, report, and track data. Researchers included examples of the potential savings transit agencies may realize in implementing cost management practices.

3. What are policies, procedures, practices, and strategies for managing_____?

Researchers provided best practices found from literature review and from high performing agencies. Researchers provided regulations, benchmark studies, and peer comparison information to understand the cost topic.

Each topic area illustrated the tools and practices suggested providing actual rural or small urban transit agency examples. Finally, each chapter ended with a "What to Remember"—to highlight the information from the chapter. Each researcher developed the topic chapter using the same template format to provide a cohesive flow to the guidebook.

### Final Guidebook

Researchers compiled the chapters and provided to a professional editor who rewrote the chapters in a user-friendly format and language. Researchers presented the draft guidebook to the TxDOT Research Committee. Researchers also provided the guidebook to each of the *Managing Operating Cost for Rural and Small Urban Transit Workshop* participants. The TxDOT Research Committee and workshop participants provided feedback. Researchers incorporated suggested edits and comments into the final document.

The guidebook entitled, *Managing Operating Costs for Rural and Small Urban Transit Systems*, is available as a separate document.

## PILOT WORKSHOP DEVELOPMENT

Researchers prepared a one-day pilot workshop with accompanying training materials that included an instructor's guide with lesson plans, a participant notebook, and PowerPoint presentations. The instructors also provided handouts and worksheets to reinforce the learning outcomes. Each participant also received a copy of the draft guidebook.

The purpose of the pilot workshop is to test and gain feedback on the workshop materials and format. The pilot workshop included a beginning and ending general session, and provided six sessions in specific operating cost areas including:

- Staff: Managing Shifts, Managing Costs.
- Maintenance: Vehicle Replacement Plans and State of Good Repair.
- Contracting for Transit Services.
- Future Trends and Forward Thinking Approaches.
- Buying Fuel and Managing Consumption.
- Minimizing No-Shows and Late Cancellations.

The workshop was a six-hour format including breaks and lunch (Table 33). Researchers distributed a flier at TxDOT's January 2013 Semi-Annual meeting for transit agencies (Figure 10).

**Table 33. Workshop Agenda and Topics.**

| Time of Day | Title | Topics | Time Allotment |
|---|---|---|---|
| **9:00–9:45** | **Opening General Session** | • Introductions.<br>• Review Workshop Agenda and Topics.<br>• Workshop Expectations. | 45 minutes |
| **9:45–10:00** | **Break** | | 15 minutes |
| **10:00–10:50** | **Session 1** Maintenance: Vehicle Replacement Plan/State of Good Repair | • Projecting maintenance costs as part of the total budget.<br>• Identifying current maintenance cost-related practices.<br>• Gathering and using information to manage maintenance costs.<br>• Using maintenance efficiency performance measures.<br>• Creating policies, procedures, and strategies to manage maintenance costs. | 50 minutes |
| **10:00–10:50** | **Session 2** Minimizing No-Shows and Late Cancellations | • Factors that drive no-shows/late cancellations (transit agency and patron).<br>• No-show/late cancellation impact on productivity and cost.<br>• Standardized forms/tools to track no-shows/late cancellations.<br>• Thresholds for excessive no-shows and late cancellations.<br>• Managing no-shows/late cancellations using strategies, policies, and procedures.<br>• Potential cost savings in reducing no-shows/late cancellations. | 50 minutes |
| **10:50–11:00** | **Break** | | 10 minutes |
| **11:00–12:00** | **Session 3** Contracting for Transit Services | • Identifying why a public transit agency might contract for transit services.<br>• Providing examples of public transit agencies in Texas that contract to provide transit services.<br>• Understanding why and how a private contractor might be able to reduce operating costs as compared to the public transit agency.<br>• Recognizing the circumstances favorable for privatization (or not).<br>• Listing the possible pitfalls for contracting for services.<br>• Identifying possible cost savings and savings offsets.<br>• Choosing the right procurement method.<br>• Reviewing best practices for procurement.<br>• Ensuring the contractor delivers quality service. | 60 minutes |
| **11:00–12:00** | **Session 4** Future Trends and Forward Thinking Approaches | • Overview of approaches and research methods in managing operating costs.<br>• Implementation of technology and understanding new or recent technology.<br>• Service design and impact of changing demographics.<br>• Fleet mix and fuel efficiency.<br>• Statewide and national deployment examples.<br>• Localizing savings from implementation of regional and national trends.<br>• Discussion and feedback from activity.<br>• Conclusion, synthesized examples. | 60 minutes |

**Table 33. Workshop Agenda and Topics (continued).**

| Time of Day | Title | Topics | Time Allotment |
|---|---|---|---|
| **12:00–1:30** | **Lunch** | | 90 minutes |
| **1:30–2:20** | **Session 5** Buying Fuel and Managing Consumption | • Identifying fuel cost drivers and budget impact.<br>• Purchasing fuel and housing fuel considerations (pros and cons) to gain best fuel price and minimize travel time to fueling stations.<br>• Managing to reduce fuel consumption (driver behavior/training, policies on idling and scheduling, planning for fleet replacement and maintenance).<br>• Calculating potential cost savings in implementing fuel purchasing and management strategies. | 50 minutes |
| **1:30–2:20** | **Session 6** Staff: Managing Shifts, Managing Costs | • Operations productivity vs. cost-savings.<br>• Evaluate current management practices.<br>• Types of information/analysis to inform your staff levels.<br>• Best-practices to control labor costs and improve service quality. | 50 minutes |
| **2:30–3:00** | **Closing General Session** | Workshop Summary and Review. | 30 minutes |

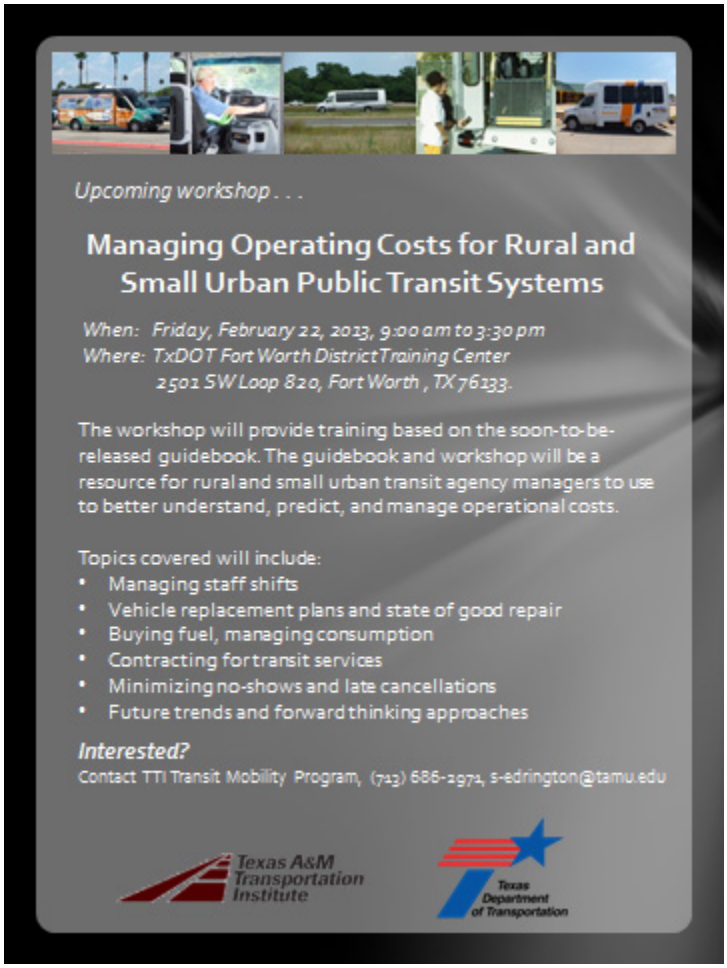



**Figure 10. Pilot Workshop Notice.**

The workshop was held on February 25, 2013, at the TxDOT Fort Worth Training Facility. Because the workshop was a pilot, researchers purposely limited the number of participants in order to gain better feedback on format and content. A total of 19 participants attended the pilot workshop. Over 60 percent of the participants (12 of 19) were from transit agencies located in the Dallas-Arlington-Fort Worth region. Workshop participants included representation from 13 different transit agencies—one dual urban-rural transit district, two urban transit districts, nine rural transit districts, and one social service agency that provides transportation services.

**Pilot Workshop Evaluations**

Instructors distributed evaluation forms to the participants at each session and at the closing session. Participants were asked to rate the overall session as Very Good, Good, Average, Poor, or Very Poor and provide comments or answers to the following questions:

- Please provide comments on what you liked most and what you liked least.
- If you rated poor or very poor, what did you not like and how might we improve?
- Did the session benefit you? If so, how?
- Please share any other thoughts on how we can make today's information more useful or effective.

The session entitled "Staff: Managing Shifts, Managing Costs" was the most attended session and the least attended was "Buying Fuel and Managing Consumption." All other sessions were about equally attended. Overall, the pilot workshop evaluations were positive.

During the closing general session, TTI facilitated a discussion of the overall pilot workshop format and information. Participant's major request was to lengthen each topic area. Participants stated that each topic area was too short–"provided appetizers and now I want the entrée." Specific suggestions are included in Chapter 7, Findings and Conclusions.

The instructor's guide, participant workbook, and PowerPoint™ presentation are provided as separate documents.

# CHAPTER 7. FINDINGS AND CONCLUSIONS

Researchers had the opportunity to interact with many rural and small urban transit agencies throughout this project. Transit agency managers and staff have a variety of backgrounds and experience. Because of the variety of backgrounds and experience, transit agency managers and staff have differing interests in topics for managing operating costs and differing level of need for guidance and training.

## GUIDEBOOK TOPIC AREAS

Researchers chose the six main topics for the guidebook based on transit agency ranking of topic areas in order to capture the majority of interests. The topic areas include:

- Maintenance: Vehicles and State of Good Repair.
- Fuel: Buying Fuel and Managing Consumption.
- No-Shows: Minimizing No-Shows and Late Cancels.
- Staff: Managing Shifts to Manage Costs.
- Contracts: Cost Savings in Contract Development.
- Future Trends and Forward Thinking Approaches

The level of interest shown from rural and small urban transit agency staff wanting to participate in the workshop indicates topic areas are relevant to today's transit agency needs. Researchers sent out a notice to all Texas rural and small urban transit agencies providing information on the pilot workshop content and requesting participants. Within two days over 40 individuals requested to participate. Because the workshop was intended as a pilot, researchers limited the attendance. The popularity of the workshop topics indicates the level of interest, need, and timeliness for both the guidebook developed and the workshop. Feedback received did not include suggestions for topics outside of the ones selected.

## WORKSHOP FORMAT AND CONTENT

Feedback from the transit agencies and project monitoring committee that reviewed the guidebook and participated in the workshop indicated that:

- Some agencies with new management and staff need more in depth on the "Transit Operating Cost Fundamentals" for establishing good cost reporting and tracking.
- The workshop topic training should be more than one hour to have time for round table discussion to hear ideas from other agencies.
- The workshop should include more how-to templates and step-by-step procedures.
- The workshop should provide more networking opportunity by bringing lunch in rather than time to go out for lunch.
- Taxes and rebate information should be added to the Buying Fuel topic.
- The Future Trends and Forward Thinking Approaches should be separated into three topics or include in other topic areas–Technology/Social Media, Service Design, and Fleet-Mix.
- The workshop should include a session on peer comparison and benchmarking.

- The workshop curriculum should include a longer session specifically to address operations labor management to include managing overtime.
- The workshop should be over a two-day period rather than one so that participants would not have to choose between topics.

## MANAGEMENT OF OPERATING COSTS

Setting standards to achieve high-quality reporting enables managers to understand, predict, and better manage program operations. Based on the research findings detailed in this report, *Identifying Best Practices for Managing Operating Costs for Rural and Small Urban Public Transportation Systems,* researchers recommend that transportation providers adopt the following:

- Consistently collect cost data for all line items in a standardized chart of accounts that should include all costs required to produce transportation services (*31*).
- Assign line items to each transit function–operations, maintenance, administration, purchased transportation, and planning.
- Calculate performance measures as a benchmark and track performance over time.
- Highlight low-performing and high-performing areas.
- Compare performance to peers and benchmark.
- Consistently report performance to stakeholders.

A lack of uniform reporting standards often results in incomplete or inconsistent statements of a program's costs and services. Transit agencies that establish a good framework for reporting costs 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.

## LEVERAGING DATA

Transit agencies have information readily available either internally or externally. Examples of the kind of information readily accessible 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.

Researchers recommend taking advantage of the data available to use in planning service and managing costs. Driver 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. Researchers encourage good data capture practices by staff and conducting reasonableness checks to verify accurately. Demographic information compared to manifest data can help transit staff to identify areas needing improvement. Categories for analysis include passenger age, trip purpose, trip origin/destination, and average rider share. Looking at the same data from multiple perspectives can help a transit agency identify where the agency is strong and where it may have weaknesses to manage costs. Transit agencies should ask for stakeholder

input. Stakeholders have a vested interest in the success of the agency. Stakeholders may also be willing to share their own data collected.

## WORKSHOP SUGGESTED FORMAT REVISION

Researchers suggest that the workshop format be revised to include time for peer agency discussion and to work with "how-to" templates and step-by-step examples in a round table format. To accomplish this, researchers suggest that each topic be in two-hour time slots rather than one-hour. Researchers suggest that topics be grouped so that participants could choose to attend one or two days. To accommodate the request from staff new to transit, researchers suggest adding a Transit Cost Fundamentals and Allocating Cost to Services as a full-day course option. Also suggested is to add a session on peer comparison and benchmarking. Table 34 provides a revised workshop format, grouping topics by different transit staff interests: operations staff, maintenance staff, management staff, and accounting staff. Researchers grouped operations/maintenance staff interest topics and management/accounting staff topics.

**Table 34. Revised Workshop Format.**

| Topic | Time Allotment |
|---|---|
| **Operations Staff Interests:** | |
| Staff: Managing Shifts, Manage Costs | 2 hours |
| No-Shows: Minimizing No-Shows/Late Cancellations | 2 hours |
| **Maintenance Staff Interests:** | |
| Maintenance, Fleet-Mix, and State of Good Repair | 2 hours |
| Buying Fuel and Managing Consumption | 2 hours |
| **Management Staff Interests:** | |
| Contracting for Transit Services | 2 hours |
| Technology/Social Media | 2 hours |
| Leveraging Data and Service Design | 2 hours |
| Peer Comparison and Benchmarking | 2 hours |
| **Accounting/Management Staff Interests:** | |
| Transit Cost Fundamentals and Allocating Costs by Service Type | Full-Day Course |

## CONCLUSIONS

Based on the findings of this research, researchers suggest dissemination of the guidebook to rural and small urban transit agencies and offering additional workshops to implement the project materials. The guidebook and workshop information support transit agencies in the interest of better managing operating costs.

The workshop training materials developed in this research project with the suggested workshop format revisions would provide transit agency staff with information and tools needed to report, track, and manage operating costs. The workshops would help promote the use of the guidebook and advance the ability to balance service demand, quality of service, and service cost with available funding.

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