Regional Fare Policy and Fare Allocation, Innovations in Fare Equipment and Data Collection

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16. Abstract

Changing demographic, land use, and social characteristics are prompting transit agencies to rethink the traditional business model of operating in a fairly independent manner within their jurisdictional boundaries. As a result, the planning and implementation of regional fare programs ranging from simple interagency agreements to allow for free transfers between systems to complex multi-agency programs with a technology focus have increased in recent years. The continued evolution and increasingly widespread usage of electronic payment technologies have facilitated fare integration efforts by making possible a greater range of payment options and offering a more efficient means of distributing fare media.

This report documents recent experiences related to regional fare programs in the United States, with an emphasis on institutional arrangements, technological impacts, customer acceptance, data processing enhancements, and costs and benefits. Five case studies are included to demonstrate a variety of approaches to regional fare coordination. A summary of best practices for the implementation of regional fare programs identified in the literature review and case studies is included for agencies who may be evaluating regional fare program options.

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EXECUTIVE SUMMARY

OVERVIEW

The 1997 Transit Cooperative Research Program digest, "Multi-purpose Fare Media Developments and Issues," identified issues and concerns on the part of transit agencies and financial institutions and assessed customer and financial implications associated with various regional fare policy arrangements. At the time the report was written, few multi-agency regional fare arrangements existed in the United States. Issues and concerns contemplated in the industry related to fare policy and technology, including multi-agency/regional fare policy, were:

- **Institutional:** Who are the participants in a regional program, how is such a program organized and operated, and what are the legal and regulatory requirements that must be addressed?

- **Technological:** What types of fare technology issues influence individual or regional agency programs, what are the design requirements, and how will new technology be integrated into existing systems, and what are the compatibility and transitional issues?

- **Customer-Related:** To what extent will customers participate in the development of a regional fare program, what are the benefits, barriers, and implementation issues for customers, and what privacy issues may exist?

- **Data Processing**: What new data will be derived from the technological advances, and how will these data improve planning and marketing efforts and allow for better allocation of fare resources among regional partners?

- **Costs and Benefits**: What are the capital costs associated with the advancements, what savings might be achieved in other areas, and what impact will the technological or policy change have on ridership?

With funding from the Florida Department of Transportation (FDOT) and the U.S. Department of Transportation (U.S. DOT), the National Center for Transit Research (NCTR) at the Center for Urban Transportation Research (CUTR) the University of South Florida (USF) was tasked with investigating and documenting more recent experiences related to regional fare programs in the United States, with an emphasis on the five areas described above. The outcome of the research is intended to be an instrument that may be used by transportation decision makers to evaluate the feasibility of implementing similar programs in their regions and to anticipate the resources necessary for implementation.

RESEARCH METHODOLOGY AND KEY FINDINGS

A comprehensive literature review was conducted to identify articles and reports that have been written on the subject of fare policy, fare technology, regional transit services, and related interlocal agreements. From the literature review, a 'State of the Industry" was prepared with several of the key findings summarized below.

Changing demographic, land use, and social characteristics are prompting transit agencies to rethink the traditional business model of operating in a fairly independent manner within their jurisdictional boundaries. There has been a surge in the percentage of people working outside

their county of residence. In 2000, approximately 34 million commuters worked outside of their county of residence, up from approximately 20 million in 1980, and between 1990 and 2000 roughly half of all individuals that joined the workforce worked outside their county of residence. Nearly 64 percent of metropolitan area commutes occurred between suburbs, and the growth of traditional suburban to city commutes grew only 14 percent.

As a result, the planning and implementation of regional fare programs ranging from simple interagency agreements to allow for free transfers between systems to complex multi-agency programs with a technology focus have increased in recent years. According to the American Public Transportation Association (APTA), in 2008, of 216 U.S. reporting transit agencies who operate fixed-route service, nearly 50 percent participate in some type of inter-agency fare agreement including single trip transfers, regional passes, stored-value media, or other multi-agency passes.

The continued evolution and increasingly widespread use of electronic payment technologies has facilitated fare integration efforts by making possible a greater range of payment options and offering a more efficient means of distributing fare media. Electronic payment, particularly in the form of smart cards, also is supporting regional fare integration and partnerships with non-transit entities.

As data storage retrieval and transfer technologies have become cheaper and more reliable, the obstacles to electronic fare collection system interoperability are decreasingly technical and increasingly managerial, institutional, and political. Agencies may be legally or politically constrained from changing fare policies. They may be resistant to change due to uncertainty in the future of technology and interoperability, or they may serve markets that are less likely to accept more advanced forms of fare payment technologies.

Recent developments in the transit and financial payment industry have created new opportunities for collaboration. The financial payment industry has turned its focus to processing low value micropayments for individual transactions, placing mass transit agencies in a better position to drive mass adoption of new payment systems. There are also new opportunities for joint marketing and promotions that can potentially benefit transit agencies, transit patrons, financial payment card issuers, and merchants.

A significant barrier to the implementation of electronic fare payment systems, particularly smart cards, is related to security. Individuals may question whether their personal data can be adequately protected, while transit agencies must develop policies and procedures to ensure strict data security related to utilization, access, distribution and disposition, based on applicable laws.

While relatively new to the United States, some transit officials see great promise in the future use of mobile systems (cellular telephone applications) for transit fare payments. Mobile payments are viewed as an eco-friendly payment option by reducing the demand for paper and plastic tickets. Because over 72 percent of the U.S. population owns some type of wireless device, the added convenience for fare payment provided by mobile technology may remove another barrier to transit utilization.

This research effort also involved more in-depth documentation of one or more of the topical areas identified in the research objective statement in five case study locations. The case study sites were selected to demonstrate a variety of approaches to regional fare coordination and integration, ranging from relatively simple programs that do not require the use of technology to

extremely complex programs with a heavy reliance on technology applications. The five case studies include the agreement between the Delaware Authority for Regional Transit (DART First State) and the Southeastern Pennsylvania Transportation Authority (SEPTA) for operation of commuter rail service in Delaware; a program involving five transit providers operating bus service in San Luis Obispo County, California; the Port Authority Transit Corporation's (PATCO) automated fare collection system for high speed rail operating in New Jersey and Pennsylvania; Miami-Dade Transit's new EASY Card fare payment system for the four transit modes and parking facilities it operates in Miami-Dade County, Florida; and the One Regional Card for All (ORCA) system used by seven operators in the Central Puget Sound region in western Washington State.

This report concludes with an outline of industry best practices for the implementation of improved fare-related technologies and fare policies that were identified in the literature review and case study development and analyses. The documentation of best practices provides a generalized framework of topics and decision steps that agencies evaluating potential regional fare policies and integrated fare systems should consider.

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1.0 INTRODUCTION

To quote from the Millennium Goals of the Transportation Research Board (TRB) Committee on Public Transportation Marketing and Fare Policy, "One certainty in the new millennium is that customers will still have to pay for their trips, although exactly how they will do so is open to speculation." Several researchers have held that technology should not drive fare policy, but the impacts of technological changes on fare policy decisions are inescapable and are likely to increase the range of options geometrically. A 1997 Transit Cooperative Research Program (TCRP) Project, A-14 "Multi-purpose Fare Media: Developments and Issues," identified issues and concerns on the part of transit agencies and financial institutions and assessed customer and financial implications associated with various regional fare policy arrangements. At the time the report was written, few multi-agency regional fare arrangements existed in the U.S. Issues and concerns contemplated in the industry related to fare policy and technology, including multi-agency/regional fare policy, included:

- **Institutional:** Who are the participants in a regional program, how is such a program organized and operated, and what are the legal and regulatory requirements that must be addressed?

- **Technological:** What types of fare technology issues influence individual or regional agency programs, what are the design requirements, how will new technology be integrated into existing systems, and what are the compatibility and transitional issues?

- **Customer-Related:** To what extent will customers participate in the development of a regional fare program, what are the benefits, barriers, and implementation issues for customers, and what privacy issues may exist?

- **Data Processing:** What new data will be derived from the technological advances, and how will these data improve planning and marketing efforts and allow for better allocation of fare resources among regional partners?

- **Costs and Benefits:** What are the capital costs associated with the advancement of fare technology, what savings might be achieved in other areas, and what impact will the technological or policy change have on ridership?

■ 1.1 PROJECT OBJECTIVE

The National Center for Transit Research (NCTR), with funding provided by the Florida Department of Transportation (FDOT) and the United States Department of Transportation (U.S. DOT), commissioned this study, "Regional Fare Policy and Fare Allocation, Innovations in Fare Equipment and Data Collection." The objective of this study is to examine industry trends and experiences related to the institutional, technological, data management, customer acceptance, and costs and benefits of regional transit fare programs in the U.S. since publication of the 1997 TCRP report. This report provides an overview of regional fare programs and general guidance for transportation decision makers who are evaluating the feasibility of introducing regional fare programs, including fare collection and fare policy options, and the resources necessary for implementation.

■ 1.2 REPORT ORGANIZATION

This report is organized into four separate chapters, the first of which provides an introduction to the report; Chapter Two provides a discussion of the "State of the Industry"; Chapter Three provides "Case Studies"; and Chapter Four provides a "Summary of Best Practices." The content of the chapters is described below.

Chapter Two: State of the Industry

A comprehensive literature review was conducted to identify articles and reports that have been written on fare policy, fare technology, regional transit services, and related interlocal agreements. In addition to a Transportation Research Information Services (TRIS) search, a review of many industry periodicals maintained at CUTR and an Internet search were conducted to identify articles and other references that deal with the subject of fare policy and fare technology. Using information gathered from the literature review, the "State of the Industry" was prepared, which includes a summary of fare media types and options, fare collection systems, data collection opportunities, customer acceptance experiences, and emerging trends.

Chapter Three: Case Studies

Based on the results of the literature review and preparation of the State of the Industry, five case study sites were selected that have implemented (or are in the process of implementing) practical and innovative approaches to fare collection in the context of regional fare policy. A more in-depth analysis of one or more of the five topical areas identified in the problem statement is provided within the case study narratives. The sites were selected to encompass a range of regional fare programs with broad applicability to the industry, from low-cost technology programs to complex technology-intensive programs.

Chapter Three includes case studies of the following regional fare collection programs:

- Delaware Transit Corporation (DTC) and the Southeastern Pennsylvania Regional Transportation Authority (SEPTA)
- City of San Luis Obispo (SLO), San Luis Obispo Regional Transit Authority (RTA), South County Area Transit (SCAT), cities of Paso Robles and Atascadero in San Luis Obispo County, California
- Port Authority Transit Corporation serving New Jersey and Pennsylvania
- Miami-Dade Transit
- King County Metro, Sound Transit, Pierce Transit, Kitsap Transit, Community Transit, Everett Transit, and Washington State Ferries in the Central Puget Sound Region of the state of Washington.

Chapter Four: Summary of Best Practices

Chapter Four contains a synthesis of best practices for the implementation of improved fare-related technologies and fare policies. These best practices were identified through the literature review and the case studies.

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2.0 STATE OF THE INDUSTRY

■ 2.1 INTRODUCTION

Public transportation agencies in the United States have traditionally operated in an independent manner, with a sole focus of providing services within their own jurisdictional boundaries. Acting under the guidance of their governing boards, transit service and fare policies were established based on the unique needs of the agencies' individual customers and their financial capacity and objectives.

Social, demographic, and land use characteristics are rapidly changing. For example, there has been a surge in the percentage of people working outside their county of residence. In 2000, approximately 34 million commuters worked outside of their county of residence, up from approximately 20 million in 1980. Between 1990 and 2000, roughly half of all individuals that joined the workforce worked outside their county of residence. Nearly 64 percent of metropolitan area commutes occurred between suburbs, and the growth of traditional suburb-to-city commutes grew only 14 percent.[1]

As a result of these changing travel patterns and new state and federal mandates to improve regional coordination and enhance efficiencies, transit agencies are increasingly looking at fare coordination and integration opportunities, not only for modes under the direct control of the operator, but with other agencies in the region. There are three basic types of fare integration. One involves linking fare payments among different modes of transportation that are managed by a single transit operator. A second links different transit operators to the same system of fare payment. A third links transit fare payment systems with consumer financial systems such as banks.[2]

The introduction of regional fare programs, ranging from simple interagency agreements to allow for free transfers between systems to complex multi-agency programs with a technology focus, have increased in recent years. According to an American Public Transportation Association (APTA) survey in 2008, of 216 U.S. reporting transit agencies that operate fixed-route service, nearly 50 percent participate in some type of interagency fare agreement, including single trip transfers, regional passes, stored-value media, or other multi-agency passes.[3]

The most common reason for implementing fare coordination practices is to improve the quality of service to customers who travel through areas served by more than one agency, while ensuring that programs are revenue neutral to the participating agencies and to the operating and capital costs of implementing fare coordination.[4] Additional opportunities and benefits of regional fare coordination (particularly electronic fare programs) include improved data collection and reductions in cash handling expenses.

■ 2.2 FARE STRUCTURES AND MEDIA

Fare structure consists of three basic elements: fare strategy, payment options, and pricing levels. Fare strategy refers to the general type of fare collection and payment approach (i.e., flat vs. differential fares) and to transfer pricing and policy. In a flat fare structure, passengers are charged the same fare regardless of the length of the trip, time of day, speed, or quality of the service. With a differential fare, passengers are charged distance-

based or zonal fares, time-based (peak versus off-peak), or service-based (express surcharge or bus-rail differential). Many systems are designed to require some riders to transfer between buses, other modes, or other systems. The pricing, rules, and policies regarding transfers are fundamental aspects of an agency's fare structure, and they also present major issues for operators, as there can be disagreement as to the validity of a transfer on a particular route at a particular time. Despite the convenience and cost savings to riders associated with free or discounted transfers, the operators may forgo revenue and incur increased administrative costs associated with transfers. Many operators have opted to eliminate transfers and replace them with day passes good for unlimited travel, or they have introduced a lower-priced flat fare.

The basic types of payment options include single-ride, multi-ride, period passes, stored-value, and post-payment. These payment options can be in the form of various fare instruments or media such as cash, tokens, paper tickets, magnetic stripe tickets or farecards, smart cards, credit/debit/ATM cards, or transit vouchers. [5] Table 2-1 shows the wide variety of fare instruments in use by 233 transit agencies operating fixed-route service that responded to a 2008 APTA survey.

Table 2-1
Fare Payment Media

Mode	Tokens	Single-ride Tickets	Multi-ride Tickets	Punch Cards	Non-magnetic Passes	Magnetic Stored-Value Cards	Magnetic Stored-Time Cards	Smart Cards	Total Participating Agencies
BUS	61	82	47	42	101	53	92	26	210
COMMUTER RAIL	0	17	5	6	14	0	1	1	17
FERRYBOAT	1	3	2	1	3	0	0	0	6
HEAVY RAIL	4	8	1	0	3	8	11	5	14
LIGHT RAIL	11	19	7	3	19	8	8	2	26
TROLLYBUS	1	0	0	0	0	0	1	0	1

The wide variety of fare structures often are difficult for transit riders to understand and can make some fare integration programs extremely complex. In the Atlanta area, a Regional Transit Institutional Analysis was conducted to recommend strategies to provide a more cohesive regional transit system throughout a fourteen county study area. One of the three key findings of the study was the need to coordinate the fare policies of the five public transit providers in the area. As shown in Table 2-2, together they offered a total of 28 different fares.[6]

Integrating and simplifying fares to enhance customer convenience within a single agency can be complex. When evaluating the need for a new electronic fare collection system, the Southeastern Pennsylvania Transportation Authority (SEPTA), determined that one strength of its existing fare collection system was that it offered a variety of fare options (i.e., pricing levels) to meet the needs of its riders. However, they did note "On the customer side, the current system lacks convenience and simplicity commonly found with modern payment systems: the array of fare instruments [see Table 2-3], payment choices, exact fare

requirements, and the limitations of token and change machines run counter to modern practices of customer service."[7]

Table 2-2
Atlanta Area Fare Structure

Fare Product	MARTA	CCT	CCT Express	C-TRAN	GCT	GCT Express	Xpress	Xpress - Reverse Commute
1 Day Pass	$8.00							
10 Trips	$17.50	$11.25	$27.00		$14.00	$27.00		
20 Trips	$30.00	$36.00		$26.00			$45.00	
30-Day Pass	$52.50							
31-Day Pass		$45.00	$70.00	$52.50	$55.00	$100.00	$80.00	$40
40-Ride Pass							$85.00	
7-Day Pass	$13.00							
Children Under 5				$0.00	$0.00			
Children Under 6	$0.00							
Half-Fare 10-ride		$5.40			$8.50			
Half-Fare 65+	$0.85	$0.60		$0.75	$0.85			
Half-Fare out of District	$1.25							
Local to Express Upgrade						$1.25		
Monthly One-way			$55.00					
Paratransit 10-ride		$22.50			$35.00			
Paratransit Monthly		$90.00						
Paratransit One-way		$2.50		$3.00	$3.50			
Round Trip			$4.00				$5.00	$2.50
Single one-way fare	$1.75	$1.25	$3.00	$1.75	$1.75	$3.00	$3.00	$1.50
Student Weekly K-12	$10.00							
U-Pass - Faculty/Staff	$49.50							
U-Pass - Student Monthly	$40.00							
Youth 10-Ride		$7.20						
Youth One-way		$0.80	$1.80	$0.75	$0.85			
Youth Paratransit 10-ride		$14.40						
Youth Paratransit Monthly		$55.00						
Youth Paratransit One way			$1.60					
Youth Round-Trip			$2.55					

A significant number of transit agencies have implemented electronic fare payment strategies in the form of magnetic stripe cards or tickets (which store data using magnetic "tracks") and smart cards in an effort to simplify and consolidate fare media.

There are two basic types of magnetic stripe media: read-only swipe cards and read-write stored-value cards. Both types of cards are relatively inexpensive to produce, ranging from approximately $0.02 to $0.10 each. Read-only cards allow for the automatic determination of the validity of an unlimited ride period pass. Read-write technology can accommodate stored-value and other automated payment options. Farebox units read the ticket and may also issue a magnetic ticket or transfer, or may return change from a large bill in the form of stored-value on a magnetic stripe card.

Table 2-3
SEPTA Fare Structure (2006)

Central Philadelphia Fares

If you travel to or from Central Philadelphia (most common) use this table:

Fare Zones	TrailPass Weekly	TrailPass Monthly	Ten Trip Tickets	Peak Fare	Off-Peak Fare	Family Fare
1	$18.75	$70.00	$28.00	$3.00	$3.00	$12.00
2	$28.25	$106.00	$35.50	$3.75	$3.00	$12.00
3	$34.50	$126.50	$42.50	$4.50	$3.75	$15.00
4	$39.50	$145.00	$47.50	$5.00	$4.25	$17.00
5	$45.50	$163.00	$52.50	$5.50	$4.25	$17.00
6	$45.50	$163.00	$60.00	$7.00	$7.00	$26.00

Intermediate Fares

If your initial and final stations are not in Central Philadelphia and you did not travel through Central Philadelphia station, use this table:

Travel within One Zone or up to	One Way	Half Price	Intermediate & Cross County Passes
Two Zones	$2.50	$1.25	$60.00
Three Zones or More	$3.00	$1.25	$85.00

Travel through Center City Philadelphia

For travel from one station to another via Center City Philadelphia use these tables:

From Zone	to Zone 1	to Zone 2	to Zone 3	to Zone 4	to Zone 5	to Zone 6
1	$4.50	$4.50	$4.50	$5.00	$5.50	$7.00
2	$4.50	$4.50	$5.00	$5.50	$7.00	$7.00
3	$4.50	$5.00	$5.50	$7.00	$7.00	$7.00
4	$5.00	$5.50	$7.00	$7.00	$7.00	$7.00
5	$5.50	$7.00	$7.00	$7.00	$7.00	$7.00
6	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00

Peak One-way Fares via Center City Philadelphia

From Zone	to Zone 1	to Zone 2	to Zone 3	to Zone 4	to Zone 5	to Zone 6
1	$3.50	$3.50	$3.75	$4.25	$4.50	$7.00
2	$3.50	$3.75	$4.25	$4.50	$5.50	$7.00
3	$3.75	$4.25	$4.50	$5.50	$5.50	$7.00
4	$4.25	$4.50	$5.50	$5.50	$5.50	$7.00
5	$4.50	$5.50	$5.50	$5.50	$5.50	$7.00
6	$7.00	$7.00	$5.50	$7.00	$7.00	$7.00

Off Peak One-way Fares via Center City Philadelphia

Children's fares for Via Central Philadelphia travel are One-half the peak fare except the weekend.
The weekend fare is $1.50.

Table 2-3 (*cont.*)
SEPTA Fare Structure (2006)

BASE FARE	**$2.00** Cash or Token or valid TRANSPASS, TRAILPASS, DAYPASS or CROSS-COUNTY PASS Plus .50 cents
TOKENS	**10 for $13.50, 5 for $6.75, 2 for $2.60**
TRANSFER & RE-TRANSFER	**Each $0.60**
ADDITIONAL SUBURBAN ZONES (With base fare)	**Each $0.50**
SCHOOL FARE (Available from schools only)	**School Token** – $1.30 revenue to SEPTA; Schools charge pupils $0.95.
ROUTES 124 and 125 Center City to Chesterbrook/Valley Forge and Center City to King of Prussia.	For Zone A **$3.50** or(With valid TransPass +$ 1.00, or with valid transfer +$1.50 For Zone B add $.50 to the above noted prices
DAYPASS	**$5.50** – One Trip on any Regional Rail Line, Plus Unlimited Trips within the City on Surface or Subway/Elevated
WEEKLY TRANSPASS	**$18.75**
MONTHLY TRANSPASS	**$70.00**
WEEKLY OR MONTHLY TRANSPASS	Accepted as Base Fare on all City transit division regular routes and traveling in the first Suburban Zone to and from the City Fare Zone. It is also valid for unrestricted travel between Center City and Zone 1 Regional Rail Stations. All TransPasses have "ANYWHERE" or an UNRESTRICTED travel privilege on weekends and major holidays on any SEPTA vehicle.
TRAILPASS (valid for all City Division regular routes. Base fare on Suburban Routes and for routes bordering the City of Philadelphia, up to zone purchased. Also valid on regional rail vehicles up to zone purchased)	**Weekly** / **Monthly** **TransPass** $ 18.75 $ 70.00 **Zone 2** $ 28.25 $ 106.00 **Zone 3** $ 34.50 $ 126.50 **Zone 4** $ 39.50 $ 145.00 **Zone 5 & 6** $ 45.50 $ 163.00 (Anywhere Pass)
SENIOR CITIZEN FARE	On transit it is **$ 2.00** during peak hours between 7:00 a.m. to 8:00 a.m. and 4:30 p.m. to 5:30 p.m. Monday to Friday. It is **FREE** with a valid ID card at all other times and on major holidays. On Regional Rail trains it is $1.00 during off-peak times for travel within Pennsylvania and $1.50 for travel outside Pennsylvania.
DISABLED FARE (ID card is required during off-peak hours between 9:00 a.m. to 3:30 p.m. and between 6:30 p.m. to 6:00 a.m.) Disabled passengers with valid ID Card can ride for $1.50 during **off-peak** to anywhere on Regional Rail trains.	**Peak** / **Off-Peak** Transit Base Fare $ 2.00 $ 0.75 Transfers $ 0.60 $ 0.30 Additional Zones $ 0.50 $ 0.25
CHILD 42" TALL or LESS	Up to 2 free at all times with a fare paying adult. On Saturdays, Sundays and certain holidays up to 2 children eleven years of age and younger with a fare paying adult travel at **$0.75** each way per child regardless of zone of origin. Transfers remain at **$0.60.**
CCT Fare	3.50 base fare, Zone 2 TrailPass or greater County +3 miles - $1 Suburbs +10 miles - $1

Unlike magnetic fare cards, smart cards are generally made of plastic with an embedded computer chip containing a data storage location. They have more capacity and are less vulnerable to tampering than magnetic cards. Communication between the smart card and the reader may be through direct contact with the reader (contact card) or through a short-range wireless interface (contactless card). The early versions of smart cards were limited-use stored-value cards, but more recent technology uses sophisticated chips and micro-processing capabilities. These support general-purpose, stored-value, multi-application capabilities (known as an electronic purse or "e purse") such as toll and parking payments, and retail purchases. While most applications have traditionally used contact cards, contact transactions tend to slow transit boarding time. Instead, contactless cards are passed within an inch or two of the card reader and allow for a transaction to be completed within about one-fifth of a second.

Electronic fare media facilitate consideration of a range of new types of payment options. Some agencies have used electronic media to automate their existing fare systems, while others have totally revamped their fare structures with the installation of electronic technology. The basic payment options possible with electronic fare media include:

- **Value-based or trip-based options** – These can be either user encoded or pre-encoded with a fixed amount. Some agencies permit purchase of farecards for just one trip and others require a minimum balance. Often, agencies offer some type of discount for higher-value fare cards.

- **Time-based options** – These can either allow unlimited rides or will cap the number of rides during a specified time period. Electronic media have allowed many agencies to convert from fixed-period passes, such as first to last day of month, to rolling passes good for a specified number of days.

- **Combined value-and time-based options** – This type of electronic fare is capable of carrying both stored-value and pass options. Combined value and time-based options allow stored-value for use on one mode or one agency's service, along with a time-based pass for another mode or service provider.

Several types of bonuses and discounts also may be offered through electronic fare media, such as initial-purchase bonuses, added-value bonuses for future use to encourage card retention, frequency-of-use bonuses, and farecard discounts over regular cash prices.

The continued evolution and increasingly widespread use of electronic payment technologies, particularly smart card technology, has facilitated fare integration efforts. The use of electronic payment technologies has made it possible for agencies to accept a greater range of payment options and offer a more efficient means of distributing transit benefits and fare media. Electronic payment, particularly in the form of smart cards, is supporting regional fare integration and partnerships with non-transit entities (financial institutions, universities, employers, and social service agencies). These multi-application initiatives offer the potential to improve mass transit's penetration by increasing the convenience of using transit and the establishment of loyalty programs. These new partnerships offer the opportunity to share administrative costs and possibly generate new revenues for the transit operator.[8]

■ 2.3 EVALUATING FARE COLLECTION SYSTEMS

While complex automated fare collection systems are not a necessary requirement of regional fare integration, most regional fare programs do use some type of automated technology. When considering a fare collection equipment procurement or refurbishment of any size, it is important that technology does not dictate the agency's objectives. There are six basic steps for the planning and implementation of an automated fare collection system, including:

1. **Identify Objectives and Priorities** - Always start with what the agency is hoping to achieve and what is most important. While there are general themes that are common to most operators (increase revenue, increase ridership, decrease costs), there may be varying priorities in terms of achieving those objectives. For example, an agency goal of increasing ridership and the associated objective of pricing services to reflect the value of the service would support a fare collection system designed with the flexibility to introduce new pricing schemes. Similarly, an agency objective of improving service quality by improving travel times is associated with a system objective of introducing a fare system that reduces or eliminates the time involved in collecting fares. Mandates and social objectives related to accessibility, reduced fares for seniors and people with disabilities, reporting requirements, and fare equity in structure and pricing must be considered.

2. **Examine the Existing Policy and System** – Evaluate how the system that is currently in place is functioning and the extent to which it is meeting agency objectives. Understanding fare policy and ridership characteristics will have a bearing on the extent to which certain fare policy and fare collection approaches will succeed. For example, lower-income, transit-dependent riders may be unable to take advantage of discounted monthly passes due to the up-front cost of purchasing a farecard. If the system's ridership base includes a high percentage of these individuals, a farecard may not offer significant benefits to the riders or improvements in system-wide efficiencies. The condition of the current fare collection system will affect the agency's ability to meet its objectives. Maintenance costs, reliability, lack of parts, and security concerns will drive decisions related to the costs and benefits of replacement or upgrades.

3. **Review Available Approaches and Technologies** – With an understanding of agency objectives and the existing system's performance, examine available technologies for opportunities to better meet those objectives. Fare collection technology has changed dramatically in recent years. Improvements in a variety of fare media and associated equipment now offer opportunities for enhanced efficiency, security, customer satisfaction, and convenience.

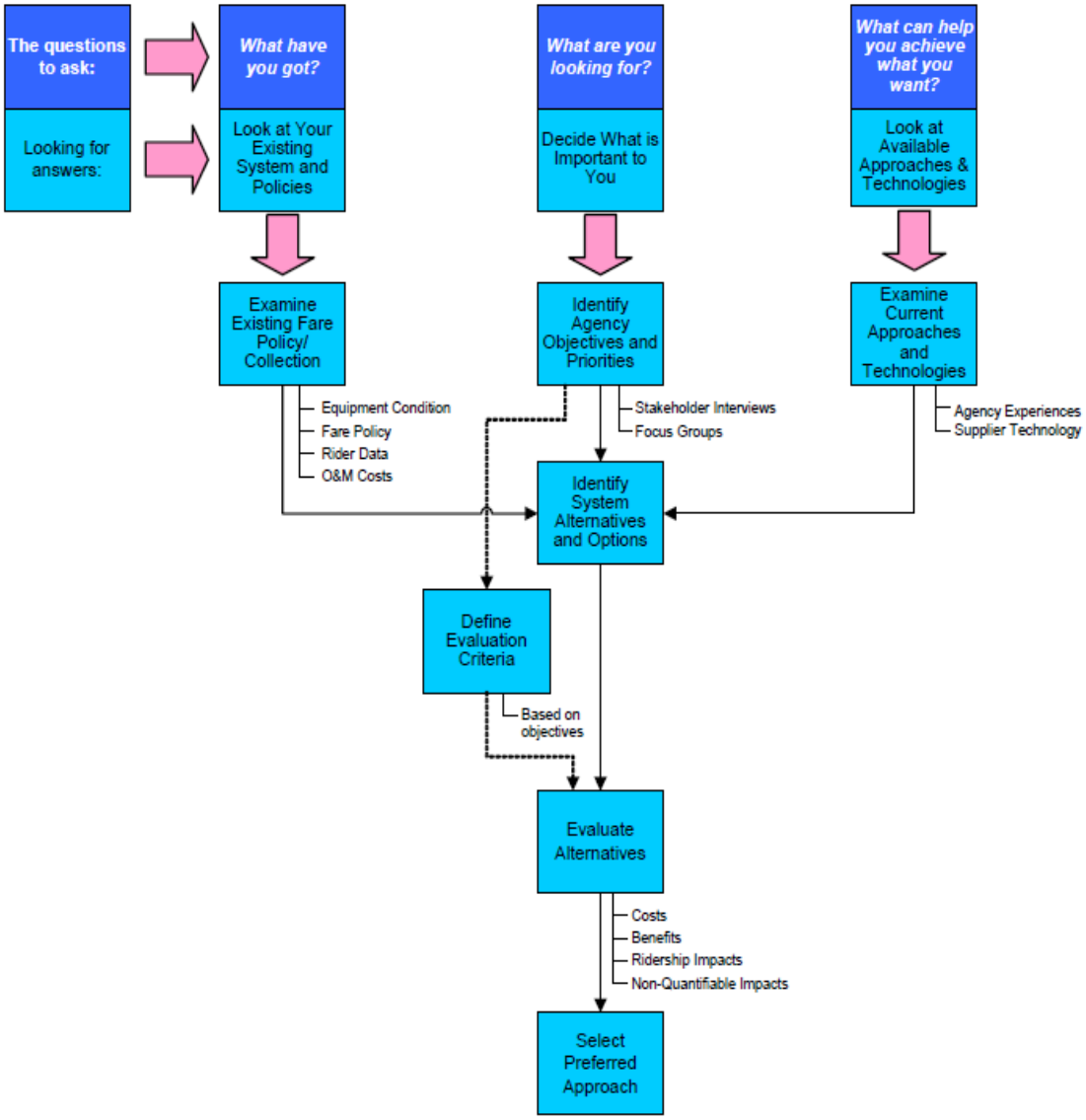
4. **Identify Alternative Solutions** - Develop alternative strategies for achieving the agency objectives, applying available approaches in both technology and fare policy. An understanding of the fare structure the agency wants to provide, the markets it wants to serve, the data it wants to collect, and the desired fare distribution system will help to define the system design.

5. **Evaluate the Alternatives** – Base evaluation criteria on agency priorities. Many of the criteria may be subjective. Quantifiable objectives, including the capital cost of the system, and the ongoing annual costs of operating, maintaining, and administering the system, should be compared to the existing system.

6. **Recommend the Preferred Approach** - The selected alternative should be the one that will most help the agency achieve its objectives.

Figure 2-1 presents the recommended process for evaluating and developing a new fare collection system.[9]

Figure 2-1
Business Case Development for Investing in a New Fare Collection System



■ 2.4 INSTITUTIONAL BARRIERS RELATED TO FARE COLLECTION SYSTEMS

As data storage retrieval and transfer technologies have become cheaper and more reliable, the obstacles to electronic fare collection system interoperability are decreasingly technical and increasingly managerial, institutional, and political. Due to the various types of public agencies that administer, plan, manage, and/or operate transit systems, each may have different functions and missions – some exclusive and others overlapping, but all are influenced by their respective local, financial, operational, and political conditions. For example, some studies suggest that interest in smart card applications vary by mode. Bus-only transit agencies are more interested in coordinating smart card programs, while light rail agencies place a higher priority on reducing farebox fraud.

Financial Considerations

There is general agreement that one benefit of smart cards for agencies is the ability to increase revenues through the floats (interest revenue from stored funds/fares not yet earned) on pre-paid cards and reductions in operating budgets. However, the strength of these incentives may differ from agency to agency. Smaller agencies may not have staff members who are capable of administering the technical details of a smart card program. This could raise the administrative and human resource costs associated with implementing smart card systems for these agencies. Additionally, the costs of processing smart card transactions (whether through a regional clearinghouse or through the agency itself) approach the costs of counting cash. While large agencies may have floats to offset these costs, smaller agencies may not.

Interoperable smart card systems require some centralized control over revenue distribution, sometimes resulting in uncertainty on the part of transit operators as to how they will ultimately collect their fares because processing is removed from their direct oversight and control.

Another institutional barrier may be related to the fact that much of the literature related to the costs and benefits associated with smart card systems has been largely promotional, making evaluation and analysis difficult, as described in the next section of this report. Most of the studies that have been conducted focused on benefits for transit operators without an examination of benefits and costs for travelers. Few studies compare the benefits derived from smart card implementation against benefits derived from institutional policy measures that require no major overhaul of existing equipment or other capital outlay

Customer Considerations

Agency incentives to adopt smart cards may vary by their patronage and user markets. Acceptance of fare media may differ between income groups. Smaller agencies serving transit-dependent or rural markets may have more riders who are unwilling to transition to smart cards, requiring them to provide a smart card system and a traditional fare payment network. For example, the potential savings resulting from a reduction in cash handling expenses associated with a smart card system, may not be fully realized if a significant number of patrons prefer to pay cash fares.

Managerial and Political Considerations

Agencies may be resistant or unable to change fare structures. As an example, one of the transit agencies identified in the literature review, had a different age qualification for senior citizen fare discounts, which necessitated complicated programming in order to become part of a regional system, yet it was unwilling to change that policy. Other agencies are legally constrained from changing fare policies, while others are politically bound by public resistance to fare increases or structural changes.[10]

Technology Considerations and Standards

External factors, such as the uncertainty over the future of technology and interoperability, have created barriers to the adoption of smart card fare payment systems. Until recently, public transportation agencies interested in deploying smart cards have had few industry standards to facilitate interoperability and reduce their reliance on proprietary technology. Agencies sometimes found they were locked into technologies that limited their ability to participate in regional fare systems.

Working in conjunction with transit agency representatives, vendors, and consultants, APTA has taken the lead in developing standards and recommended practices for the key interfaces between smart cards, smart card reader devices, station/depot computers, and agency and regional central computer systems

APTA's efforts have resulted in the publication of the "Manual of Standards and Recommended Practices for Universal Fare Cards." The purpose of APTA's Universal Transit Farecard Standards Program was to produce interface standards and recommend practices that provide uniform guidelines to help transit systems achieve fare collection system interoperability with other systems in their region. The benefits of these uniform guidelines and the resulting interoperability with other systems include:

- competition among multiple vendors;
- agency independence and vendor neutrality;
- open-source and open architecture development using commercially available products;
- a platform that allows for development of multi-modal multi-applications and the integration of other payment systems; and
- new transit partnerships

The intent of the standards is to establish a level of commonality between two or more agency systems participating in a regional fare program. The standard can be used in the acquisition of equipment, goods, and services. By referencing the standard, it is not necessary for the agency to develop its own proximity card format and communication protocols.

It is not necessary for an agency to use all parts of the standards. However, to ensure interoperability, users must comply with the certain mandatory elements of the parts.

Although the standards are very technical in nature, a brief overview of the Manual's five parts is provided below.

Part 1 - Introduction and Overview - Part I explains the components of a contactless fare media system, roles and functions of participating entities, and the overall flow of events that occur in processing the transaction between a contactless fare card and a reader device.

Part II - Contactless Fare Media Data Format and Interface Standard – Part II provides a consistent and uniform method for storing, retrieving, and updating data from contactless fare media used in transit applications. It describes the data objects and the individual data elements on the contactless fare card and accommodates most known fare products and related services currently available in the U.S. This part dictates the minimum mandatory information stored on the card, as well as optional information that can be implemented at the discretion of an agency or a region. It supports compliance with well-known international standards for smart cards.

Part III - Regional Central System Interface Standard - Part III describes the structure of the messages between an agency central system or fare collection subsystem and a regional central system. The data sent to the regional system are the result of transactions such as fare payment and fare product load performed by a fare card. The data sent from the regional system, an agency's central computer, subsystem controllers, and other system components are control messages, fare card directives, and system configuration data. This part introduces a widely-used method for describing the structure of data to be transmitted to allow systems developed by different vendors to be interoperable with a common regional system.

Part IV - System Security Planning and Implementation Guidelines - For agencies to achieve interoperability, they should have a common set of security rules and measures. Part IV of the standard provides the terminology associated with these common security rules and measures and suggests the basic steps and considerations that should be employed to define, implement, and manage a security program for a regional smart-card-based fare collection system. Part IV does not define the security elements of the standard, but is a guideline for transit agencies.

Part V - Compliance Certification and Testing Standard - Part V of the standard for testing and compliance currently is not available. APTA anticipates addressing the development of a test specification in the future. Use of this test specification will be required to show compliance with the standard. The certification process also may include testing at an APTA-designated laboratory.[11]

■ 2.5 COSTS AND BENEFITS OF ELECTRONIC FARE PAYMENT SYSTEMS

It is difficult to generalize about the costs associated with procuring and implementing a new fare system. Fare collection equipment tends to be made up of customized products, although somewhat less so recently with the development of new standards. There are no typical costs. But, a range of costs can be estimated.

Unit costs are generally developed for each type of equipment, based on supplier quotations, equipment characteristics, experience with recent purchases, and appropriate multipliers to allow for economies of scale and escalation for the value of money. In addition, costs for engineering and support services depend on the purchasing experience of the agency, the local contracting environment, and the personnel skills available within the agency. Costs will be impacted by whether or not the equipment is being purchased for the

first time or if it is an upgrade to an existing system. The choice of specific media and equipment in terms of initial capital expenditures and ongoing operating and maintenance expenses are critical issues to consider when selecting fare collection technology.
The prices for any type of equipment are sensitive to factors that include:

- Equipment specifications, including performance requirements
- Quantities
- The extent to which the new equipment will have to interface with existing equipment
- The nature of the vendor selection and negotiation process
- The timing of the procurement relative to the procurement of similar equipment by other agencies
- Growth potential
- Warranties
- Documentation requirements
- Software requirements
- Vehicle/station/facility modifications
- ADA requirements

Ultimately, the overall cost for an agency's fare collection system depends largely on the size and modal composition of the agency. If the agency is procuring a new or upgraded system as part of an integrated regional payment system, the exact types and quantities of equipment will depend to a large extent on the nature of the program and the institutional arrangement being established.[12]

The case study section of this report (Chapter Three) contains some current information regarding the estimated cost of regional fare collection system implementation for large and small agencies.

Until recently, transit smart cards have been implemented primarily as stand-alone systems and, to a lesser degree, interoperable regional systems. Despite the growing adoption of transit smart card systems, there are few rigorous evaluations of their costs and benefits, and these studies are neither consistent nor definitive. The potential benefits of smart card systems are widely expected to exceed the costs, yet very few public agencies have conducted a cost/benefit analysis of smart card implementation, and there are no widely accepted standards for rigorous analysis.

The benefits of smart cards that accrue to transit users and individual operators are difficult to quantify. While users can benefit by having the ability to travel seamlessly throughout a region, and operators will likely benefit from more automated passenger processing and fare collection, these are more qualitative items. The degree to which users and operators will benefit is dependent upon many other unknown factors. For example, operators will reduce their expenditure on cash processing only if enough users decide to use the smart card.

The recent analysis of three case studies that were conducted by the Metropolitan Transportation Commission (MTC) for TransLink in the San Francisco Bay area, by the Los Angeles County Metropolitan Transportation Authority (LAMTA), and by the Southeastern Pennsylvania Transportation Authority (SEPTA) shows a wide variety of perceived costs and benefits of smart card programs. These vary by stakeholder (existing and potential users, individual transit operators, multiple transit operators, and regional agencies). Some of the costs can be quantified, some were mentioned by agency representatives and may be credible but not quantifiable due to lack of information, and some are mentioned in literature,

reports or by people, but lack credibility. A summary of the cost analysis is shown in Table 2-4.

Table 2-4
Case Study Cost Analysis

	Costs that have been assessed quantitatively	Costs frequently mentioned, likely incurred, but which have not been carefully quantified	Costs sometimes mentioned, but which are speculative or treated with considerable uncertainty
Existing/ Potential Users	Users must purchase card (BA)	▪ Existing fare media may be cancelled, and users must learn new system (BA,LA,S) ▪Users may have to provide identification and personal information to use smart cards	
Individual Transit Operators	▪ Capital costs-buy/upgrade equip. and infrastructure: LA: $35.5 million per 1,000 peak vehicles S: 47.8 million per 1,000 peak vehicles ▪ Lifetime Operations & Maintenance LA: $99.4 million per 1,000 peak vehicles S: $492 million per 1,000 peak vehicles ▪Training Staff to Use New Technology BA: $629,000 per 1,000 peak vehicles ▪Additional Operating Cost to be Borne by Agencies BA: $4.3 million per 1,000 peak vehicles	▪ Relinquishing control of fare structures, policies, and collection to a regional organization*	▪Uncertainty of how smart card readers will hold up in more unprotected environments , e.g. parking lots (S) ▪More accurate ridership date may change allocation of regional funds-individual operators could receive less funds (LA)
Multiple Transit Operators/ Regional Agencies	▪Outsourced Clearinghouse Functions $8 million annually in MTA case (LA)	▪Shared operating costs-clearinghouse, marketing, distribution (BA,LA) ▪Unforeseen tech. problems may delay system implementation, increasing capital costs (BA) ▪Opportunity cost of adopting new technologies (BA,LA) ▪Path dependence; being "held hostage" to future change orders and contract renewals (BA) ▪Institutional barriers may delay system implementation, increasing capital costs (BA)	

LA: LAMTA or LA Metro, S: SEPTA, BA: San Francisco Bay Area

*LA individual operators decided not to cede control of fare structures

In all three studies, agencies estimated some additional expenses and costs for deployment incurred by individual transit operators. These can be broken down into capital, operating, and additional costs.

Capital Costs - Because the Bay Area information is derived from a pilot program involving only 4 of the 23 operators in the region, the results may not be representative of what would occur in a region wide implementation. The MTC estimated an additional $2 million (2006

dollars) incurred by the four agencies in several areas to implement smart card systems, including preventative maintenance, replacement due to vandalism, and marketing.

Since the LA Metro and SEPTA analyses were for implementing new systems, they both estimated capital and operating costs. LA Metro estimated a capital cost of $35.5 million per 1,000 peak vehicles and SEPTA estimated a capital cost of $47.8 million per 1,000 peak vehicles. All approximated costs for LA Metro (capital or otherwise) were only for those vehicles operated by LA Metro and did not include any of the other operators that serve Los Angeles County.

Operating Costs – LA Metro's estimated operating cost was $99.4 million per 1,000 peak vehicles, whereas SEPTA estimated a cost of $492 million per 1,000 peak vehicles. The difference in operating costs was substantial but may have been due, in part, to the way operating costs were calculated. LA Metro's report was unclear on what timeframe constituted a "lifetime," and it did not explain what items were included in the operating cost estimate. On the other hand, SEPTA's report was explicit in stating an operation lifetime of 15 years. Although it did not explain how this particular lifecycle was selected, the SEPTA report did outline the various items that comprised its operating cost estimate.

Additional Costs – The MTC estimated the cost for individual operators to train staff to use the new equipment. The total cost was approximately $629,000 per 1,000 peak vehicles for all four of the agencies. Neither LA Metro nor SEPTA included this item in the calculations.

One serious concern for operators in the Bay Area and Los Angeles was ceding control of their fare structures and policies. In Los Angeles, the movement toward a universal fare structure failed, and each operator retained its individual fare structures. In the Bay Area, this issue had not yet been resolved. Since SEPTA is the only operator in the Southeastern Pennsylvania region, its managers maintain control over fares.

Since there were so many operators in the Bay Area and Los Angeles, there were questions about the shared operating expenses of the smart card system. A new electronic fare and data collection system requires one regional clearinghouse to manage the funds and the data. LA Metro agreed to outsource the clearinghouse function for $8 million annually. Smart card marketing costs are another additional cost of conversion.

Similar to the analysis of costs, an analysis of the benefits of smart cards was done based on the three case studies. A summary of the key findings is shown in Table 2-5, and further described in the section that follows.

One of the major customer and agency benefits of smart card technology is a reduction in fare processing time. The average smart card fare processing time estimated in the LA Metro study was 2.27 seconds, compared to the 3.07 seconds for non-smart card fare collection. This represented a savings of almost one second per boarding. LA Metro also noted that cards failed to interface with smart card readers less often than magnetic stripe technology (6.7 failures per day for smart cards, compared to 200 per day for magnetic stripes). Overall, the time savings will most significantly affect modes where boarding and fare payment occur at the same time. If enough people use smart cards, there will be a significant reduction in boarding time and total vehicle dwell time. This will increase the ability of vehicles to maintain schedules and improve on-time performance and reliability. Since users value the quality of transit service very highly, this benefit could help to increase ridership.

Another major benefit is the simple convenience of the smart card. Riders do not have to worry about having enough money or exact change. They can add money and buy passes on-line and pay their fare without having to take the card out of their wallet. In addition, the card itself is durable and balance protection is usually offered. If the card is lost or stolen, the money stored on the card can be electronically preserved for the user. The card can be used for non-transit applications such as parking facilities and retail purchases depending upon the ability of the transit agency to partner with other public and private sector companies.

Table 2-5
Case Study Benefits Analysis

	Costs that have been assessed quantitatively	Costs frequently mentioned, likely incurred, but which have not been carefully quantified	Costs sometimes mentioned, but which are speculative or treated with considerable uncertainty
Existing/ Potential Users	▪Fare processing time significantly decreased: 2.27 seconds versus 3.07 seconds (LA)	▪Seamless travel for riders (BA,LA,S) • Smart card can be modified to interact with with multiple operators eliminating need to buy multiple fare media ▪Convenient and practical for users • Ease of transfers (LA,S) • No need to remove card from wallet • Can add value/buy pass online (LA,S) •Smart card loading machines can provide exact change ▪Durable fare medium (LA) ▪Balance protection – if card is lost or stolen, value of card is preserved (BA,LA) ▪Reduced need for cash (LA) ▪Loyalty programs reward frequent users	▪Station staff will spend less time handling cash transactions and more time helping customers ▪Card can be configured to be used in many non-transit applications, e.g. parking meters, retail purchases, and university campus purchases
Individual Transit Operators	▪Less cashiers needed (BA,S) ▪Reduced need for paper media (BA) ▪Fare processing time significantly decreased: 2.27 seconds for smart card versus 3.07 (LA) ▪Significantly fewer failures than magnetic strip readers: 6.7/day for smart card vs. 200/day for magnetic strips (LA) ▪Cost significantly cheaper than other options (LA)	▪Replaces aging fare equipment (LA) ▪Can accommodate different pricing structures ▪Greater memory – many fare options (LA) •Smart card capacity: 256 kilobytes •Magnetic capacity: 100 bytes ▪Greater fare media flexibility (S) ▪Greater reliability (S) ▪Capacity to track and audit trips (s) ▪▪Fraud prevention (LA,S) Improved data collection (S)	▪Handheld ticketing terminal devices allow quicker processing of tickets onboard regional rail and revenue collection throughout commuter rail system (S) ▪Station computer centralized data collection and also performs credit card authorization (S) Farebox activation by smart cards eliminates need for staff to activate keypads, also minimizes the data entry errors and enhances data reliability (S) ▪Fare system security and enforcement (S) ▪Multi-application potential (S) ▪Savings from cash handling dependant on smart card take-up rates (BA)
Multiple Transit Operators/ Regional Agencies		Improved data collection – ridership and travel behavior information can aid regional planning (BA,LA)	▪Regional integration of transfer transactions (BA,LA,S)

Both MTC and SEPTA quantified the savings based on the reduction in cash handling costs and found this to be one of the biggest financial benefits of smart card systems. However, the savings are dependent upon the take-up rate of smart cards. If a cash fare is kept and few users adopt the smart card, operators will still have to process a significant amount of currency.[13]

■ 2.6 DATA COLLECTION ENHANCEMENTS FROM AUTOMATED SYSTEMS

Public transportation agencies traditionally have had to rely on passenger surveys to identify customer travel patterns and manual counts of passenger loads. The resulting estimates are subject to bias and error, and the data are expensive to collect and process. Automated fare collection systems, particularly those that utilize smart cards, offer the potential of tapping a rich source of customer usage data to improve transit planning. Due to the longer life span of smart cards, travel behavior can be evaluated over a longer period of time. Smart cards involve a registration process, providing a potential opportunity for agencies to obtain demographic information such as home address, age, gender, and income.

The following provides an overview of how the Chicago Transit Authority (CTA) collects and uses the data from its automated fare collection system. Although this overview is focused on data related to billing addresses and fare payment type, additional information is available for other types of analyses.

CTA is the second largest public transportation system in the United States, providing rail, bus and paratransit service to Chicago and 40 surrounding suburbs in Cook County. CTA was the second transit agency in the U.S. to implement smart cards. In 2002, it introduced the Chicago Card, which is a stored-value card that requires customers to add value using cash or a credit card at vending machines. Then, in 2004, CTA introduced the Chicago Card Plus, which included an auto-load feature billed directly to the customer's credit card.

Information collected when the Chicago Cards are issued includes the customer's name, billing address, telephone number, and email address. This information is linked to the card's serial number. Each time the card is used, the fare collection system creates a transaction record including transaction time, equipment numbers, and the unique serial number of the fare medium used. When registering for the card, customers are informed that all information they have provided may be used for planning CTA services.

The information contained in the transaction records differs by mode. In the case of rail, the equipment identification number maps the station where the customer entered the rail station. For a bus transaction, the identification number is mapped to the bus route number, but no information is available at the bus stop level. CTA's flat fare structure requires a customer to make a transaction upon entering (but not exiting) the bus, so destination information is not available.

This overview is based upon all fare collection transactions (521,630 boardings) during a seven-day period in 2004. At that time, there were 62,351 active cards. While the market penetration of the smart cards was insufficient to provide a representative sample of the entire population, agency staff concluded the Chicago Card users generally had higher incomes, were younger, and lived in more upscale neighborhoods.

Access Distance

A total of 91 percent of all cards used during the seven-day period were geocoded and then linked to a geographic representation of the rail and bus stations and stops. The customer billing addresses were linked to the first boarding location (the first rail station or bus route accessed after 3:00 a.m.) to estimate access distances. Access distances were calculated as the shortest walking distance on the street network to the closest bus stop or rail station.

For both rail and bus, the calculations showed that, for a significant number of customers, the walking distances were longer than what would be reasonably expected. The potential explanations included:

- The customer's registration address may have not been the current home address, but rather an office address or the address of another person purchasing the smart card.
- Errors may have been present in the data.
- The home address and system access data may have been correct, and the long access distance may have reflected actual behavior. For example, the customer may have driven to an access point that was not the closest to their home, may have used CTA only for a one-way trip from work to home, or may not have started from home on a particular day.

Because no firm conclusions could be reached, the remainder of the analysis focused on customers with a daily access distance of one mile or less. Walk access distance is a function of both the density of access points and service attractiveness, among other things. The analysis revealed that average walk access distance varied significantly between rail (approximately 0.2 to 0.3 miles) and bus (0 to 0.1 miles).

Frequency and Consistency of Use

As expected, transit utilization rates among cardholders were much lower on weekends than on weekdays. Only about 2/3 of active cards were used on any given weekday, showing that a significant number of customers do not use the transit system every weekday.

At CTA, linked trips were defined as those in which up to two boardings were recorded on the card within two hours from the initial boarding time. One would expect typical customers to take one round trip between home and another destination, but the analysis showed that the average number of daily unlinked trips was 1.74 for Chicago Card users. Recognizing that some customers take more than two daily unlinked trips, it appeared as though a significant number of customers made one-way trips on CTA.

In addition to the analysis of demographics, access distance, and frequency and consistency of use, other potential uses for smart card data in the areas of market research, service planning, demand forecasting, operations and advertising are shown in Table 2-6. Although problems still exist in conducting analyses with only automated data, it is clear the Chicago Card and Chicago Card Plus data provided valuable information about customer travel behavior that was not available in the pre-smart card environment.[14]

Table 2-6
Potential Uses of Unlinked AFC - Chicago Card User Database

Market research and service planning
Analysis of demographics of riders by route/station Analysis of travel characteristics of riders by route station Analysis of travel by riders with particular demographics Analysis of travel by riders with particular travel characteristics Analysis of demographics of riders making particular trip patterns Analysis of the spatial coverage of CTA's system Analysis of changes in travel patterns over time by people with particular demographics Analysis of changes in travel patters over time by people with particular travel characteristics Analysis of demographics of riders by time of day Analysis of the demographics or riders using particular CTA services Identification of individuals for detailed survey or focus groups Development of a mailing list for public meeting notices
Travel demand forecasting
Provision of a large sample transit "travel diary," including demographic data Study of travel changes as reactions to fare changes (elasticity) by demographics
Operations
Development of a mailing list for service change announcements Development of an email list for delays and emergency detours
Pricing and fare policy
Analysis of complete trip-making patterns to evaluate new fare products Evaluation of the feasibility of trip frequency-based discounts or "guaranteed best fare" policy Analysis of travel by fare category Study of price elasticities by demographic characteristics
Marketing
Identification of distinct market segments among CTA riders Targeting of marketing information to the most appropriate users Identification of market segments with low penetration Use of demographic database to conduct targeted surveys
Advertising
Development of route/station demographic profiles to identify target locations for particular CTA advertisers and set advertising rates accordingly

■ 2.7 CUSTOMER ACCEPTANCE OF ELECTRONIC PAYMENT SYSTEMS

Most research regarding electronic payment systems has been focused on the transit industry, with little emphasis on the transit customer's levels of acceptance and satisfaction. The Northern Virginia Transportation Commission (NVTC) conducted a study in 2003 to inventory and review transit-related Intelligent Transportation System (ITS) projects in the region, evaluate approaches to performance measurement, research the benefits associated with these projects, and establish an ongoing performance monitoring process. The project included interviews with transit managers and vendors and an intercept mail-back survey of Northern Virginia transit riders. Surveys were distributed to more than 14,000 riders at several large transit stations over the course of several weekdays. Approximately 16 percent (2,292) of the transit riders responded.

The survey sample had two potential sources of bias: frequency bias and the non-random nature of the sampling methodology. Frequency bias may have occurred because the survey was distributed on a single day at each specific location and may have been skewed toward frequent riders. To correct for the bias, information obtained from the respondents on their frequency of use was used to weight the data by increasing the effect of infrequent riders and decreasing the effect of frequent riders.

Another potential source of bias was the non-random nature of the sample because it involved transit riders at certain rail stations, potentially making it biased against bus riders who do not use rail. However, because so many riders used the bus to access rail stations, it was decided that the survey captured a sufficient sample of riders to provide useful information related to transit services.

Overall, almost 80 percent of respondents indicated that either the current use of technology was sufficient or a greater emphasis on technology was needed. Only four percent of respondents felt there was too much emphasis on technology. The responses were tabulated with regard to residential jurisdiction, age, household income, and computer access. In general, there was little difference among the subgroups. The exception was with regard to respondent age and computer use. Older (ages 60 and over) respondents were slightly less interested in greater use of technology than younger respondents, and respondents without computer access were somewhat more likely to think there was too much emphasis on technology (12% versus 45%).

The demographic profile of respondents showed that most were individuals of working age. Only 5.3 percent were under the age of 25, and those 65 years of age and older comprised approximately 9 percent of survey respondents. Consistent with the relatively high income levels of Northern Virginia residents, the income levels of respondents to the survey was quite high. Thirty-seven percent reported incomes of $100,000 or more and 58.3 percent reported incomes of $70,000 or more. Only 2.7 percent reported incomes under $20,000.

Respondents were asked to select the three most important uses of new technology from a list of choices. As shown in Figure 2-2, the most important reason (71.5%) for the use of technology was to improve service reliability, while 16.2 percent responded that making fare payment and transfers between systems easier was most important.

When asked about their familiarity with various ITS applications, approximately 76 percent of respondents were familiar with the SmarTrip regional electronic fare payment system on Metrorail. Respondents were then asked about frequency of use. There was a high frequency of SmarTrip use, with over 51 percent indicating they used it five or more days per week, and approximately 10 percent one to four times per week. Respondents who had used the ITS application were then asked to rate how useful they thought the application was (where 1 = not useful and 5 = very useful). The SmarTrip electronic payment system received the highest rating (4.9) for ease of use for parking and MetroRail payments as shown in Figure 2-3.

Overall, transit riders were widely supportive of the use of technology on transit services in the region and, to a large extent, supportive of the expanded use of technology.[15]

Figure 2-2

Most Important Use of Technology – Northern Virginia Transit Riders

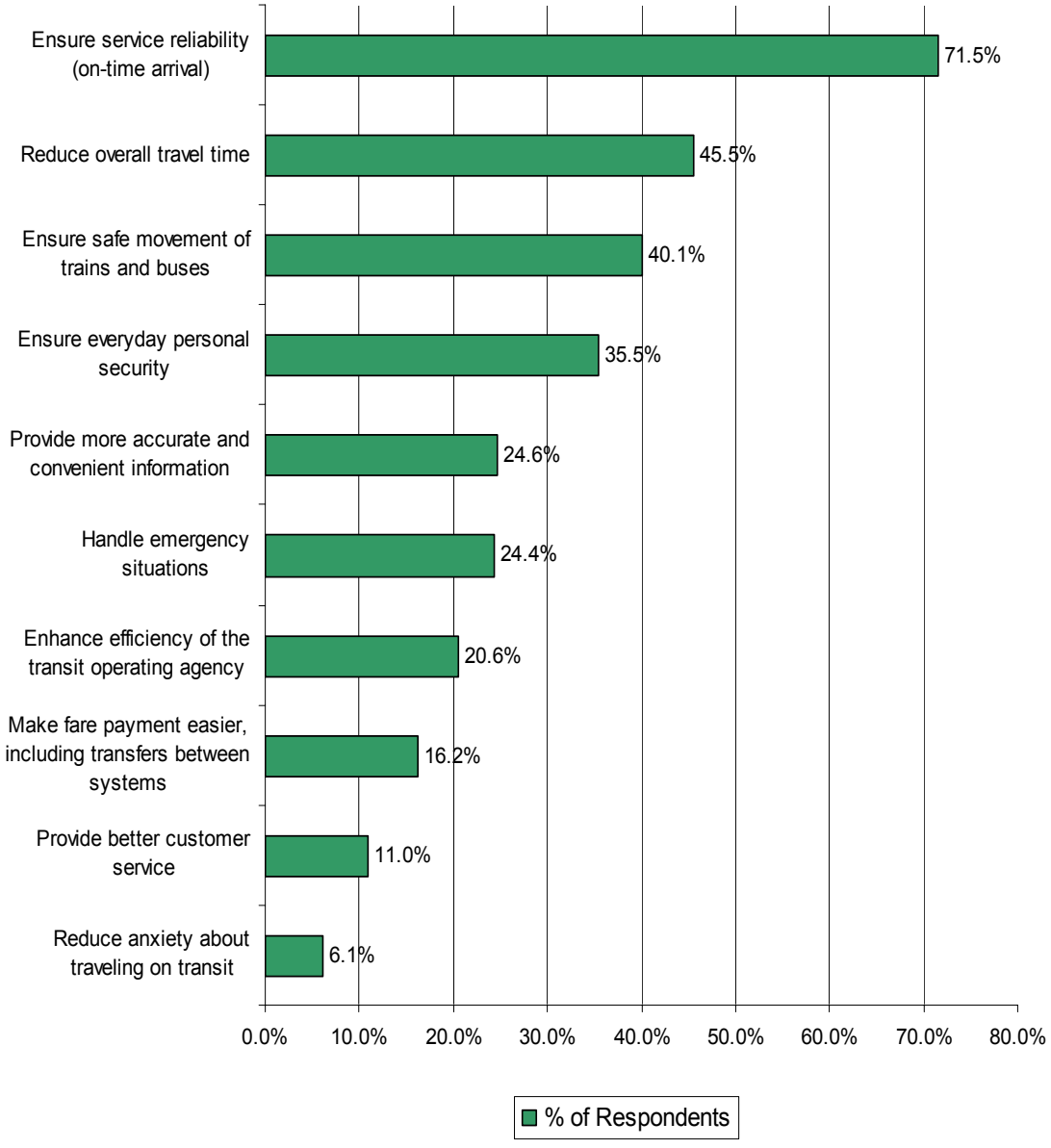
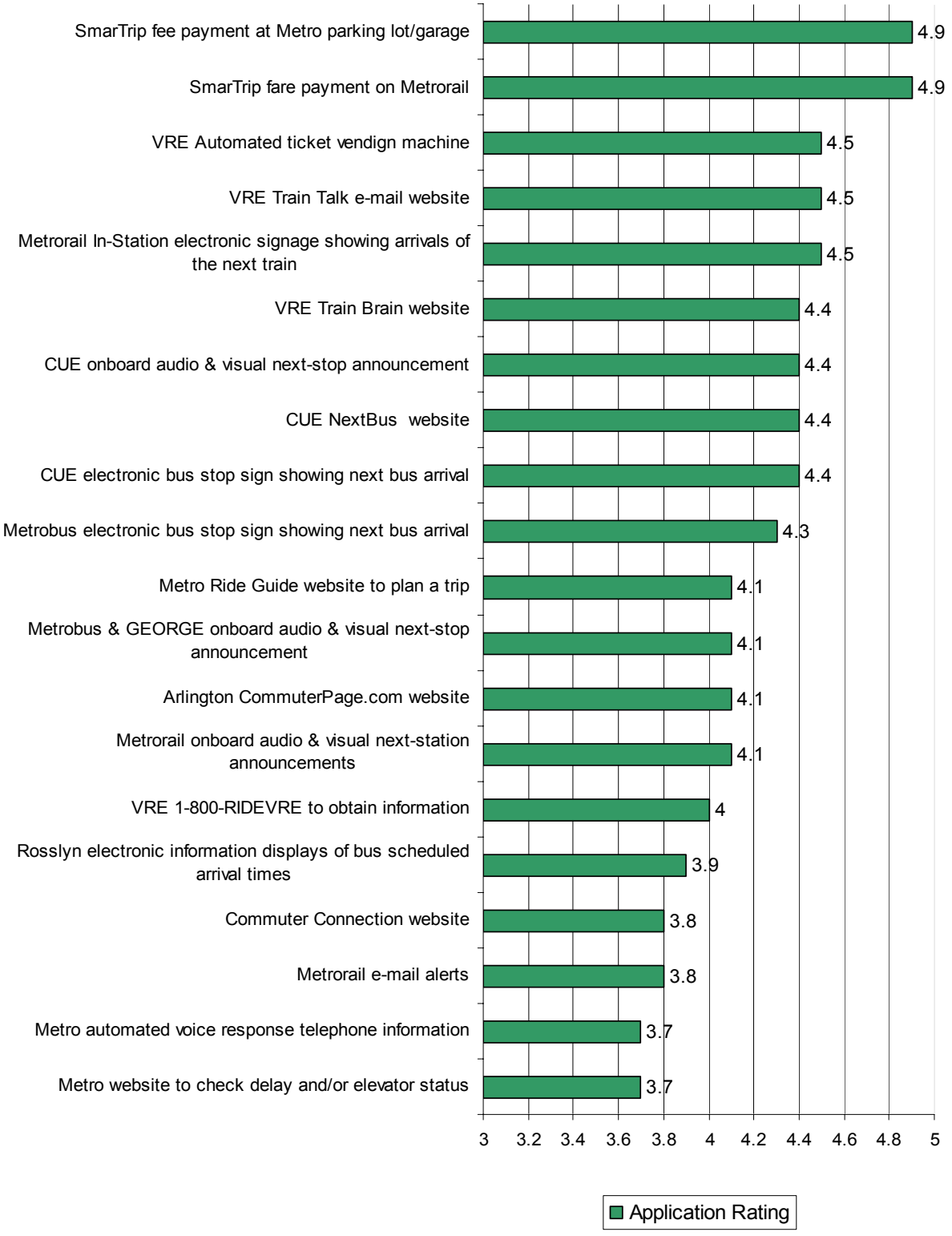


Figure 2-3
Level of Satisfaction



■ 2.8 EMERGING TRENDS AND ISSUES

The Financial Industry

Electronic fare media has been used in the transit industry for many years. Typically, fare payment has involved an agency-issued smart card for use in the transit system only and, in some cases, in retail locations. They have usually been stored-value cards, where the card holds the fare product or cash value that is updated with each use of the card.

More recently, developments in the transit and financial payments industries have created new opportunities for convergence and collaboration. For example, the financial payments industry has turned its focus on processing "micropayments" for individual transactions (generally less than $25) and making the necessary changes in business rules and practices to foster that expansion. On an individual transaction basis, the value of a purchase may be insignificant but, collectively, these transactions were estimated to be almost $1.7 trillion of personal consumption expenditures in 2005. Despite its smaller revenue base, the mass transit industry is in a position to pioneer contactless payment systems. Given an often captive clientele that must use a public transit agency's preferred payment method to use its services, the mass transit agency is better positioned than other industries to drive mass adoption of new payment systems.[16]

At the same time, some transit agencies are looking beyond their existing fare collection systems for opportunities to improve customer service and operating efficiencies and reduce, though not eliminate entirely, their role as a payment media issuer and transaction acquirer.

American Express, MasterCard, Visa, and, more recently, Discover have implemented new programs and rules that apply to low-value transactions in some industries, including transit. These programs, which apply to both magnetic stripe and contactless transactions, may feature the following:

- No consumer signature is required when the transaction value is below a certain amount (typically $25).
- A customer receipt is required only if requested by the cardholder.
- The merchant generally has full chargeback protection for transactions that meet the requirements of these programs.
- Decreased processing rates for credit and debit transactions may be offered to merchants for transactions below a certain limit in certain merchant categories.

Credit and debit card fee structures vary by payment brand and fees typically are negotiated between the merchant and the acquirer. The discount rate is a fee for processing credit card transactions and handling the deposit of card funds into a merchant bank account. The main component of the discount rate is the interchange fee. For credit card purchases, the interchange fee includes both a variable amount (computed as a percentage of the transaction amount) and a fixed amount. Debit card payments have a similar fee structure with a lower interchange rate. For micropayments, the fixed portion of the interchange fee

can be large enough that it is not economical for some merchants to accept credit, debit, and prepaid products,

While the fee methodology described above is suitable for traditional purchasing behavior, it can be expensive for merchants who sell products and services at micropayment prices. To address this issue, the industry is moving toward transaction aggregation. Aggregation identifies repeat transactions that use the same payment instrument (such as a credit card), aggregates the charges up to a certain value or time, and then processes the aggregated charges, thereby processing a smaller number of higher-value transactions. This can result in lower fees than processing each micropayment transaction individually.

There are risks associated with aggregation, but there are approaches that can be used to mitigate the risks associated with waiting until aggregation criteria are met. One possible approach is to perform authorization on the initial use of the contactless payment device before a transaction is forwarded to the back office to begin the aggregation process. A transit agency may be willing to accept the additional time to authorize the card online for the initial transaction to ensure that the payment device is in good standing with the financial issuer. If for the first transaction, the card is valid, the transit agency could have a high degree of confidence that the rider is a legitimate customer and may be willing to accept the risk until the aggregation criteria are met.

Use of transaction aggregation can offer two benefits. First, a majority of the transactions would be handled by systems located on the front-end of the payment network or internal to the transit system, improving response times and potentially reducing transaction fees. Second, the aggregated bundles of transactions may be processed over the existing financial payment networks, reducing the agency's risk of non-payment and fraud.[17]

Marketing Electronic Media

Recent initiatives by financial institutions have had a significant impact on the potential viability of multi-application cards for transit fare payments. These include the development of partnerships between financial payment card issuers and transit agencies and the adoption of contactless card technology by card issuers. There are two basic partnerships – those that require the cards to feature the financial issuer's brand (brand card marketing) and those that require the transit agency's brand to be more prominent (co-branded card).

In a brand card marketing arrangement, financial payment card issuers may establish partnerships to leverage additional marketing channels for acquiring accounts. The owner of the marketing channel may receive compensation based on the volume and quality of accounts generated. Transit agencies typically control physical facilities and online channels that can represent opportunities for marketing payment cards.

A co-branded card carries both a non-payment brand (such as the brand of a transit agency) and the brand of the financial issuer. Examples of co-brand cards in the transportation industry include cards issued by Citibank in partnership with WMATA and by Chase in partnership with BART. Co-branded card programs are defined by a business relationship between the brand owner and the financial payment issuer. The relationship is guided by an agreement that defines the marketing approach the card issuer will follow, the participation of the brand owner in the marketing efforts, and the financial responsibilities of each party.

For the financial card issuer, the co-branded card provides an opportunity to leverage new channels for card solicitation and build upon consumer loyalty to the brand displayed on the card. Issuers hope to generate active cardholder relationships based on the consumer's loyalty to the brand.

In a co-branded relationship, the financial institution is typically responsible for the following:

- Soliciting prospective cardholders, using techniques such as direct mail, telemarketing, online, direct response, and television marketing;
- Issuing cards, authorizing and settling transactions, and creating statements; and
- Providing customer service related to payment transactions, such as answering questions about disputed transactions and processing credits, if appropriate.

The co-brand partner is typically responsible for the following activities:

- Providing access to the brand for marketing purposes;
- Providing the financial institutions with a list of prospects for acquisition campaigns;
- Providing access to marketing channels (websites, physical facilities);
- Funding certain elements of the rewards program, as appropriate; and
- Supporting customer services as it relates to service delivery failures, and responding to questions specific to the brand.

The financial payment brand (e.g., American Express, Discover, MasterCard, Visa) is generally responsible for the following:

- The payment system infrastructure
- Rules and governance
- Marketing support

While not necessary for a co-branded relationship, transit agencies are increasingly moving toward co-branded relationships using a "basic combined" system approach. The basic combined system incorporates three operating principles:

- The multi-application card carries a transit data file and a traditional credit/debit card data file;
- The contactless credit/debit payment application is honored at conventional retail point of sale terminals, but not at the point of transit access (faregate or farebox); and
- The transit data file is processed by the transit terminal as though it were a transit issued fare payment card.

Stakeholders in the basic combined system model include transit agencies, financial payment card issuers, merchant acquirers, transit patrons, and potential retail partners of both the transit agency and the acquirer. All of these stakeholders groups can benefit from this model.

Transit agencies may achieve some of the following benefits:

- Reduction of costs associated with card stock acquisition and card distribution, resulting in ongoing savings in both capital and operating expenses;
- Simplified transactions at vending machines, leading to fewer patron issues and lower customer service costs;
- Use of existing fare policies, patron feedback, and enforcement features and practices;
- Minimal system costs for deployment for agencies already operating contactless smart card programs. Co-branded multi-application cards can be introduced and accepted without modifying current terminal software or imposing financial industry data security requirements on fare processing equipment. Current systems, standards, and processes can be leveraged;
- Revenue opportunities, such as co-brand revenue sharing, bounties on newly acquired accounts, and possibly even fees from licensing the transit brand and application to the issuer;
- Opportunities to link transit use with particular retail partners by integrating with merchant loyalty programs, thus further motivating patrons to obtain the card;
- Increased migration to smart cards, lowering the operating costs inherent in using other supported fare media (e.g., single-ride magnetic tickets, limited-use cards, cash, paper, tickets); and
- Use of existing customer service centers, with the on-card data file assisting customer services and enforcement personnel who may not have access to online terminals, as well as opportunities for reduction in customer service overheads as patrons look to their financial payment card issuer for information and issue resolution (subject to the development of a business case that provides issuers with the incentive to take on such functions).

Financial payment card issuers may achieve the following benefits:

- Opportunities for new customer acquisition as the transit application and brand may act as an effective marketing tool to target regular transit users and encourage them to adopt and use the issuer's financial payment card. A multi-application transit/financial card may be particularly appealing when there is a pre-existing strong transit brand;
- Generation of additional spending volume for the financial payment card through fare product purchases;
- Top-of-wallet card positioning due to daily use associated with the transit application;

- Improved customer awareness and knowledge of contactless benefits due to the use of contactless media for both transit and retail point of sales payments; and

- Straightforward implementation. The model leverages the current financial infrastructure, with few additional services and little system development required of the financial community.

Merchant acquirers may achieve the following benefits:

- Increased purchase volume due to fare product sales and card reloads; and

- Potential for an improved business case for merchant conversion to contactless-enabled terminals, due to customer ability to reload the transit application at properly configured terminals.

Transit patrons may achieve the following benefits:

- Enhanced convenience resulting from the use of a single payment card for both transit and retail financial payment;

- Increased ease of use resulting from the familiarity of the user's experience with a transit issued fare payment card;

- Easy vending machine transactions;

- Availability of current transit-only fare payment card features and benefits (e.g., feedback on balances and transaction activity at point of use: transit balance checking and access to trip history at offline devices: access to proof of payment); and

- New transit-centric rewards programs (if offered by the transit agency).

Retail partners may achieve the following benefits:

- Increased foot traffic and commission revenue for merchant facilitated transit reloads; and

- Potential for cross-merchant loyalty programs to bring customers into stores and drive spending.[18]

Serving Unbanked and Underbanked Individuals

It is estimated that close to 20 percent of all American households, representing 80 million people, do not have basic bank accounts. In addition, there are many individuals also considered to be underbanked. These underbanked individuals may have a basic savings account with a financial institution but do not use more advanced financial services. The unbanked individual is likely to earn less than $25,000 per year and live in a household with a total household income of less than $40,000 per year. A large percentage of the unbanked population is Hispanic or African-American and is more likely to be female. The reason for avoiding financial institutions may be due to a belief that they do not have enough money to need services or justify fees, the wish for privacy, or a language barrier.

In 2003, the Metropolitan Transportation Commission (MTC) performed an analysis to identify the number and location of households without bank accounts in low-and middle-income neighborhoods of the San Francisco Bay Area. MTC's interest was to determine whether ownership of a bank account would interfere with adoption of the new TransLink smart card by local transit riders and to recommend approaches for ensuring access to TransLink for unbanked transit riders.

MTC's analysis indicated that lower income households were more likely to use public transit and less likely to maintain a bank account. MTC estimated that more than 60 percent of Bay Area residents who rode public transit and lived in households with annual incomes below $15,000 did not have a bank account. For residents who rode public transit and lived in households with incomes between $15,000 and $30,000, the estimated percentage without a bank account was 40 percent.

These large segments of the population create challenges for transit agencies that are implementing smart-card-based fare collection systems. Serving unbanked transit riders involves issues both when the transit fare payment card is initially sold and during the life of the card, when additional fare value is sold. Many transit agencies continue to depend on traditional approaches for vending fare media to service both banked and unbanked riders. While programs attempt to maximize the advantages of smart card technology through features like autoload and online sale of cards and fare value, transit agencies still invest heavily in more traditional fare media sales channels, such as in-station vending machines and retail sales outlets.

Transit agencies face challenges and incur significant expenses in establishing and operating fare product sales through retail outlets. Transit agencies must promote programs to retailers and persuade stores to participate. Financial agreements must be executed that specify commission rates to sales outlets and settlement timing. Point-of-sale terminals capable of loading value on transit fare media must be installed at participating retailers. Retailer staff must be trained on the use of the equipment in addition to fare product sale and reload terms. Some transit agencies have been cautious in implementing or expanding smart-card-based systems because of the specific concerns about the availability of smart cards to consumers without bank accounts and the difficulty of establishing broad retail distribution. For agencies interested in eliminating legacy fare payment systems and creating smart card payment infrastructure, the success of the retail sales network has been essential to creating public acceptance.[19]

As previously described, the financial payment industry has moved forward with new products that can offer an alternative to the traditional transit approach of serving unbanked and underbanked consumers. Prepaid cards do not necessarily require a minimum balance or a credit check, and value can be loaded at retail locations as opposed to financial institutions.

In an effort to better serve unbanked and underbanked consumers, transit agencies could partner with a prepaid card program manager. Agencies could also become "program managers" and issue private label cards in conjunction with a bank and processor. While prepaid cards can support agencies immediately by allowing patrons to purchase transit fare media through ticket vending locations, it is likely to take some time for prepaid card issuers to accept the cost of adding a contactless chip on the card.

The Los Angeles County Metropolitan Transportation Authority Board of Directors recently approved a 12-month service agreement with Visa for a pilot project to introduce a TAP prepaid card that can be used on Metro Bus and Metro Rail and for use as a general purpose payment card, similar to a "gift card." Visa and its affiliate Ready Credit will provide dual application cards, self-service bilingual kiosks for card loading and distribution, web-based card distribution infrastructure and a marketing and promotions plan with an estimated value of 1.6 million. Metro will be responsible for the placement of advertising materials and marketing materials, valued at approximately $974,000. Following an evaluation of purchase and usage volumes, pricing and revenue opportunities, and customer satisfaction, Metro and Visa will determine if this is a viable option for serving the unbanked and underbanked residents of Los Angeles County. [20]

■ 2.9 DATA SECURITY

Following the events of September 11, 2001, the renewed focus on higher levels of security has prompted rapid growth in technological enhancements and uses of smart cards. While the data collected from smart cards are beneficial to transportation planners, some individuals may question whether their civil and human rights can be adequately protected, posing a potential barrier to the implementation of regional smart card programs.[21] The level of privacy protection depends upon what type of data are acquired and recorded; how the data are accessed, distributed and destroyed, and who has access to the data.[22]

What Types Of Information Are Gathered?

A smart card could have minimum prepayment functionality, like a debit card, and readers could merely subtract the cost of individual trips. Financial and trip data might be all the smart card provides. Alternatively, marketing data may be obtained if information such as an individual's name, home or work address, age, or gender is requested. The radio frequency identification features of a smart card may enable centralized monitoring of the venue of individual passengers carrying these cards. Further, smart cards could collect information that could be correlated with criminal information to enhance transit security.

What Are The Potential Uses Of Gathered Information?

Information may be used merely for fare payment or for planning and advertising purposes, or to monitor other personal travel behaviors. Transit providers have an increasing interest in protecting public safety and security and may want to share the data with law enforcement officials.

Who Has Access To The Information?

The transit provider has an obvious interest in payment for trips taken and may have an interest in monitoring trip behavior. Once the information is included in a data base, then the transit employees having access to the database may access the personal information. Commercial or criminal interests may have access to data for purposes of personal gain such as identity theft or raiding bank accounts. Further, under state public record laws, the general public may potentially have access to information collected by governmental institutions, some of which may be of a private nature.

Greater concerns arise if a smart card is issued for multiple uses and purposes. An agency might decide to issue a card for transit and retail purchases, which involves banking and credit transactions. Several potential problems with this type of card are:

- **Centralization of personal information collection** - A single card used for different purposes runs the risk of creating a centralized warehouse of data about an individual's activities. If all of the individual's transactions occurred through or were recorded at the same source, a center of data for citizens would be ripe for misuse and abuse.

- **Means for new social controls** - The issuance, revocation, or withholding of such a card could be used to control social behavior, limit an individual's activities, or punish unrelated activities. While losing a driver's license may limit a person's ability to drive, it does not impact his or her ability to purchase goods. A single purpose application card does not provide the same flexibility.

- **Greater collection and use of personal information** - When a single card is used across multiple applications, it could become a default personal identification card. A single certifier will result in more data being collected than is needed for many transactions. Using a single card for multiple purposes creates an electronic trail of personal interactions.[23]

Although governmental agencies are given wide latitude in collecting information in their operations, it is prudent for transit providers to carefully consider the protection of individual privacy when designing their ITS applications. One example of some general guidelines issued by the State of California's transportation agency (Caltrans) for state departments is shown below.

Pursuant to Government Code Section 11019.9, all departments and agencies of the State of California shall enact and maintain a permanent privacy policy, in adherence with the Information Practices Act of 1977 (Civil Code Section 1798 et seq.), that includes, but not necessarily limited to, the following principles:

(a) Personally identifiable information may only be obtained through lawful means.

(b) The purposes for which personally identifiable data are collected shall be specified at or prior to the time of collections, and any subsequent use of that date shall be limited to and consistent with the fulfillment of those purposes previously specified.

(c) Personal data may not be disclosed, made available, or otherwise used for a purposed other than those specified, except with the consent of the subject of the data, or as required by law or regulation.

(d) Personal data collected shall be relevant to the purpose for which it is needed.

(e) The general means by which personal data is protected against loss, unauthorized access, use, modification, or disclosure shall be posted, unless the disclosure of those general means would compromise legitimate agency objects or law enforcement purposes.

Each department shall implement the privacy policy by:

- *Designating which position within the department or agency is responsible for the implementation of and adherence to this privacy policy;*
- *Prominently posting the policy physically in its offices and on its Internet website, if any;*
- *Distributing the policy to each of its employees and contractors who have access to personal data;*

- *Complying with the Information Practices Act (Civil Code Section 1798 et seq.), the Public Records Act (Government Code Section 6250 et seq.), Government Code Section 11015.5, and all other laws pertaining to information privacy, and*
- *Using appropriate means to successfully implement and adhere to this privacy policy.* [24]

Transit payment security is not an element in a system that should be added on; it is a core element in the design of the entire system. Security design is based on the principles of prevention, detection, and reaction. All security systems are designed with the basic assumption that someone will figure out how to breach any defenses that are created. For this reason, the design must include detection and reaction measures in addition to preventive measures. In the case of a transit system, prevention is typically based on making it very difficult to counterfeit the contactless cards that are used to pay fares to trick the system into thinking a different card is a legitimate fare card or to add value to a legitimate card without paying. Preventive measures include card security, reader security, and system tests. Detection is a critical element of any security system. Knowing when a counterfeit card has been successfully used is essential to confining the losses to small amounts. Reaction refers to the measures available to the system owner to prevent the successful attacker from repeating the process.

In general there are some commonly-accepted mechanisms used for securing transit payment systems. Some approaches are simple, others more complex. What is implemented depends greatly on the specific situation and, especially, the physical and financial resources available. No matter what type of system has been implemented, some commonly-accepted practices should always be followed. For example, every transit employee that requires access to the system should be assigned a unique user ID and password or personal identification number. This gives the organization the ability to work backwards starting with the last person to have access to identify who was on duty should something go wrong with the system. Another simple item is ensuring that a strong password policy is in effect. This means users cannot have simple passwords such as names or phone numbers. Strong passwords ensure a high degree of difficulty for someone attempting to guess a password. Other such straightforward practices include:

- Using a closed network without a connection to the Internet or corporate network; one of the best ways to ensure no outside access is granted/gained;

- Linking the IP address to the Media Access Control address to ensure a level of trust that the device is authorized to access the system;

- Using a physical security token such as a one-time password device or smart card for system access to ensure a level of trust that the device and its holder are authorized to access the system;

- Using hotlists and immediately blocking access when specific IDs are entered or presented to the system; and

- Using key diversification to provide a higher degree of security by giving every card its own specific keys.

No matter what security measures are implemented, transit agencies should ensure that access to the system is based on "need to know," and the system should not rely solely on a single person or position to protect the system.

The system's security should not be limited to the system but should also cover the overall infrastructure within which it will be deployed. For example, within transit there are many areas where round-the-clock personnel coverage is not feasible. Deployment of closed circuit television cameras might be an option.

Even after following the suggestions above, mechanisms need to be in place to proactively scan the system to detect and react to, as early as possible, any activity that suggests someone is trying to use the system fraudulently. For example, charges being made to the same card being used at two locations simultaneously should raise a flag.

With the rapid advancement of smart card technology in transit and the increasing sensitivity of individuals to privacy issues, it is important that agencies satisfactorily address security concerns. Customer data typically is held in the back office and is not stored on the card. However, some exceptions do exist. For example, individuals who qualify for special fares must use a registration process that may require them to provide personal information. Others who want to register for balance protection or auto-load features may also need to supply personal information. Similar to the recommended procedures to ensure card security for the transit agency, employee access to the information should be limited and carefully monitored to ensure the security of personal information.[25]

It is also important that individuals have a clear understanding of how their information may be collected, used, and stored. Exceptions to privacy rules (release of personal information related to legal proceedings and in cases involving threat of imminent harm) also should be explained. With a clear understanding of the privacy policy, individuals may be more likely to take advantage of smart cards or may make an informed decision not to participate if they choose not to provide the necessary data. Appendix A includes a sample of a very thorough privacy policy in use by the Port Authority Transit Corporation (PATCO) related to its website and new Freedom Card fare program.[26]

■ 2.10 MOBILE PAYMENTS AND OPPORTUNITIES FOR TRANSIT

According to the International Association for Wireless Communications, in 2006 there were more than 219 million wireless subscribers in the United States. This represented approximately 72 percent of the total U.S. population who owned some type of wireless device such as a mobile phone, wireless email device (such as a BlackBerry®), or a personal digital assistant (PDA). Mobile payment pilot projects outside the U.S. have shown that consumers value the convenience of using their cell phones for payment at a physical point of sale. The transaction value of mobile payments is estimated to grow from slightly more than $2 billion in 2007 to approximately $22 billion by 2011. Several factors are driving the adoption of mobile payments. First, consumers are adopting wireless data services very rapidly, and second, mobile hardware is becoming less expensive, faster, and easier to use while incorporating more functions.

There are two types of mobile payments. The first, remote mobile payments may use a variety of mobile phone data channels to initiate a transaction. One example of a remote mobile payment process would involve the consumer or merchant setting up an account with a trusted third party of mobile payment service provider (MPSP). When a transaction is

initiated, a short message service (SMS) message is sent the MPSP, which would authenticate the transaction via a password, handset hardware information, or other personal information from the sender.

The second type of payment is proximity mobile payment. Proximity payments leverage the financial industry's payment infrastructure. A near field communication (NFC) enabled phone would include a payment application (i.e., credit or debit card) issued by the consumer's financial institution. The application and payment account information are encrypted and loaded into a secure area of the phone. The phone uses the NFC technology to communicate with the merchant's contactless point of sale system, similar to the contactless payment cards previously described. The payment and settlement processes are the same as those used when the consumer pays with the traditional contactless or magnetic stripe credit or debit card. Many industry experts believe the proximity mobile payment option will become the mobile payment technology of choice for consumers using mobile phones for retail payment transactions in the U.S.

All stakeholders involved in proximity mobile payments stand to reap significant benefits. Potential benefits to mobile operators include new customers and new revenues from data-related data services (such as text message advertisements). Financial institutions may be able to increase their credit and debit card transaction volumes by offering the same trusted payment services currently provided by cards. Merchants may benefit from operational efficiencies associated with faster transactions and reduced cash handling expenses, while handset manufacturers may gain a competitive advantage by offering mobile phones that support payment along with other mobile applications.

To date, mobile payment applications have been viewed as providing a competitive differentiator, so they are being implemented among specific partners and not in a way that promotes interoperability across the industry. Mobile payment implementation at the physical point of sales is complex and requires a solid business case and value delivered to all stakeholders. The development of new technology for consumers, merchants, mobile operators, and the financial community are also necessary. Successful implementation will require an "open platform" that makes the payment wallet available to all stakeholders, reducing the need for single operator/one issuer projects.[27]

While there have been a few mobile payment trials around the country, BART was the first U.S. transit agency to test proximity mobile payments, and it was the first trial to give participants the added benefit of automatically receiving the discounts and offers that companies usually provide only to customers who have enrolled in their loyalty programs. In the past, other pay-by-mobile-phone trials allowed customers to pay for goods and services only using a credit card tied to their phone, which prevented them from automatically receiving the discounts merchants provide. In the BART trial, participants automatically received the 6.25 percent discount BART offers to those who purchase high-value tickets through its regular fare program.

The four-month trial began in January 2008 and involved 230 participants. Each was provided with a Sprint NFC-enabled phone with a stored value of $48 worth of BART rides. Riders simply had to tap the phone on the top of the fare gates to access the system. When the stored value dropped below $10, the NFC technology automatically reloaded the phone "over the air" with another $48 worth of value. The phones could also be used to pay for meals at participating Jack-in-the Box restaurants and could be used to take advantage of

"smart ads" in BART stations. By tapping their phone on advertising posters, they could get directions to the nearest Jack-in-the Box restaurant.
Approximately 9,000 trips were taken by participants during the trial period. Participants added value to their cards more than 800 times. More than 80 percent of the participants said the mobile payment system was easy to use.

BART officials see the future introduction of mobile payments as an eco-friendly fare payment option. BART uses approximately 32 million paper tickets annually and disposes of 450,000 used tickets per week. They also believe the added customer convenience for fare payments provided by mobile technology removes another barrier to transit use.[28]

■ 2.11 SUMMARY OF THE STATE OF THE INDUSTRY

Changing travel patterns in the United States, coupled with new state and federal mandates to improve regional coordination, have prompted the transit industry to seek new ways to enhance customer convenience and simplify often complex fare structures through the use of interagency fare agreements, and regional fare coordination programs.

Following the identification of objectives, an examination of existing policies and approaches, and an evaluation of various alternatives, some type of automated technology is often selected for new or enhanced fare collection systems, although technology is not necessarily a requirement. With the recent development of APTA's Universal Transit Farecard Standards program, technology and system interoperability barriers are more easily overcome, while financial, customer, managerial, and political considerations must still be addressed.

The costs and benefits of electronic fare payment systems are difficult to quantify. To date, few rigorous cost/benefit evaluations have been conducted. Many agencies, however, have reported or anticipate reductions in fare processing time, reductions in cash handling expenses, and significant enhancements in the volume and accuracy of data to improve service planning.

As electronic fare media and multi-application smart cards are becoming more widely accepted by the financial service, transit, and retail industries, new partnership opportunities and efficiencies are emerging. Transit agencies are sometimes able to reduce their role as a payment media issuer, resulting in savings associated with card stock and distribution expenses. Financial payment card issuers may acquire new transit customers, and retail partners benefit from increased foot traffic and purchasing volume, to name a few.

With the growing acceptance of smart cards and the sensitivity of privacy related issues, transit providers must carefully consider data security. They should develop detailed plans regarding the type of data that is required, and how the data is recorded, accessed, distributed and destroyed. Individuals should be provided with a concise description of how their information will be collected and processed. Exceptions to privacy rules should also be provided.

The results of the first proximity mobile (cell phone) payment test by a U.S. transit agency suggests this technology may become more prevalent in the future. Consumers are adopting wireless data services very rapidly and mobile hardware is becoming less

expensive, faster, and easier to use. The added convenience of mobile fare payments has the potential of removing another barrier to transit use.

3.0 CASE STUDIES

■ 3.1 INTRODUCTION

Based on the results of the literature review and preparation of the State of the Industry, five case study sites were selected that have implemented (or are in the process of implementing) practical and innovative approaches to fare collection in the context of regional fare policy. A more in-depth analysis of one or more of the five topical areas identified in the problem statement is provided. The sites were selected to encompass a range of regional fare programs with broad applicability to the industry, from low-cost/no technology programs to complex technology intensive programs.

The five case studies detail the following regional fare collection programs:

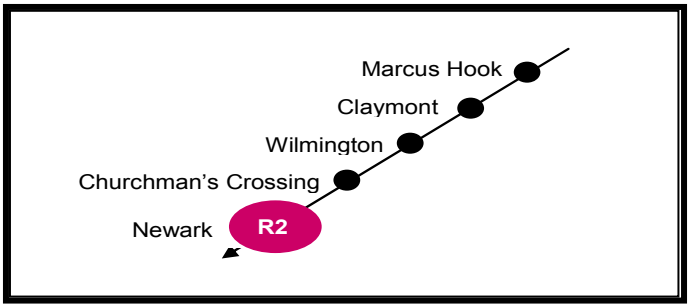
- Delaware Transit Corporation (DTC) and the Southeastern Pennsylvania Regional Transportation Authority (SEPTA);
- City of San Luis Obispo (SLO), the San Luis Obispo Regional Transit Authority (RTA), South County Area Transit (SCAT), and the cities of Paso Robles and Atascadero in San Luis Obispo County, California;
- Port Authority Transit Corporation serving New Jersey and Pennsylvania (PATCO);
- Miami-Dade Transit (MDT); and
- King County Metro (KCM), Central Puget Sound Regional Transit Authority (Sound Transit), Pierce Transit, Kitsap Transit, Community Transit, Everett Transit, and Washington State Ferries in the Central Puget Sound Region of the State of Washington.

■ 3.2 DELAWARE TRANSIT CORPORATION (DTC) – SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY (SEPTA) OVERVIEW

In Delaware, commuter rail service is operated by the Southeastern Pennsylvania Transportation Authority (SEPTA) in partnership with the Delaware Transit Corporation (DTC), a subsidiary of the Delaware Department of Transportation and manager of DART First State public transportation services. Operating on Amtrak's Northeast Rail Corridor, the regional rail service, referred to as SEPTA R2, began operations to Wilmington Delaware in 1989 and added stops in Claymont in 1991, Newark in 1997, and Churchman's Crossing in 2000. The four Delaware stations are displayed in Figures 3-1 and 3-2.

Figure 3-1
SEPTA Regional Rail Map

Figure 3-2
Delaware Stations



On weekdays, inbound trains (toward Philadelphia) depart Delaware beginning at approximately 5:50 a.m. Outbound trains return to Delaware until approximately 10:30 p.m. (not all of Delaware's four stations are served during these hours). On Saturdays, inbound trips begin at approximately 6:45 a.m. and return trips run until approximately 8:30 p.m. There is no R2 service operating in Delaware on Sundays. During Fiscal Year 2008, SEPTA transported 1,073,000 riders in Delaware, or an average of 4,000 passenger trips per day. DART operates connecting bus service to each of the four stations.

■ 3.3 SEPTA FARE STRUCTURE

All of SEPTA's Regional Rail stations are assigned a zone number based on their distance from Center City (30th St., Suburban and Market East Stations in Philadelphia). Ticket prices and zone destinations increase accordingly. In addition to the zone-based regional fares, peak fares are charged on weekday trains that arrive in Center City between 6:30 and 9:30 a.m. or depart Center City between 4:00 and 6:30 p.m. Off-peak fares apply at all other times, including weekends and holidays. Tickets purchased at the time of boarding are assessed an additional fee over those that are purchased in advance. In addition to single-ride tickets, SEPTA also offers round-trip and 10-ride ticket books.

Tables 3-1 and 3-2 display SEPTA full fare Regional Rail ticket costs. In Delaware, the Claymont and Wilmington stations are in Zone 4 and the Churchman's Crossing and Newark Stations are in Zone 5.

As an example, the single-ride SEPTA fare for someone boarding the train at Newark Station for travel to Downtown Philadelphia is $6 for peak travel with advance purchase, $7 for peak travel with on-board purchase, $4.75 for off-peak travel with advance purchase, $6 for off-peak travel with on-board purchase, and $57.50 for 10-trip tickets.

Round-trip fares for a similar trip are $11.75 for peak travel with advance purchase, $14 for peak travel with on-board purchase, $9.25 off-peak round-trip with advance purchase, and $12 off-peak round trip with on-board purchase.

Table 3-1
SEPTA Round Trip Fares

Zone	Peak Round Trip (A)	Peak Round Trip (OB)	Off-Peak Round Trip (A)	Off-Peak Round Trip (OB)
CCP/1	$6.75	$8.00	$6.75	$8.00
2	$8.25	$10.00	$6.75	$10.00
3	$9.75	$12.00	$8.25	$10.00
4	$10.75	$14.00	$9.25	$12.00
5	$11.75	$14.00	$9.25	$12.00
6	$15.00	$18.00	$15.00	$18.00

Table 3-2
SEPTA Single Ride Fares

Zone	Peak Fare (A)	Peak Fare (OB)	Off-Peak Fare (A)	Off-Peak Fare (OB)	10 Trip Tickets (A)
CCP/1	$3.50	$4.00	$3.50	$4.00	$32.50
2	$4.25	$5.00	$3.50	$5.00	$40.00
3	$5.00	$6.00	$4.25	$5.00	$47.50
4	$5.50	$7.00	$4.75	$6.00	$52.50
5	$6.00	$7.00	$4.75	$6.00	$57.50
6	$8.00	$9.00	$8.00	$9.00	$70.00

In addition to tickets, SEPTA also offers a variety of weekly and monthly TrailPasses that can be used on the Regional Rail system for travel to and from stations in Delaware. Examples are shown in Table 3-3. TrailPasses are valid for unlimited travel on Regional Rail to destinations in the zones indicated on the pass.

Table 3-3
TrailPass Fares

TrailPass Cost		
Zone	Weekly	Monthly
1	$22.50	$84.00
2	$31.50	$116.00
3	$39.00	$142.50
4	$44.50	$163.00
5	$50.50	$181.00
6	$50.50	$181.00

Examples of other monthly passes include:

- **Monthly TrailPass Zone 4**

  A monthly TrailPass is valid for an unlimited number of rides on all modes of transportation within Philadelphia, through fare zones on Suburban vehicles, and for unlimited rides on Regional Rail trains up to and including Zone 4 stations. Monthly TrailPasses are valid on Regional Rail trains only during the calendar month for which

they are issued until 10:00 a.m. of the first non-holiday weekday of the following month. All monthly SEPTA passes include "anywhere" status on weekends and major holidays for unrestricted SEPTA travel.

- **Monthly Suburban Pass (Cross County)**

  The Monthly Suburban Pass is valid for unlimited rides in any direction involving any number of Suburban Fare Zones on any regularly-scheduled transit route or Regional Rail service operating outside of Philadelphia. A valid Cross County Pass, plus an additional Suburban zone fare, entitles a passenger to a one-way trip in either direction on any route within Philadelphia.

- **Monthly Intermediate 2-Zone Pass**

  This pass supports multiple and/or frequent trips between adjacent or near adjacent stations on particular branches of the SEPTA Regional Rail System. In Delaware, this pass is valid between zones 2 and 3, zones 3 and 4, and zones 4 and 5. This pass offers no privileges for SEPTA bus, subway, or trolley service, nor does it provide passage to or from Philadelphia. This pass does not include unlimited travel on weekends and holidays.

SEPTA regional fare media can be purchased from station agents and automated ticket vending machines, via mail, or on-board. SEPTA conductors are responsible for manual ridership counts.

■ 3.4 DTC - SEPTA OPERATING AGREEMENT

Through its agreement with SEPTA, DTC is responsible (at its expense) for coordination with Amtrak regarding the use of Amtrak facilities in Delaware. This includes all specifications for train operations in the state, administration of personal injury and property damage claims for which it is responsible, indemnification of SEPTA personnel excluding personal injury claims for injuries sustained in the course of employment by SEPTA, and property damage to rail vehicles for which DTC contributes to a self-insurance fund.

DTC is responsible for the operation of at least one sales location in Delaware for SEPTA fare instruments. SEPTA provides the fare instruments at no charge to DTC, which ensures proper controls, management, and accounting in a manner approved by SEPTA. Currently, SEPTA and DART fare instruments are sold at both the Wilmington and Newark train stations.

In exchange for the provision of R2 rail service in Delaware, SEPTA charges DTC a unit cost (train mile rate). This rate is based on the Association of American Railroads (AAR) annual Indexes of Charge Out Prices and Wage Rates East. The specific index used is the "Index of Material Prices, Wage Rates and Supplements, Combined (excluding fuel)" in effect for the calendar year preceding each July 1. The adjustment to the train mile rate is calculated by taking the change between two prior calendar years and applying that rate change effective July 1.

DTC is credited with revenues collected by SEPTA for transporting passengers whose trips originate or terminate in Delaware. Changes to the R2 fare structure in Delaware are

coordinated with DTC to the extent possible, but are ultimately established by SEPTA Regional Rail Division policies governed by SEPTA Board actions, public notices, and hearings.

■ 3.5 DTC-SEPTA FARE ALLOCATION AND RECONCILIATION

The revenue sharing agreement between SEPTA and DTC for passenger fare revenue collected as a result of operations in Delaware is as follows:

- For trips to/from Wilmington and other Delaware stations north of Wilmington, the DTC fare credit is 91.5 % of the average daily interstate fare, excluding intra-Delaware travel, as shown in Figure 3-3. The current average Delaware interstate fare rate (excluding intra-Delaware travel) is $4.35 x 91.5% = $3.98 per revenue passenger trip.
- For trips to/from stations south of Wilmington as far as Newark, the DTC fare credit is 33.3% of the average Intra-Delaware fare. The average Intra-Delaware fare is $2.12 x 33.3% = $0.70 per revenue passenger trip.
- To determine the monthly operating revenue creditable to DTC, the average fare per revenue passenger to Delaware stations is multiplied by the total number of monthly trips.
- SEPTA provides a quarterly statement of costs and revenues, and SEPTA/DTC makes appropriate payment within thirty days.
- The average fares can be reevaluated by either party up to two times each year as a result of fare increases or decreases and publication of SEPTA's Biennial Ridership Census, which is the source of the R2 average fare calculations.

In addition to the revenue sharing agreement between SEPTA and DTC, SEPTA pass holders simply "flash" their pass to the bus operators on the DART routes serving the four Delaware rail stations to receive a free fare.

■ 3.6 SUMMARY OF DTC-SEPTA OPERATING AGREEMENT

The agreement between SEPTA and DTC is one example of a relatively simple, low cost/no technology application that facilitates seamless rail travel between Pennsylvania and Delaware. Unit operating costs are based on the Association of America Railroads accepted industry standard, with a provision for annual updates to reflect changing conditions. The revenue allocation formula ensures an equitable distribution of fares between the two operators on a quarterly basis. SEPTA pass customers receive added value as a result of the policy offering free travel on connecting DART routes.

Figure 3-3
Delaware and Pennsylvania Passenger Counts Weekday Inbound

Delaware and Pennsylvania Passenger Counts
2008 Inbound Weekday

Station		Boards	Leaves	Zone	Delaware Boards
Newark		342	0	5	
Churchmans Crossing		275	0	5	
Wilmington		803	34	4	
Claymont		667	7	4	
Net Boards	2046	2087	41		47.5%
Marcus Hook		482	17	4	
Highland		62	12	4	
Lamokin Street		0	0	3	
Chester		279	70	3	
Eddystone		56	10	3	
Crum Lynne		85	12	3	
Ridley Park		253	19	3	
Prospect Park		217	10	2	
Norwood		261	11	2	
Glenolden		169	14	2	
Folcroft		163	20	2	
Sharon Hill		136	16	2	
Curtis Park		74	25	2	
Darby		71	31	2	
		4395	308		

Effective August 2007	
Average Inter-State Delaware Fare:	$ 3.98
Average Intra-State Delaware Fare:	$ 0.70

From	To				
Delaware	Delaware	41	2.0%	$2.12	$86.83
Delaware	PA	127	6.1%	$2.71	$343.68
Delaware - Zone 5	Phila.	533	25.5%	$4.79	$2,554.18
Delaware - Zone 4	Phila.	1,386	66.4%	$4.33	$6,005.29
		2,087	100.0%	$4.31	$8,989.99

Average without Intra-State Delaware Travel

2,046	$ 4.35	$ 8,903.16	

FY 2008	Revenue	Rides	Average Fare	Percent	Center City Rides
Monthly Passes	$54,806,912	17,401,245	$3.15	55.0%	57.0%
Weekly Passes	$13,839,668	4,175,143	$3.31	13.2%	13.7%
Intermediate Monthly	$1,462,698	696,040	$2.10	2.2%	
Ten Trip	$9,115,951	1,912,612	$4.77	6.0%	6.3%
One way Peak	$11,034,569	2,026,963	$5.44	6.4%	6.6%
One way Intermediate	$1,251,046	405,993	$3.08	1.3%	
One way Off Peak	$8,767,583	2,132,234	$4.11	6.7%	7.0%
Half Fare	$421,809	161,814	$2.61	0.5%	0.5%
On Board Collections	$18,922,418	2,738,528	$6.91	8.7%	9.0%
	$119,622,654	31,650,572	$3.78	100.0%	100.0%
Center City Rides		30,548,539			

■ 3.7 SAN LUIS OBISPO COUNTY, CALIFORNIA FARE PROGRAM OVERVIEW

Located along the Central Coast of California between Los Angeles and San Francisco, San Luis Obispo County consists of 3,616 square miles with an estimated population of 265,297 in 2008. The county is more rural and agricultural than other coastal regions in California. The region's economy is driven by agriculture (the third largest producer of wine in the state), tourism, and California Polytechnic State University (Cal Poly), located in San Luis Obispo.

The region has a network of traditional fixed-route and demand-response services and several seasonal trolley routes operated by public and private entities. In Fiscal Year 2008, approximately 2.3 million trips were provided in the region.

Figure 3-4
San Luis Obispo County

The City of San Luis Obispo (SLO) is the largest provider of services in the area, providing local service within the city and serving Cal Poly. SLO transit carries approximately one million fixed-route passengers per year. The San Luis Obispo Regional Transit Authority (RTA) provides inter-community fixed route service within the county. In 2007, RTA carried nearly 390,000 fixed-route passengers. South County Area Transit (SCAT) is managed by RTA and provides local service in five cities located in San Luis Obispo County. The Paso Express, operated by the City of Paso Robles, offers local service within the city. The North County shuttle is a joint operation between the Cities of Atascadero and Paso Robles, providing intercommunity service in the North County Area.

■ 3.8 FARE POLICY IN SAN LUIS OBISPO COUNTY

Prior to a regional fare coordination effort undertaken in 2008, there were several existing policies and mechanisms that simplified fixed-route travel between systems and throughout the region:

- Originally adopted in 1982, the San Luis Obispo Council of Government's Regional Transit Transfer Pass policy established uniform inter-operator transfer pricing ($0.75) and procedures. The transfer fee is collected and retained by the system to which the passenger is transferring.

- RTA's Monthly Regional Pass ($50) offered unlimited rides on all RTA, SLO Transit, SCAT, Paso Express, and North County Shuttle routes.

- Universal Pass Coupons ($30 for a book of 120 coupons) presented at face value were accepted on all systems to pay the applicable fare.

- Summer Break Pass ($30) allowed unlimited rides for K-12 students on all fixed-route systems between Memorial Day weekend and Labor Day weekend.

Apart from these, each agency had its own fare policy, fare media (tickets and passes), and fare distribution policies.

Cash Fares

Regular cash fares on the fixed-route systems were relatively uniform. SLO Transit, RTA, SCAT, and Paso Express all had a $1 base fare. RTA added zone charges (up to $2.50) for longer trips. With the exception of RTA, which charged a $0.75 transfer fee, the other systems offered free transfers. The seasonal trolleys were free or charged a minimal fee and did not accept intra-system transfers. The various Dial-A-Ride services had much greater fare variability ($1 - $4 plus applicable zone charges).

Passes

SLO Transit, RTA, and SCAT offered monthly passes ($30) for unlimited travel during the month. However, the RTA pass was only valid on one route and the SLO monthly pass was good for 31 days from the date the pass was activated versus the calendar month. Paso Robles offered a $35 monthly pass good for unlimited travel on the North County Shuttle.

A $50 regional pass was available for unlimited travel on all RTA, SLO, SCAT, Paso Express, and North County Shuttle routes.

SLO, RTA, and SCAT offered day passes, but priced them differently ($3, $3.50, $4) with varying policies and restrictions. SLO Transit's day pass was not valid on the SLO Downtown Trolley. RTA's day pass offered unlimited trips on all RTA routes, even those that would have required an extra zone charge if paying the regular cash fare. SCAT's Day Pass was valid on all SCAT routes.

Although the three largest systems (SLO, RTA, and SCAT) offered both day and monthly passes, there were other characteristics unique to each system. For example, SLO offered magnetic stripe period passes valid for a specified number of days from the first use, Paso Express sold a non-discounted 10-ride coupon book, and RTA offered a punch pass for $30 that translated to $36 worth of fares.

Student and Youth Discounts

The single largest rider segment in the region (over 50% of SLO's ridership) consisted of Cal Poly students, staff, and faculty. Through an agreement between the City of San Luis Obispo and Cal Poly, individuals presenting a Cal Poly ID could ride all SLO routes, with the exception of the trolleys, free of charge. Cal Poly paid the City an annual fixed fee based on the level of service provided to the university. Similar to this arrangement, the City of Paso Robles allowed North Cuesta College students to ride the Paso Express and the North County Shuttle free of charge with appropriate identification. RTA punch passes also were sold to Cuesta College and Cal Poly students at a discounted rate, which was subsidized by the college or university. The Regional Monthly Pass was also sold to students in grades K-12 at half price.

Several examples of other student and youth fare policies that existed in the region included:

- RTA offered half-price student monthly and punch passes, but no discounts on the day pass;

- Children 5 and under could ride SCAT free of charge with a paying adult, but no discounts were available on monthly or punch passes; and

- Paso Express offered free rides to children 4 years of age and younger, while children 3 years of age and younger rode free on the North County Shuttle.

Senior and Disabled Discounts

Senior and disabled cash fares on all fixed-route buses (excluding the seasonal trolleys) in the region were half of the regular fares during all hours of operation, and each defined seniors as those individuals who were ages 65 and older, with the exception of SLO Transit, which used ages 62 and over.

Each agency determined its own process for individuals to obtain a senior or disabled discount. Seniors and persons with disabilities were sometimes allowed to pay the discounted cash fare without showing proof of age or disability. For example, SLO Transit required a photo ID as proof of age, while Paso Express required a City-issued ID as proof of age or disability, which was to available only to Paso Robles residents.

■ 3.9 FARE COLLECTION TECHNOLOGY IN SAN LUIS OBISPO COUNTY

SLO Transit was the only agency in the region with registering fareboxes capable of reading magnetic stripe farecards and was also the only system to use a specialized on-board technology developed in partnership with Cal Poly to process Cal Poly ID cards.

RTA and SCAT used manual vault fareboxes in 2008. These fareboxes could not read magnetic stripe farecards or register or count cash fares. With the exception of SLO Transit, all systems relied on bus drivers to visually determine if the correct cash fare was inserted in the farebox or if the ticket or pass presented was valid. Additionally, it was necessary for the drivers on some systems to punch the correct fare or date on punch passes and the correct date and time on transfers.

■ 3.10 SAN LUIS OBISPO COUNCIL OF GOVERNMENTS REGION-WIDE FARE IMPROVEMENT STUDY

In its role as the designated regional transportation planning agency for the San Luis Obispo County Region, the San Luis Obispo Council of Governments (SLOCOG) engaged Majic Consulting Group to conduct a Region Wide Fare Improvement Study to examine issues and suggest solutions to address the inconsistencies and complexities in the transit fare media and fare polices in the region. The goals of the study were to improve service quality, customer awareness, service efficiency, cost effectiveness, operations, and administration. The goals included:

- Do no harm (i.e., leave each operator whole)
- Preserve farebox recovery
- Make transitions seamless for riders

- Make the boarding process easier for drivers
- Strive for fare equity among different classes of riders
- Provide for clear and fair allocation of revenue
- Remain technology neutral
- Attract more riders
- Increase revenues
- Ease administration

The committee then identified eight obstacles to achieving the desired results. These include:

1. Fare policies meet the needs of individual operators, resulting in reluctance to change;
2. Lack of confidence that changes will keep farebox revenue constant;
3. Funding source requirements, such as the Transportation Development Act (TDA) requirements that specify required farebox recovery ratios depending on the type of service provided, the area, and population served (specific to California transit providers);
4. Different technologies in use (or lack thereof);
5. All providers are not at the table;
6. Difficulty allocating pooled fares without reducing revenue for some operators;
7. Communications with riders and
8. Overlapping services (shared stops and different base fares) with potentially competing markets.

The study relied on several public outreach activities to evaluate potential options for a more simplified and consistent fare system, including a rider intercept survey, focus groups, driver interviews, and stakeholder interviews.

Rider Intercept Survey Conducted for Fare Improvement Study

Surveys were conducted at six major transfer facilities located throughout the county. A total of 385 valid surveys were collected. In addition to collecting demographic information, the survey also captured information about the respondent's fare payment characteristics. The survey revealed that approximately 38 percent of riders used a transfer to get to their final destination; 40 percent paid the cash fare; approximately 16 percent used a 31-day or monthly pass; and 27 percent used some type of discounted fare media.

The survey also collected data regarding service attributes of greatest importance to the respondents based on a score of 1-4, with 1 being least important and 4 most important. The improvements that ranked the highest among all respondents are shown in Table 3-4.

Table 3-4
Ranking of Key Transfer Attributes

Attribute	Score
Having a pass that can be used on all routes	3.46
Short waiting time between connections;	3.22
Paying one fare for the entire trip	3.01
More information on connections at bus stops.	3.00
Free transfers	2.91
Same transfer rules on all routes	2.90
Transfers good for a longer period of time	2.78
Having senior/disabled discount	2.36

"When filtered by riders who stated they used transfers, the relative importance of having a pass that can be used on all routes ranked first for transfer users and all respondents."

Focus Groups Conducted for Fare Improvement Study

The study also included three focus groups with participants representing senior citizens, current riders, people with disabilities, non-riders, and social service agency representatives. The focus group questions were centered on three main topics, including finding information needed to plan a trip requiring transfers, transferring and fare media problems and solutions, and differing policies among the agencies regarding transfers, fares and discounts. Based on the focus group findings, seven proposed changes to transit fare practices and policies were considered, and their overall level of importance was measured and advanced for further consideration as follows:

1. **Implement Regional Day Pass** – ***Acceptance with Reservations***
   Although a Regional Day Pass valid on all systems was considered a positive, the price point was a major concern. Several participants noted that the elimination of transfers and/or punch passes would be a disadvantage, but they were frustrated at having to handle three or more different fare media to make a single trip.

2. **Redesign Regional Monthly Pass** – ***No Opinion***
   A redesign of the Regional Monthly Pass was not discussed; however, one respondent commented that it was difficult to distinguish the Regional Monthly Pass from the RTA Monthly Pass.

3. **Eliminate Universal Pass Coupons** – ***Good Acceptance***
   While riders participating in the focus groups had seen the Universal Pass coupons, none had used them. Representatives from social service agencies indicated that a Regional Day Pass would be easier for them and their clients.

4. **Establish Uniform Discount Policy** – ***Very Favorable Acceptance***

   Developing common rules and regulations and simplifying the fare media was a common theme in the focus groups.

No agreement was reached about the correct age for senior discounts, although age 55 was named most often. Focus group participants did not see any reason that special passes such as RTA's Senior VIP Gold Pass, which allows individuals 80 years of age and older unlimited free travel, should not to be valid on all systems.

Overall, seniors and people with disabilities did not object to having an ID to take advantage of discounts, but desired an ID that would be valid on all systems. Participants could not agree on the number of children who should ride for free with a paying adult.

5. **Provide Consistent Information** – ***Very Favorable Acceptance***
   The Internet was considered the best choice for providing information regarding connections, but most agreed that hard copy maps and schedules (specifically, a single map that would show all connections) and customer service phone lines also were necessary. Overall, the transit agencies' websites were considered difficult to navigate, and some suggested they contained incorrect or out-of-date information.

6. **Consider Uniform Farebox Technology** – ***Very Favorable Acceptance***
   Smart card features were suggested independently in two focus groups.

7. **Expand Purchase Options** – ***Very Favorable Acceptance***
   Although participants were not specifically asked about purchase locations, several mentioned that expanding the number of locations to purchase passes was important to avoid forcing those who are transit-dependent to go somewhere they would not normally travel to purchase a pass.

Driver Interviews Conducted for Fare Improvement Study

The Region Wide Fare Improvement Study also included a survey of drivers and supervisors from RTA, SLO Transit, SCAT, and Paso Express. The purpose of the interviews was to understand the driver and supervisor perspectives regarding transfer policies, fare media acceptance issues, verification of senior and discount fares, policies regarding youth discounts, and driver training. Following are the key findings of the interviews:

- **Understanding of Current Transfer Policy**
  Drivers indicate that riders are sometimes confused about the differences between an intra-system transfer, which are free on all systems except RTA, and the inter-system transfer, which requires an additional $0.75 fare. Non-RTA drivers say many passengers did not realize they needed to pay more.

  On SLO Transit, riders must know whether to ask for a regional transfer or an SLO Transit transfer. Some drivers ask passenger what type of transfer they need, but others do not.

- **Acceptance of Fare Media**

  Regional Monthly Passes – There also was confusion between RTA Regional Monthly Passes, which were valid on all fixed routes in the county, and RTA Regular Monthly Passes, which were only valid on selected RTA routes. Both passes were identical except in the way they were punched. The pass type and month can be covered up,

providing an opportunity for fraud by those who paid for a Regular Monthly Pass but present it as though it were a Regional Monthly Pass, particularly during the busy peak periods when strict enforcement is difficult.

RTA Punch Passes – These passes, which had a variety of dollar values printed on them, were punched by the driver to indicate the applicable fare. Drivers reported they were subject to error and slowed the boarding process.

Universal Pass Coupons – All drivers reported these coupons also slowed boarding. Passengers would wait until they were on-board to tear off the appropriate number to pay the applicable fare. The coupons also were difficult to insert in the fareboxes.

- **Senior and Discount Fares**

  SLO drivers were instructed to accept only Medicare cards for discounted fares for people with disabilities, since they are easily identifiable. Some passengers preferred to use the State issued card for people with disabilities, arguing that Medicare cards contain private information, such as Social Security numbers, they often do not carry the card with them, or they do not wish to present them to the drivers.

  Most drivers generally relied on the honor system for both senior discounts and those for people with disabilities, which presented further opportunities for fraud and lost revenue.

- **Children Riding Free**

  As previously mentioned, each system had its own rules regarding the age and number of children who could ride free of charge with a fare-paying adult. Drivers rarely questioned the number or age of children who boarded with an adult.

- **Driver Training**

  Drivers at SLO Transit and RTA indicated they generally did not tell passengers that they need to pay a transfer fee because the amount may be different and drivers may not be familiar with the others system's rules.

Stakeholder Interviews Conducted for Fare Improvement Study

Stakeholder interviews also were conducted as part of the outreach component to the Region Wide Fare Improvement Study. The interviews, particularly those conducted with social service agency representatives, revealed that fare policies were confusing for both agency representatives and riders. The need for consistency was stressed.

Fare Improvement Study Findings and Recommendations

The committee carefully analyzed existing conditions and input received from the various outreach activities. The committee reviewed and the advantages, disadvantages, and concerns associated with various fare and policy options available to improve regional mobility and enhance the ease of transfer between operators. After doing so, the committee put forth a plan that reflected proposed policy changes based upon funding availability and/or opportunities to build upon strategies implemented in early phases of the plan.

Following are summaries of the key findings and recommendations resulting from the Region Wide Fare Improvement Study.

1. Implement a Regional Day Pass

The existing Regional Transit Transfer Policy facilitates transfers between agencies but requires riders to request a transfer from the driver and pay each time passengers board. The policy does not provide for a discount for seniors or people with disabilities. On SLO Transit, the transfer is used as a $0.25 coupon, which can be applied either to the full fare (transfer plus $0.75 = $1 full fare) or toward a discounted fare (transfer plus $0.25 = $0.50 discount fare). On the other hand, when riders use the transfer to board SCAT buses, they must pay $0.75 plus the transfer. In this situation, the discounted fare for seniors and people with disabilities is actually lower than using the transfer plus $0.75. Drivers have the responsibility of enforcing transfer rules, which adds to their workload and creates potential conflicts with riders. Communicating the rules quickly and clearly is problematic, especially during peak ridership periods. As a result, enforcement is often inconsistent.

A Regional Day Pass would provide unlimited trips on any regional fixed-route transit provider (RTA, SLO Transit, Paso Express, North County Shuttle, SCAT) for a single day and eliminate the need for inter-system or intra-RTA transfers. It would provide a convenient method for occasional riders to access the regional fixed-route system for multi-leg trips. Building on the existing Regional Monthly Pass, a Regional Day Pass would allow riders to pay once for unlimited trips on all fixed-route systems in the county for one day. The Regional Day Pass should have a unique identity and reference all participating agencies and should be available on board or in advance at fare outlets or through participating social service agencies and colleges. A discounted version for senior and disables riders also should be made available.

No mechanisms are in place to reconcile and adjust revenues among the participating operators. Because no regional passes are sold by any local agencies other than RTA, RTA collects all revenues. The local fixed-route operators are partly compensated for rides offered to regional pass holders on their buses based on a flat percentage of the total revenues. The percentage is somewhat arbitrary; it is neither tied to ridership levels, nor does it reflect the average fare on the local systems.

2. Redesign the Regional Monthly Pass

RTA's existing Regional Monthly Passes offer unlimited rides on all RTA, SLO Transit, SCAT, Paso Express, and North County shuttle routes. They are not accepted on trolleys or Dial-A-Rides. Initiated by RTA, the pass's paper stock is the same as for the RTA regular Monthly Pass; only punches distinguish the two. The distinction between the two types of passes (Regular and Regional) is not obvious, nor does it clearly communicate on which system the pass is valid. It is currently available at RTA outlets. Drivers indicate that some riders may be using old passes or RTA regular Monthly Passes by covering the punches.
A redesign of the Regional Monthly Pass should clearly differentiate it from the RTA Regular Monthly Pass and more effectively communicate its acceptance by other systems. The prominent display of names and logos of all participating systems will make its universality more obvious and reduce conflicts with any non-participating operators.

One of the challenges of the redesign will be deciding on a medium that will be simple to administer, but will reduce the opportunity for counterfeit or fraudulent use. Although 31-day

passes would have advantages for riders, monthly passes with a different color each month are recommended to work with existing technology used by the different systems.

The new design must be usable by the current technology in use by all systems.

As with the Regional Day Pass, a revenue allocation formula would be developed based on consensus among all participating operators.

3. Eliminate Universal Coupons and Replace with a Regional Day Pass

Universal Passes, which are actually a book of coupons each worth $0.25, are good on all fixed routes, Dial-A-Ride, and ADA paratransit systems in the county. They have no expiration date, which makes them easy to distribute, as there is no need to return unsold inventory and exchange for current coupons. They are primarily offered by social service agencies but may be purchased by any rider. Use of the coupons tends to slow boarding, as riders often do not pre-count them, and they are not easily read by SLO Transit's fareboxes. The cost of printing and distribution is borne primarily by RTA. The coupons are captured in the farebox, counted, and returned with an invoice to RTA. RTA pays the face value to the recipient transit operator. Universal Passes are becoming more widely distributed, making the administration and printing costs more of an issue for RTA.

A Regional Day Pass would provide unlimited trips on any regional fixed-route transit provider (RTA, SLO Transit, Paso Express, North County Shuttle, SCAT) for a single day and eliminate the need for the expensive administration of universal coupons.

The need for Universal Pass Coupons for trips on fixed-route systems can be eliminated through the implementation of a Regional Day Pass.

4. Establish Uniform Discount Policies

The rules for discounts related to the age of seniors, number and ages of children riding free with a fare paying adult, and requirements for people with disabilities vary among the different transit providers. Enforcement of these policies has been inconsistent from one system to the next and among drivers on the same system. Some systems require passengers to present proof on boarding, others require proof of purchase of discount media, and some do not require any proof for cash fare boarding. One system requires a special picture ID, which is available only to residents of one city. Forms for verifying eligibility used by the different systems differ considerably, although all forms ask for much of the same information.

Uniform policies, procedures, and forms for eligibility for discounted fares among all public transportation systems will ensure that passengers are treated consistently as they travel across systems. The transit operators should develop and adopt consistent policies and forms for eligibility for discounted fares among all general public providers, create a standard ID card, and move to standardize the types of media offered at a discount, including people with disabilities, seniors, children, and students.

The establishment of standardized policies, procedures, and forms will provide a more seamless experience for riders.

5. Provide Consistent Information

Transit information is available through Regional Rideshare, individual agency brochures, and on the web. The information is not consistently presented, and some materials appear to be out of date. Each agency presents information differently and may not mention all policies related to inter-agency transfers, child with fare paying adult, etc.

Information for the various systems should be presented in a similar format, including how to find information about transferring from one system to another. A regional ride guide and/or a regional transit map should be developed to clarify system transfer opportunities.

The creation of a transit website template for rider information that would present fare, route, and schedule information in a common format, including transfer information with links to each agency's website, and perhaps a regional trip planning application should be hosted on the Regional Rideshare website.

6. Uniform Farebox Technology

The current fare collection technology used by the different agencies varies widely. While SLO Transit has registering fareboxes capable of reading and validating magnetic stripe media, the other agencies have antiquated farebox technology, which cannot accommodate more flexible fare media. The current swipe card technology for validating Cal Poly passes, which is separate from SLO Transit's electronic fareboxes, does not perform consistently.

A criterion of this study was to not rely on new technology. If, however, all operators employed modern farebox technology, additional opportunities for streamlining the fare integration process could be pursued.

7. Expand Purchase Options

Currently, fare media are available only at each agency's office and at a limited number of outlets, forcing passengers to make a special trip to purchase them, which is especially difficult for seniors and people with disabilities. Information regarding pass sales outlets is not readily available, and the locations where only certain media are available are not identified.

This recommendation called for expanding the availability of media by offering them at more outlets geographically dispersed throughout the county, on the web via Regional Rideshare, over the phone, and by mail to a central office such as Regional Rideshare.

The proposed change would provide more choices at existing outlets and expand sales outlet locations. Additionally, the ability to sell fare media on-board vehicles should be explored as technology enhancements are introduced.

■ 3.11 NEW ELEMENTS OF REGIONAL FARE COORDINATION IN SAN LUIS OBISPO COUNTY

Following the release of the San Luis Obispo Council of Governments Region Wide Fare Improvement Study draft report in the fall of 2008, many of the incremental steps outlined in the report have been implemented, as indicated below.

Adoption of Revenue Sharing Model in San Luis Obispo County

During the course of the preparation of the Fare Improvement Study, one obstacle identified by the operators was the absence of a fair and equitable revenue sharing formula associated with the introduction of regional passes to facilitate seamless transfers between systems. Majic Consulting presented examples of revenue-sharing agreements used by other transit operators for future consideration. Several were considered too complex, particularly in light of the fact that only one operator (SLO Transit) had registering fareboxes.

In early 2009, operators in San Luis Obispo reached a verbal agreement to adopt a relatively simple revenue-sharing agreement that could be used with the farebox equipment that was in place, as shown in Table 3-5 below. The revenue sharing agreement applies to a new Regional Day Pass and a Region All Monthly Pass. The operators agreed that fare revenue settlement would occur on a quarterly basis.

Table 3-5
Revenue Allocation Formula

	Count Boardings	**Calculate Share of Regional Day Pass Sales Revenue**					**Settlement**	
Operator	Regional Pass Boardings	X Avg System Fare	= Fare – Weighted Boardings	% of Fare Weighted Boardings	X Total Region Pass Sales	= Revenue Share	Regional Pass Sales by Operator	= Due or (Owe)
SLO Transit	4,500	$0.56	2,520	16.5%	$28,000	$4,618	$5,000	($382)
RTA	11,000	$0.99	10,890	71.3%	$28,000	$19,955	$20,000	($45)
Paso Express	1,000	$0.75	750	4.9%	$28,000	$1,374	$1,000	$374
North County Shuttle	1,000	$0.86	850	5.6%	$28,000	$1,558	$1,000	$558
SCAT	500	$0.54	270	1.8%	$28,000	$495	$1,000	$505
Total	18,000		15,280	100%		$28,000	$28,000	$0

New Fare Media in San Luis Obispo County

Following the adoption of the revenue allocation formula, a Regional Day Pass was introduced, providing unlimited trips for a single day on all of the regional fixed-route transit providers, to replace regional transit transfers.

The Monthly Pass was redesigned and renamed "Regional All Monthly Pass" to clearly differentiate it from the RTA Regional Monthly Pass to more effectively communicate its acceptance by other systems and reduce its vulnerability to fraud.

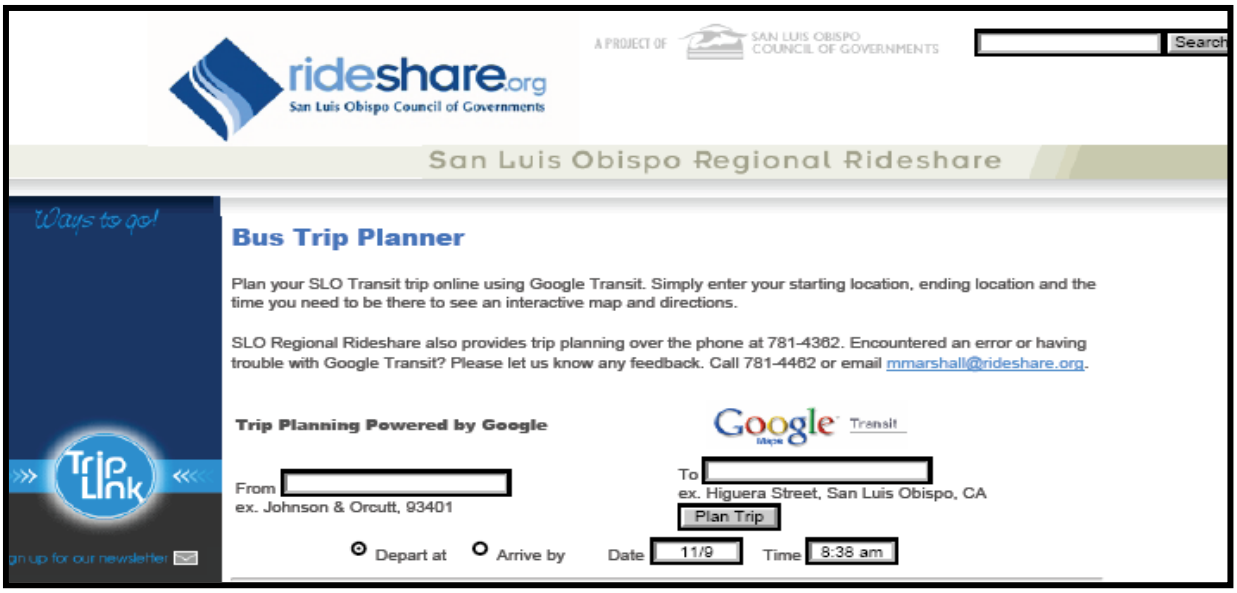
Simplified Fare Structure

The fare structure was simplified through the elimination of the Universal Punch Pass.

Introduction of Trip Planning Tool

To simplify transfers from one system to another, Google trip planning features were added to the San Luis Obispo Regional Rideshare website, http://www.rideshare.org

Figure 3-5
Google Trip Planning



New Fare Media Purchase Options

Fare media purchase options were expanded with the introduction of on-line sales via the San Luis Obispo Regional Rideshare website. Passes are purchased through Pay Pal, which is similar to an escrow service, with PayPal acting as the middle man to allow people to send money to each other's PayPal account in a secure manner; the parties do not have access to each other's credit card or bank information. PayPal accepts most major credit cards. There is a $1.55 shipping fee and a 2.9% PayPal transaction fee. Daily and discount

passes can be purchased at regular pass outlets, but the following passes can be purchased on-line:

- SLO Transit 31-Day Pass
- SLO Transit 31-Day Student Pass
- RTA One Pass (unlimited rides for a month on any single RTA route)
- RTA Go Pass (unlimited rides for a month on all RTA routes)
- RTA Region All Pass
- SCAT Monthly Pass
- Paso Express Monthly Pass

Introduction of Uniform Farebox Technology

One of the most significant (and somewhat unanticipated) improvements since the Region Wide Fare Study was completed has been the introduction of new farebox technology in the region. As previously noted, in 2008 only SLO Transit had electronic fareboxes capable of processing magnetic fare media, resulting in some limitations in terms of regional fare collection initiatives. Although SLO Transit had an electronic farebox system (Cents-A-Bill) with the capability of selling fare media on-board, it was only a recording system as opposed to a validating system Validating fareboxes and typical registering fareboxes both register (i.e., count) money and tokens inserted for payment of fares. A validating farebox, however, uses modern electronic methods to verify that the coins and bills inserted are valid and to accurately determine the value and denomination of the coins and bills. Validating fareboxes are capable of rejecting invalid coins and bills and of distinguishing between $1, $5, $10, and $20 bills.

Additionally, the equipment could not process Cal Poly ID cards (Cal Poly riders represent approximately 60 percent of SLO Transit's ridership), but relied on other on-board equipment that was unreliable for that function. The SLO Transit farebox equipment was reaching the end of its useful life.

In 2009, the operators in the region received a total of $912,000 in American Reinvestment and Recovery Act funding for the purchase of or upgrades to fare collection equipment. This new opportunity allowed the operators to address the need for uniform regional fare equipment sooner than originally anticipated.

SLO Transit already was using the GFI Cents-A-Bill farebox, so SLO was able to move forward with a sole-source procurement of new GFI Odyssey fareboxes since its existing vault receivers were compatible. This approach would also allow SLO to import data from the existing system.

The various fare collection components and associated costs for SLO Transit's 18 vehicle fleet (and test simulator) are shown In Table 3-6.

The RTA has "piggybacked" on the SLO procurement, which will allow it and other local operators to use some type of magnetic or smart care fare media. Paso Robles plans to purchase a different farebox product but with features that will support regional fare initiatives.

The operators do not plan to "integrate" the fare collection systems at this time. The new revenue systems will not have any impact on the adopted revenue sharing/cost allocation agreement in the foreseeable future. Each operator will keep its own fare structure and conduct fare collection activities independently. The systems have the capability of processing smart cards, stored-value cards, and credit cards, but these features will not be introduced until further testing of the hardware and software has been completed.

Figure 3-6 displays one example of the standard revenue reporting capabilities (cash, ticket, and pass) reconciliation and revenue. Additional standard reports offer ridership analysis by route, run, location, and pass type. Tracking of Cal Poly ID cards, which was not available through SLO's old farebox system, is of particular interest because it will provide more detailed data to allow SLO to more accurately forecast ridership trends.

Because the other systems (RTA, Paso Robles, and SCAT) have had to rely on manual data collection due to the absence of electronic fare collection equipment, immediate benefits of the new systems will include more accurate daily ridership and revenue information. Additionally, on some routes with heavy ridership, existing fareboxes cannot retain a full day of revenue, prompting the need to change out fareboxes during revenue service.

It is too early to quantify the savings associated with the new fare collection equipment; however, it is anticipated that there will be significant enhancements in overall efficiency (lower cash handling costs, shorter boarding times) and potential ridership increases resulting from the simplified fare media and ease of transfer between systems throughout the region.

Table 3-6
SLO Fare Collection System Costs

Fare Collection Components	Cost
Odyssey Electronic Revenue Center (fareboxes)	$232,750
Smart Card Readers	$6,175
Odyssey Test Simulator	$12,250
Installation	$ 5,400
Software and Configuration	$16,500
Odyssey Spare Parts Kit (5)	$37,975
Printing Encoding Machines (2)	$32,450
Thermal Paper (5000)	$ 5,500
Thermal Plastic (95,000)	$29,450
Smart Card (1000)	$2,350
Data Training	$ 0
Maintenance Training	$ 0
Total (excluding taxes)	**$ 380,800**

Figure 3-6
Regional Fare Collection Components

Driver Display

- Driver Login
- Records Route and Block
- Programmable Buttons

Passenger Display

- Programmable Buttons
- Reads or Recharges Fare Media
- Issues Receipts

Operator Control Unit

- Driver, Route and Block Login
- 3" X 5" Graphical Display
- Menu Driven – Simplifies Multiple Fares

Magnetic Card Reader

- Reduces Cash
- Processes Period Passes and ID Cards
- Electronic Read, Write and Encoding

Currency Processing

- Validates Bills and Coins
- $600 Coin Capacity
- 800 Bill Capacity

Printing Encoding Machine

- Issues Magnetic Cards
- Initialize New or Recharge Existing Card
- Processes Optional Smart Cards

Smart Card Ready

- Reduces Cash Handling
- Increased Security
- Reload On or Off Board

Other Initiatives Currently Underway in San Luis Obispo County

The San Luis Obispo Council of Governments continues to work with the transit agency partners to make discount fare policies and practices more consistent to simplify travel throughout the region. Although not yet adopted, the interim recommendations include:

- The development of a single transit discount card for seniors (valid on all systems) that becomes proof of age for boarding or to acquire discount passes. Medicare cards will remain valid ID in lieu of the new card;
- Maintaining flexibility on the appropriate ID for use by passengers with disabilities; and
- Replacing the varying age criterion for free ride privileges to children accompanied by a fare paying customer by a height criterion (corresponding to younger than four years).

To build upon the updated Regional Ride Guide Map that displays the integration of the fixed-route services including major transfer points and park-and-ride lots, the transit operators are conducting public outreach activities to gain input on the appropriate design and format of their maps and timetables. Consistent imagery and text may be developed for use by all of the regional operators.

■ 3.12 SUMMARY OF SAN LUIS OBISPO FARE COLLECTION PROGRAM

As a result of the San Luis Obispo Region Wide Fare Improvement Study, the partners identified opportunities to simplify fare structures and create and adopt a revenue allocation formula, at a minimal expense to the agencies. While technology was not a requirement of these initiatives, the American Reinvestment and Recovery Act funding enabled the partners to lay some of the groundwork for what could become a regional electronic fare collection system in the future. That option, is currently under evaluation by the partners who have recently purchased (or upgraded) their fare collection systems.

■ 3.13 PORT AUTHORITY TRANSIT CORPORATION (PATCO) OVERVIEW

The Port Authority Transit Corporation (PATCO), a subsidiary of the Delaware River Port Authority (DRPA), is a regional transportation agency serving Southeastern Pennsylvania and New Jersey. PATCO operates a 14.2-mile high speed rail system (using 121 rail cars) that connects Center City Philadelphia to suburban Camden County in New Jersey. In 2008, PATCO carried approximately 10.3 million passengers.

To support its rail operations, PATCO has seven parking facilities with approximately 12,500 parking spaces. Of these, roughly half are paid parking spaces in the lots closest to the stations, and the remaining spaces are free.

Figure 3-7
PATCO Train

Figure 3-8
PATCO System Map

PATCO is a principal connection to two other major transit systems that serve the northeast corridor: New Jersey Transit's commuter rail and bus system and SEPTA's commuter rail and bus system.

■ 3.14 PATCO FARE COLLECTION SYSTEM BACKGROUND

PATCO had one of the first automated fare collection systems in the world when it introduced plastic magnetically-encoded fare payment tickets in 1975. After nearly 25 years, in 2000, PATCO was still using this generation of magnetic data technology, which was much more prone to damage as a result of environmental issues and the aging fare collection equipment, making it difficult to provide customer refunds when damaged tickets were purchased or damaged following purchase. The process to verify the value on the tickets and refund the customer money had to be done at remote locations, which could take

several days to process. Additionally, replacement parts necessary to keep the system functioning had to be manufactured in-house or scavenged from other agencies that were phasing out similar systems.

With advances in technology, changing customer expectations, and lack of industry support, the DRPA found it necessary to begin the investigation of a new rail fare and parking fee collection system. DRPA representatives consulted with other transit agencies that were implementing smart card technology and coordinated with the primary regional transit partners (SEPTA and NJ Transit) regarding their fare collection needs, given the recognition that one significant impediment to seamless travel in the region was the lack of a coordinated or integrated fare system. In 2001, DRPA secured consultant support services to evaluate modern fare collection and parking system technology. Together, they developed the specifications for a new system for the PATCO High Speed Rail Line. The recommended system would use smart cards for transit fare and parking fee payment and would offer new magnetic tickets for occasional users that were of a more modern technology and less susceptible to damage than the tickets that were in use.

The proposed system included a requirement for a scalable design that could integrate with other regional systems. It had the ability to incorporate fare, revenue, and data collection equipment across a wide range of operators in the Philadelphia and New Jersey region. The specifications required the system be designed in accordance with the requirements of the Regional Interoperability Standard (RIS) for Electronic Transit Fare Payment, developed by the Port Authority of New York and New Jersey (PATH) to ensure future interoperability as other regional providers upgraded or purchased new fare collection systems. At the time, these standards were being reviewed throughout the transit industry and eventually became part of the Regional Interoperability Standards adopted by the American Public Transportation Association.

When implemented, the system was expected to offer much more data regarding customer travel patterns, improved tracking and accountability of revenue collection, and more flexibility in terms of future fare structures.

DRPA conducted a competitive procurement process that considered the proposed technical solution (which included the flexibility of the proposed system's ability to accommodate current and potential interconnections with SEPTA, NJ Transit, and the Port Authority of New York and New Jersey), the firm's experience and management approach, and pricing. Ultimately, a contract for $11.3 million was awarded to Cubic Transportation Systems, Inc. in early 2005.

At the time PATCO was developing the specifications for its fare collection system, NJ Transit expressed an interest in exploring opportunities for using PATCO's smart cards on its River Line rail corridor as a pilot project. Subsequent to the fare collection system contract award, Cubic developed a solution that would allow integration with NJ Transit. The design and implementation and a portion of the operating costs for a fare collection system on the River Line were expected to cost $960,000 (plus operating expenses). In May 2005, DRPA/PATCO authorized staff to negotiate an agreement with NJ Transit to establish the terms and conditions whereby NJ Transit could use PATCO-issued smart cards and reimburse PATCO for the cost of developing the River Line fare collection system. Under the proposed arrangement, NJ Transit would own, operate, and maintain the fare collection hardware and equipment. Since the River Line represented only a small portion of NJ Transit's statewide operations and the River Line system was intended only to be a pilot

project, NJ Transit planned to use PATCO's operating systems and back-office functions. Due to financial constraints, NJ Transit ultimately determined it would be unable to participate in the pilot project, although PATCO's system is designed to accommodate future integration.

SEPTA has continued its efforts to implement a new fare collection system that is expected to be interoperable with PATCO's FREEDOM Card system. SEPTA issued a Request for Proposals in late 2008 and has since extended the submission deadline four times to allow prospective vendors an opportunity to get clarification on specifications and secure necessary financing. Final proposals, which were due in October 2009, are under review by SEPTA, with an anticipated award date in the spring of 2010.

The key elements of PATCO's contract with Cubic included the following:

- Supply of contactless smart cards;
- Replacement of existing Ticket Vending Machines (TVMs) with new TVMs to support the issuance and loading of value to smart cards, smart tickets, and magnetic fare media, accept cash, debit and credit card payment options, and issue of transfers;
- Replacement of existing fare gates at all stations with new paddle-style fare gates that will accept smart cards, smart tickets, and magnetic ticket fare media;
- Installation of stand-alone card interface devices to replace existing parking equipment and installation of all associated wiring to facilitate payment for parking at rail stations using smart cards;
- Provision and installation of a central computer system providing transaction control, fare gate, ticket vending, ticket office terminal event and machine status reporting, a data repository for all event and transaction data, control of various operating parameters (e.g., fare tables and monetary limits), and daily reconciliation;
- Installation of a support network of communication devices and workstation for reporting data analysis purposes;
- Training; and
- Maintenance and warranties.

In addition to the Cubic-provided elements, PATCO needed to secure the services of a financial institution to process credit and debit card payments for purchasing or adding value to smart cards. The financial institution transmits the transactions to the various debit and credit networks and acts as the settlement agent for all bank card transactions in accordance with industry standards.

In November 2005, DRPA authorized execution of a contract with Wachovia Merchant Services for a period of two years with annual renewal options. The estimated cost of the contract was $69,000, based on implementation in the third quarter of 2006 assuming 30 percent penetration rate (current purchasers of magnetic tickets switch to smart cards); $190,000 for a full year of operation in 2007 with a 50 percent penetration rate; and

$133,000 for the first half of 2008 with an estimated penetration rate of 70 percent. Although manual tickets sales were planned to continue through the use of new ticket vending machines, the elimination of manual ticket sales in conjunction with the new fare collection system was estimated to result in an annual savings of approximately $130,000 per year; offsetting a large portion of the cost of the Wachovia contract.

In June 2005, DRPA engaged a public relations consultant to establish a brand and logo for the new smart card and, subsequently, a public awareness and outreach campaign at a cost of approximately $200,000.

■ 3.15 FREEDOM FARE COLLECTION SYSTEM

In August 2006, PATCO began a two-month pilot project to test the new fare collection system. A total of 150 volunteers tested all aspects of the system for fare payment and parking fees. The pilot project was successful in that it helped to isolate two issues that needed to be addressed prior to full implementation. The first was related to the initial batch of smart cards purchased. The bonding between the computer chips and antennas were found to be faulty. Although invisible to the customers, there was also a software problem that caused an unacceptably high level of cards to fail PATCO's initialization process (programming cards with data specific to that particular batch of cards) prior to issue. Although the issues resulted in schedule delays, both were addressed by the card manufacturer and fare collection system vendor.

Following six years of development and design, PATCO began the official rollout of the FREEDOM Card system in November 2007 and completed installation at all stations in February, 2008.

Figure 3-9
FREEDOM Card

FREEDOM Cards and Freedom Tickets

The FREEDOM Card, shown in Figure 3-9, is a stored-value card that can be used to pay for PATCO rail fares and parking and for reduced-fare round-trip tickets that are valid on selected SEPTA bus and subway links in Philadelphia from a PATCO transfer point. During a three-month introductory period, the cards were available free of charge for those who registered for balance protection. The current fee is $5, and the card is valid for 10 years. There was a high level of customer satisfaction with the new FREEDOM Card payment option. Less than four months after they were introduced, approximately 70 percent of PATCO commuters had used them, approximately 18 months ahead of projections.

Figure 3-10
FREEDOM Ticket

Designed for occasional riders, FREEDOM Tickets, shown in Figure 3-10, are magnetic stripe paper tickets valid for three days from the date of purchase.

PATCO's Reduced Fare Program allows eligible individuals, Medicare cardholders, persons 65 years of age or older, and people with disabilities to travel on PATCO during off-peak hours for $0.62. Off peak is defined as all day Saturday and Sunday and weekdays between 9:00 a.m. and 4:00 p.m. and from 7:00 p.m. to 6:00 a.m. To

receive the discounted fare, customers must use the FREEDOM Card with a photo ID, which will be provided upon certification of eligibility.

Table 3-7
PATCO Fare Schedule

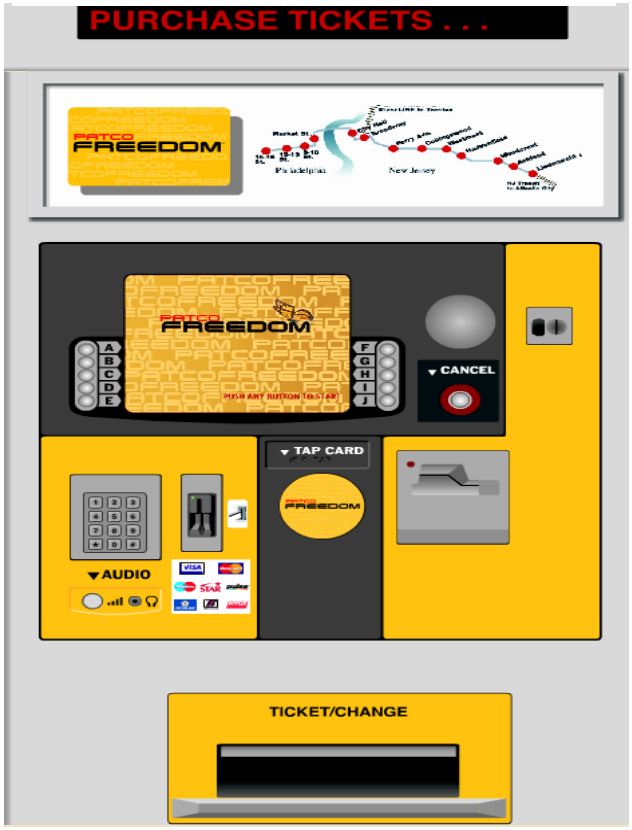
From	*To*	*One Way*	*Round Trip*
Lindenwold, Ashland & Woodcrest	Philadelphia	$2.70	$5.40
Haddonfield, Westmont & Collingswood	Philadelphia	$2.35	$4.70
Ferry Avenue (Camden)	Philadelphia	$2.05	$4.10
Any New Jersey station (except between Broadway and City Hall))	Any New Jersey station	$1.45	$2.90
Broadway (Camden)	City Hall (Camden)	$1.25	$2.50
Broadway & City Hall (Camden)	Philadelphia	$1.25	$2.50
Any Philadelphia station	Any Philadelphia station	$1.25	$2.50

SEPTA round trip tickets are available for $2.40 (cash or value on a FREEDOM Card). The transfer is actually two separate tickets. One is valid for one hour from the time of purchase and can be used on certain rail and subway lines from a PATCO transfer point; the second is valid for 24 hours from the time of purchase and is used to transfer from designated SEPTA lines to PATCO.

Although not required, FREEDOM Cards may be registered by customers who provide PATCO with certain personal information such as their name, address, and telephone number, along with the card's serial number. Two features are available to customers who choose to register their cards. The first is balance protection. If the FREEDOM Card is registered, customers who lose their card can have the card disabled and the remaining balance transferred to a replacement card for a fee of $5. If customers provide PATCO with personal and credit card information, they can register for an autoload feature, selecting an amount they would like to have automatically added to their card ($30 minimum). If their balance drops below $5, the preauthorized value will automatically be loaded on their FREEDOM Card when it is presented at a parking or fare gate.

Automated Fare Vending Machines

Figure 3-11
FREEDOM Card Vending Machine



Automated vending machines are located in all PATCO stations and dispense FREEDOM Cards, FREEDOM Tickets, and SEPTA transfers. The vending machines allow patrons to add value (minimum of $20) with cash, debit, or credit cards. They display system information and provide user-friendly instructions. The machines are fully ADA compliant and capable of displaying the last 10 smart card transactions and account balances.

Prior to introduction of the new vending machines, PATCO had cashiers working at each station. Now that the manual sales function has been virtually eliminated, many contract employee positions were eliminated, resulting in significant cost savings.

Fare Gates

New fare gates are paddle style and separate the free areas of the station from the paid areas. Customers simply tap the FREEDOM Card on the target or insert the FREEDOM Ticket. They incorporate a passback control that monitors all entries into the station to prevent card/ticket sharing within a specified period of time following initial entry through the fare gate. The fare gates display the FREEDOM Card balance each time the customer passes through.

Parking Gates

Parking gates are installed at all PATCO parking facilities and separate the paid parking lot areas from the free areas. These replaced the old coin system. Automatic barrier arms control vehicle entry upon payment of the parking fee by tapping the FREEDOM Card on the target. Exit gates monitor and control all exits.

■ 3.16 FREEDOM TO SAVE RETAIL PROGRAM

PATCO partners with area businesses in a program called FREEDOM to Save. In exchange for offering discounts to FREEDOM Card holders, local businesses receive FREEDOM to Save signage for posting on their storefronts, at cash registers, and on websites. PATCO also features the businesses on its website and promotes the program in vehicles and stations, at promotional events, and through the media. There are over 125 participating businesses including restaurants, florists, dry cleaners, jewelers, and insurance companies. The program affords businesses an opportunity to promote their products and services to PATCO riders, while PATCO uses the partnership to encourage participation in the FREEDOM Card program.

■ 3.17 PRE-TAX TRANSIT BENEFITS

FREEDOM Card has enhanced the convenience for customers and employers who participate in the pre-tax transit benefits program. Traditionally, paper transit vouchers were distributed by employers to their employees for redemption at PATCO ticket windows. Because the benefits are now automatically loaded on the FREEDOM Card by PATCO, employers no longer have to print and distribute vouchers, and employees no longer have to redeem the vouchers.

■ 3.18 DATA COLLECTION AND REPORTING CAPABILITIES

PATCO staff report the FREEDOM Card system provides much more accurate ridership data and a wealth of data for improved service and system planning. Examples of some of the new reporting capabilities include the following.

Freedom System Ridership Reports

The system provides daily, monthly, and annual reports on origins and destinations, including intra-trip transfers and trips taken with smart cards whether anonymous or registered. The reports include the following:

- Ridership data, sorted by card category including standard fare and inter-operator transfers;
- Usage data for services by fare type, sorted by location number, entry location, transaction type, ride counts, and amount;
- A summary of daily activities, sorted by card category within fare product and dollar amount;
- A detailed transaction report including card serial number, time, entry/exit location, transaction type, and transaction amount; and
- A summary length of trip report with ride count and dollar value, sorted by card category.

Freedom System Clearing and Settlement Reports

The system provides daily and monthly reports on all activity related to clearing, settlement, revenue handling and distribution, cost allocation, and financial management. The system includes:

- Daily settlement reports that include the settlement amount for all bank card transactions, by bank card type, settlement amount, number of transactions by time of day, terminal, and card number; and
- Fee calculation reports that identify all fees charged to DRPA/PATCO, number of transactions, and fee basis.

Freedom System Revenue and Sales Reports

The system provides revenue and sales reports, including the following:

- Credit and debit processing reports that provide daily and monthly reports relating to authorization requests, approvals, denials and authorizations aborted by ticket office terminals, ticket vending machines, and central system auto-loads; and
- Daily and monthly reports related to all bank card transactions include the date, time, ticket type, price, card number, and authorization number.

Freedom System Parking Reports

The system collects the following parking data:

- Device number
- Parking lot location
- Date and time in hours, minutes and seconds
- Hourly vehicle entries and exits
- Hourly lot occupancy
- Cumulative revenue collected by card type

■ 3.19 SUMMARY OF FREEDOM CARD SYSTEM

The FREEDOM Card system relies heavily on technology, and it required a significant initial capital investment (in excess of $11 million) to equip its rail cars, rail stations, and parking facilities with automated fare collection capabilities. In addition to offering customers more convenient fare and parking payment options, it provides DRPA/PATCO with an abundance of data to improve service and system's planning, and includes a scalable design to accommodate future interoperability with other systems in the region.

■ 3.20 MIAMI-DADE TRANSIT OVERVIEW

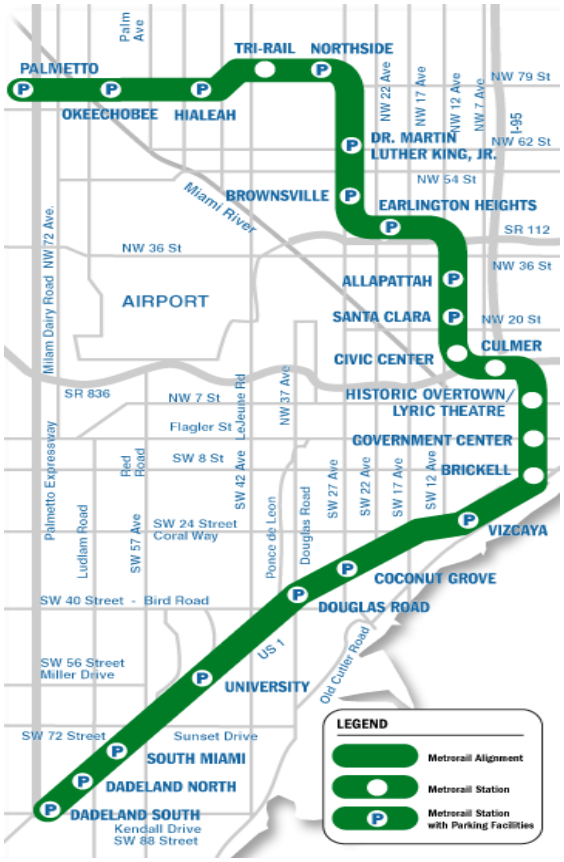
Located along the southeastern coast of Florida, Miami-Dade County is the most highly-populated county (estimated at approximately 2.4 million in 2008) in the state. The county's major transportation provider, Miami-Dade Transit (MDT), is the 16th largest public transportation system in the U.S. MDT operates four major modes of transportation: Metrobus, Metrorail, Metromover, and paratransit.

Figure 3-12
Miami-Dade County

MDT's regular fixed-route bus service, Metrobus, consists of approximately 90 individual routes operating throughout the county, with some extending as far north as Broward County and as far south as the middle Keys. In 2007, 83.5 million trips were taken on Metrobus.

Miami-Dade Transit also operates Metrorail, a 22.6-mile elevated double-track heavy rail system with 136 vehicles and 22 stations, as shown in Figure 3-13. In 2007, over 17.5 million trips were taken on Metrorail. Seventeen Metrorail stations have parking facilities (10,064 spaces) available for use by Metrorail passengers.

Figure 3-13
Metrorail System Map



Metromover is a fully-automated people mover system consisting of 4.4 miles of elevated dual-ane track guideway with 21 stations. Two of these stations are served by Metrorail. Nearly 9 million trips per year are taken on Metromover. Additionally, Miami-Dade Transit provides approximately 1.7 million paratransit trips each year through its Special Transportation System (STS) program.

■ 3.21 MIAMI-DADE TRANSIT FARE COLLECTION SYSTEM BACKGROUND

Recognizing the need to improve multi-modal connectivity, facilitate seamless travel, update and streamline fare policies and media, and replace its antiquated (nearly 25-year-old) fare collection system, MDT received approval to issue a Request for Proposals (RFP) in September 2007 for a regional fare vending and collection system. The RFP called for the design and installation of hardware and software and ongoing support services to accomplish integration of fare vending and collection devices that would offer residents and visitors to Miami-Dade County the ability to use a single fare instrument. The RFP included certain provisions to allow for future integration with Tri-Rail, the commuter rail service operating in Miami-Dade, Palm Beach, and Broward counties and the public transit providers in neighboring Palm Beach and Broward County - Palm Tran and Broward County Transit. Following negotiations with the two highest-ranked vendors, the Board of County Commissioners authorized a contract award to Cubic Transportation Systems, Inc. in May 2008. The negotiations committee concluded that Cubic offered the best value for the county - it committed to a more accelerated delivery and implementation schedule, had more experience with installation and maintenance of systems compliant with Part 2 of the Universal Transit Farecard Standards, offered a lower base contract price, and would provide more training to County staff for operations and maintenance of the fare collection system.

Following more than five years of planning, MDT became the first transit system in Florida to introduce smart card technology when it officially launched its new EASY Card system in October 2009. EASY Card is expected to offer advantages that will significantly improve financial management and revenue generation, fare collection control, operational efficiency, cost effectiveness, and customer convenience. More specifically, the following improvements over the prior fare collection system are anticipated:

- Replacing erratic magnetic strip cards with more reliable technology to enhance operating efficiencies and the customer travel experience;
- Offering patrons alternate payment methods such as credit/bank cards;
- Increasing revenue with new validating fareboxes that recognize counterfeit currency;
- Collecting more accurate passenger counts through the use of new Automatic Passenger Counters (APCs);
- Offering potential new incentives for EASY Card customers through partnerships with participating vendors;
- Improving the speed of bus boardings through reductions in dwell time, resulting in improvements in headway performance;
- More accurate reporting will facilitate strategic planning;
- Using new electronic fareboxes to reduce bus operator involvement in the boarding process, allowing more time to concentrate on driving;

- Reducing fare evasion; and
- Reducing fare collection processing costs.

■ 3.22 EASY Card - EASY Ticket

Two new fare media types, EASY Cards and EASY Tickets, replaced approximately 12 different types of media that were in use prior to the introduction of the new fare collection system. EASY Cards are plastic smart cards that contain a microchip capable of recognizing the discounts associated with the rider's fare class and multiple fare products (single ride, weekly/monthly pass, etc.). EASY Cards also can be loaded with stored value (up to $150). Easy Cards allow customers to change the type of fare products loaded on the card. EASY Tickets are paper cards designed for the convenience of tourists and infrequent riders. EASY Tickets use the same technology as EASY Cards, but only one- and seven-day passes and up to $40 in stored value can be loaded on them. Once an EASY Ticket is loaded with a one- or seven-day pass, it cannot be loaded with any another type of pass.

Approximately two weeks before and after the official launch, EASY Cards were distributed free of charge to patrons at all Metrorail stations, major Metrobus transfer points, and select retail outlets. Beginning on October 17, 2009, the cost of an EASY Card, valid for three years, was $2. EASY Tickets, valid for 60 days, were offered free of charge.

Figure 3-14
EASY Card

Figure 3-15
EASY Ticket

With the new system, cash fares are still accepted on Metrobus and Metrorail (Metromover is a free fare system); however, riders without an EASY Card or Easy Ticket who want to transfer must pay the full fare of $2 or the $1 reduced fare each time they board. Table 3-8 displays the new fare options.

Balance protection is offered for lost, stolen, or damaged EASY Cards. To register for balance protection, cardholders must sign an EASY Card registration form and submit it to MDT via mail, Internet, or in person. Refunds will be given, or the stored value or pass value remaining on the card can be transferred to a new card for a $2 fee provided the card has been used on MDT within the previous six months.

EASY Cards also have a one-time or automatic fare replenishment feature. With a valid debit or credit card the following thresholds and transaction dates can be established:

- Stored Value - $5.00
- 1-Day Pass – one hour prior to expiration
- 7-Day Pass – two days prior to expiration
- 30-Day Pass – five days prior to expiration

Table 3-8
Fare Payment Options

	EASY Card	*EASY Ticket*	*Cash Only*
Metrobus Fare	X	X	X
Metrorail Fare	X	X	X*
1-Month Pass	X		
7-Day Pass	X	X	
1-Day Pass	X	X	
Add Stored Value	Up to $150	Up to $40	
Transfers	X	X	
Monthly Parking Permit	X		
One-Day Parking Fee	X	X	
Loss/Theft Production	X		
Automatic Loading	X		

*Metrorail fare gates do not accept cash

The replenishment service must be activated by tapping the card on a farebox, fare gate, or Easy Card vending machine within 30 days after the service is established.

■ 3.23 EASY CARD FARE COLLECTION AND VENDING COMPONENTS

The following provides an overview of the basic elements and functionality of the EASY Card System.

Central and Garage Computer Systems Track Patron Usage and Revenue – The central computer system collects, processes, and stores data generated by the fare collection equipment. It generates reports' forwards real-time equipment operation status and alarm information to designated workstations; performs Internet sales, debit and credit card authorization, and card and ticket management; maintains negative balance lists; and supports customer service functions.

1,000 Metrobus Fareboxes – The Metrobus fareboxes are capable of accommodating various versions of each type of fare media (cash, stored-value, period pass, rolling period

pass, fixed number of trips and reduced fare cards) and zone-based fares. Riders simply tap the EASY Card or EASY ticket on the farebox and the fare is automatically deducted.

1,000 Automatic Passenger Counters (APCs) for Metrobus and 22 APCs for Metromover – Automatic Passenger Counters are integrated with the Automatic Vehicle Location System and record the number of passengers boarding the bus or entering a station (including wheelchair access), passenger loads, dwell times, departure times, idle times, and travel times between stops. Passenger boarding and alighting activity is recorded by date, time of day, and location, with a desired accuracy of not more than 30 feet.

4 New Garage Revenue Collection Systems for Metrobus – The garage revenue collection systems include cashbox receivers and mobile vaults that allow for the secure transfer of funds to money trucks and revenue counting rooms.

Figure 3-16
Standard Fare Gate

249 Standard and Handicap-Accessible Fare Gates Installed at Metrorail Stations – Similar to the Metrobus fareboxes, passengers must tap their card at the fare gate upon entry and exit. The fare gates verify the validity of the pass, record entry and information on the EASY Card or EASY Ticket, and deduct the appropriate fare.

62 Full-Service and 34 Cashless Ticket Vending Machines (TVMs) for Metrorail Stations – Ticket vending machines allow patrons to purchase fare media with coins and bills (full service) and stored-value, debit, and credit cards. The machines reload media and, upon request, dispense receipts that display date, time of day, value, and other transaction data. In addition to transit fares, the TVMs process parking fees as follows:

- Patrons who wish to pay for parking are required to purchase a fare. Patrons who select the “Single Ride Fare with Parking “option are prompted to enter a parking space number and, upon receipt of the single ride fare and daily parking fee payment, the TVM will issue a single-ride EASY Card or Ticket and a parking receipt.

- Patrons wishing to pay with stored value select the “Pay for Ride and Parking with Stored Value” option. Upon insertion of an EASY Card, the TVM will deduct the transit fare and daily parking fee and encode the EASY Card with transfer privileges.

- Those who have unlimited ride period passes and stored value encoded on their EASY Card or Ticket choose the “Pay for Parking Only with Stored Value” option. After entering their parking space number and inserting their card or ticket, the TVM deducts the appropriate parking fee from the stored value balance.

- EASY Card or EASY Ticket holders with unlimited ride period passes without stored value select the “Pay for Parking” option. After entering the parking space number, inserting their card or ticket, and making payment, the TVM will issue a receipt.

Figure 3-17
Ticket Vending Machine

New Station Barriers – Stainless steel station barriers separate the free and paid areas of Metrorail stations to discourage fare evasion.

4 Ticket Office Machines – Located at MDT customer service centers to perform services related to Easy Cards and Tickets, including issuance and registration, adding fares and stored value, checking balances and transaction history, and replacing lost or stolen media.

100 Point-of-Sale Devices – Point of sale devices are used by retail outlets to provide patrons with the ability to load fare, add value, or replenish EASY Cards and Tickets without the need to visit a Metrorail station or MDT Service Center.

Figure 3-18
Point of Sale Device

■ 3.24 EASY CARD PAYMENT SYSTEM COSTS

The base price of the EASY Card payment system was $41,999,739, but the contract included several options for future consideration by MDT. For example, MDT exercised the option to include the parking equipment and services option, as well as plans to implement the EASY Card system on its Special Transportation Services (STS) in 2010.

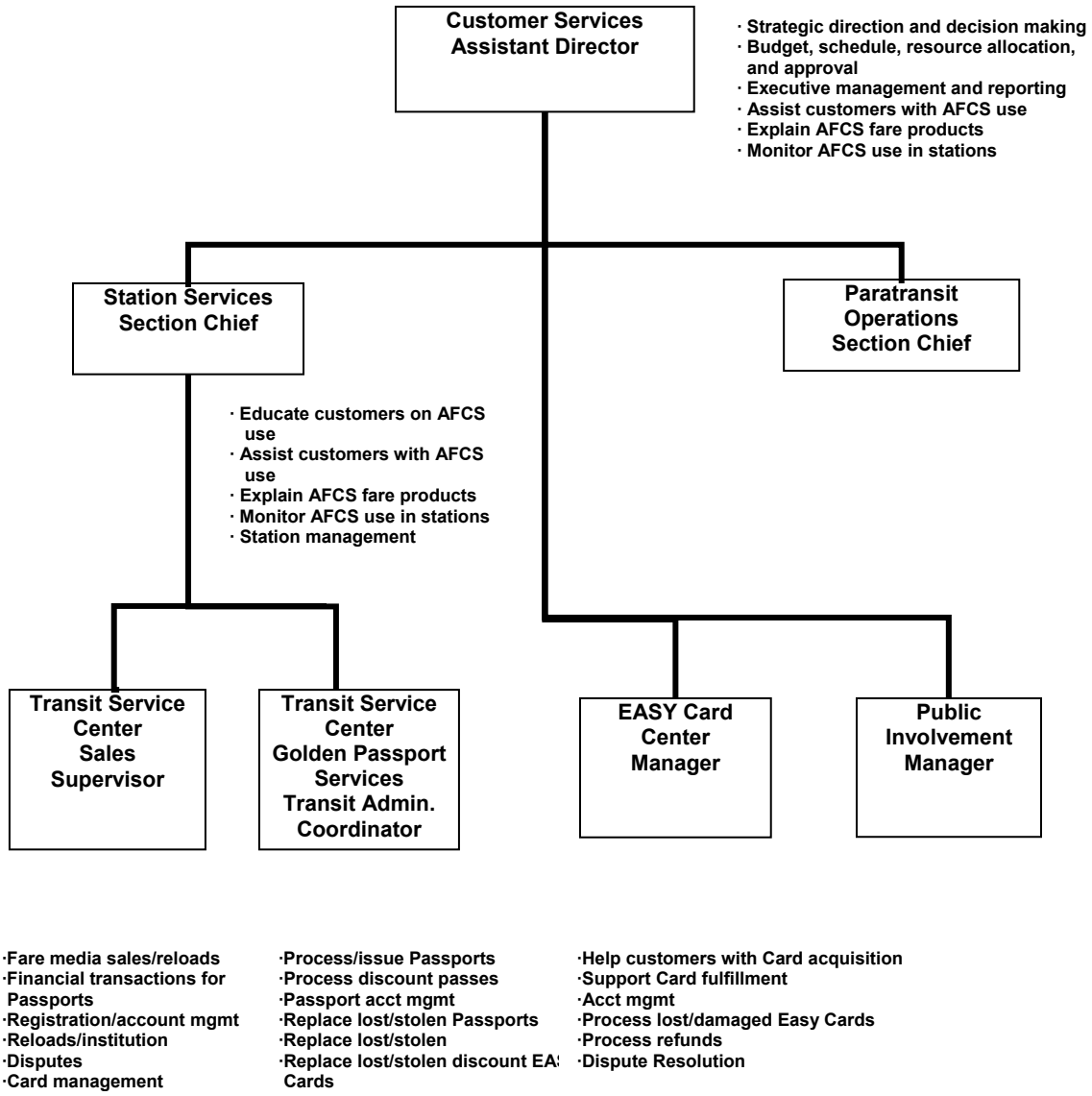
Table 3-9
Fare Collection System Costs

Base System	
Rail Equipment –Fare Gates and Barriers	$7,604,480.00
Rail Equipment – Vending Equipment	$6,244,226.00
Bus Equipment	$20,549,970.00
AFC Computer Systems	$1,058,917.00
Other Equipment and Services	$3,237,419.00
Other Costs	$348,857.00
Fare Media	$2,955,870.00
Total Cost of Base System	**$41,999,739.00**
Optional Systems	
Option 1 - Additional Rail and Bus Equipment and Services	$12,567,363.00
Option 2 - Special Transportation Services Equipment and Services	$3,793,665.00
Option 3 - Parking System Equipment and Services	$600,000.00
Option 4 – Extended Warranties	$1,622,175.00
Option 5 – APTA UTFS Part 3 Compliant Devices	$394,710.00
Option 6 – Payment Card Industry Digital Security Standard Compliance	$232,586.00
Total Cost of Options	**$19,200,499**

■ 3.25 EASY CARD SYSTEM ORGANIZATIONAL STRUCTURE

While implementation of the EASY Card impacted all divisions of MDT, it is the primary responsibility of the Customer Services Division to ensure efficiency in its ongoing operation and support to other MDT divisions. Figure 3-19 displays the new Customer Services organizational chart. A Customer Service Business Plan was used to guide implementation of the fare collection system, including a clear definition of the roles and responsibilities of the six functional areas and the training requirements related to system use and fare product options.

Figure 3-19
Customer Services Organizational Chart



The six functional areas within the Customer Services Division and their associated responsibilities are:

1. **EASY Card Center:** This is a new operation that used existing MDT resources to create an EASY Card Management Center (predominantly call-in) for customer convenience in acquiring cards, registering and managing accounts, providing assistance to resolve any customer issues, and providing general information.

2. **Transit Service Center at Government Center:** This is the hub for sales transactions that do not occur at ticket vending machines, retail outlets, or on-line.

3. **Stations Services:** Station Services is a new unit, drawing from MDT staff previously assigned to other areas. The staff are largely dedicated to helping customers at the point of fare media purchase.

4. **Paratransit Operations:** This division did not have any organizational or functional change but was responsible for transferring STS customers to the EASY Card.

5. **Golden Passport Services:** The Golden Passport/Patriot Passport continues to serve customers who are eligible for free and discounted fares which have been transitioned to EASY Cards.

6. **Public Involvement:** This area was responsible for creating and implementing the public outreach plan and will continue to work with the Marketing Division on outreach programs and informational materials.

■ 3.26 EASY CARD SYSTEM ROLLOUT AND CUSTOMER ACCEPTANCE

Outreach Efforts

MDT began preliminary outreach efforts to notify the public of the upcoming changes to fare collection system as early as 2008. Prior to full rollout in October 2009, advertisements were placed on buses and trains, at business centers and bus stops, and at each transit transfer center announcing the changes. Informational materials were produced in English, Spanish, and Creole. A variety of collateral materials was distributed, including brochures, pocket folders, posters, giveaways, and bookmarks. Mock ticket vending machines also were used as training tools at bus terminals, rail stations, and fairs to educate the public.

A television campaign consisting of 30-second commercials that aired on local and public access televisions stations, print advertisements in all major circulation and community newspapers, and 30-second radio spots also were used to announce the changes.

Installation

Installation of the fare collection system took place in two phases. Beginning in July 2008, Phase 1 included the new bus system with partial installation of the central computer system, the garage computers, vaulting equipment, and bus fareboxes. There was little or no impact on patrons. The old and new fareboxes processed most fare products in the same manner, and existing policies and practices remained in place (with the exception of the

various magnetic passes which were "flashed" rather than swiped, as they were with the old fareboxes) until the entire fleet was equipped with new fareboxes.

Rail equipment installation (Phase 2) began in March 2009 and included the installation of the rail components including central computer components, ticket vending machines, ticket office machines, point-of-sale devices, and fare gates. Implementation of the entire system took place in just over a year, which the contractor reported was the fastest automated fare collection system installation in transit history.

Card Distribution

EASY Card conversion began with Golden Passport and Patriot Passport customers. Permanent residents of Miami-Dade County 65 years of age and older and Social Security beneficiaries are entitled to ride MDT services free of charge. Golden Passport holders ages 65 years and older were mailed EASY Cards. Because Social Security beneficiaries required annual renewal and recertification for Golden Passport eligibility, upon recertification at MDT they received new EASY Cards.

In addition, all honorably-discharged veterans who are permanent residents of Miami-Dade County and have an annual income of $22,000 may ride MDT services free of charge. MDT contacted these Patriot Passport holders and encouraged them to apply for recertification to receive new EASY Cards. MDT also worked cooperatively with the Veterans Administration to contact other qualified veterans who historically have been difficult to reach by mail.

Because the conversion from Golden and Patriot Passports commenced before full implementation of the fare system, individuals were required to "flash" their EASY Card or Easy Ticket to security and fare collection personnel prior to boarding.

People with disabilities, who are qualified to ride MDT's Special Transportation System, travel free of charge on Metrorail and Metrobus. EASY Cards with a photo ID were mailed to eligible customers before full system implementation.

As previously mentioned, approximately 500,000 free EASY Cards were available for distribution beginning September 28, 2009 to facilitate the transition to the new system.

Customer Acceptance

While the system is still very new and undergoing adjustments, MDT staff reported very few customer issues to date.

When transferring from rail to bus, some customers have found it difficult to remember to tap out of the fare gates. If the patron does not tap out at the rail faregate, the bus farebox will not recognize the trip as a transfer and will deduct the full fare from the EASY Card, as opposed to the reduced transfer rate, resulting in some confusion and fare disputes.
As outlined in the Customer Service Business Plan, MDT undertook an extensive employee training program. As a result, MDT's decision to have a significant number of its staff perform station service for several weeks following the official launch was extremely beneficial. Knowledgeable staff familiar with all of the system's intricacies, were readily available to respond to questions and demonstrate equipment.

■ 3.27 SOUTH FLORIDA TRANSIT CONNECTIVITY AND COORDINATION

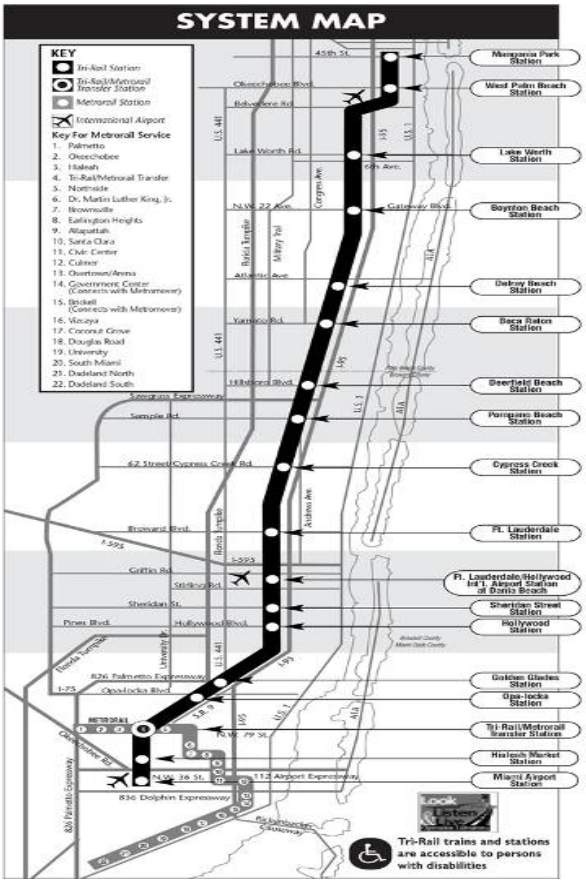
While Miami-Dade Transit has taken the lead on implementing the automated fare collection system, other transit agencies in the region are evaluating the feasibility of fare system integration (or are currently in the design phase). Currently, Miami-Dade Transit, Broward County Transit, Palm Tran, and Tri-Rail each maintain individual fare policies. Standard base fares are as follows:

- Metromover - Free
- Metrobus - $2
- Metrorail - $2
- BCT - $1.50
- Palm Tran - $1.50
- Tri - Rail (zone based fares from $2.50 - $6.90)

The systems also have a variety of daily, weekly, monthly, premium, and discounted fares including inter-system transfer policies. For example, there is a fare of $0.50 when transferring from Palm Tran to BCT. A transfer from Tri-Rail to a Palm Tran bus is free, transfers from BCT to Palm Tran or Tri-Rail are free, and transfers to BCT from the other systems are $0.50.

An overview of the region's other three major public transit providers, the status of their fare collection systems, and inter-system regional connectivity are described below.

Figure 3-20
Tri-Rail System Map



South Florida Regional Transportation Authority

The South Florida Regional Transportation Authority (SFRTA) operates a 70.9-mile commuter rail line (Tri-Rail) connecting Palm Beach, Broward, and Miami-Dade counties, as shown in Figure 3-20. Each Tri-Rail station has connecting shuttle bus service operated by Tri-Rail or by the public transit agency in each respective county. Tri-Rail provided over 4 million trips in 2008.

In August 2008, the SFRTA Governing Board approved an agreement in the amount of $373,542 between SFRTA and Booz Allen Hamilton (BAH) for consulting services to support efforts to procure a fare collections system. After evaluation, it was recommended that the SFRTA proceed by joining the fare collection infrastructure established by MDT. Since that time, BAH's contract has been amended to include additional procurement-related support, as well as support in the development of proposed interagency operating procedures, fare policy alternatives,

negotiation support for a participation agreement with MDT, and development of a communications plan for a regional fare card, for a total amount not to exceed $1,471,993.

In January 2010 , SFRTA was given approval to finalize a sole source agreement with Cubic Transportation Systems for an automated fare collection system consisting of 76 ticket vending machines, 85 station validators, 6 ticket office machines, 60 handheld units, and other equipment necessary to operate the fare collection system, for an amount not to exceed $15,000,000. Staff also received approval for an additional amendment ($623,860) to the BAH contract to assist with design, inspection, testing, system integration, and equipment installation. The Governing Board also authorized execution of a Participation Agreement with MDT for the administrative management of the central system, following approval by MDT.

Broward County Transit

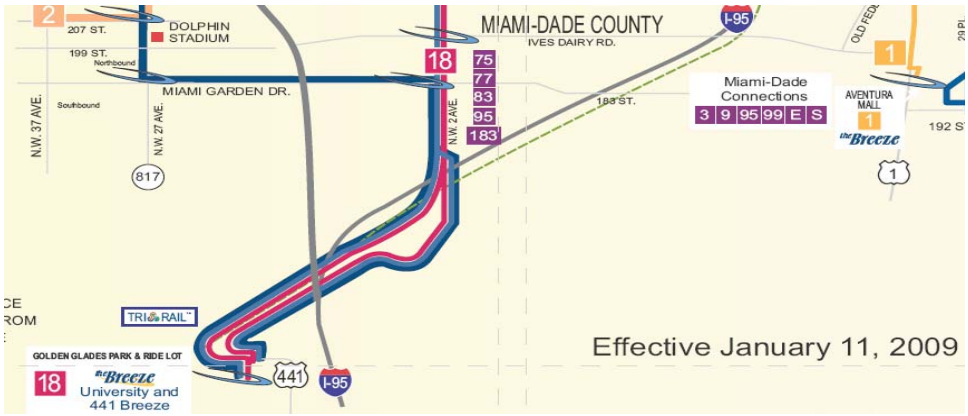
The Broward County Transportation Department operates Broward County Transit (BCT) services. BCT currently has 40 regular weekday routes, with slightly fewer operating on Saturdays and Sundays. In 2007, BCT had 240 buses in regular fixed-route service that provided 38,964,807 annual passenger trips.

In addition to its directly operated service, BCT supports and coordinates the Community Bus Program. There are 64 community bus routes operating in 22 municipalities within Broward County. The Community Bus Program is operated with a fleet of 78 vehicles and provided 2,282,037 passenger trips for the year ending in February 2007.

Broward County Transit has three routes that travel into Miami-Dade County, providing connections to 11 MDT routes.

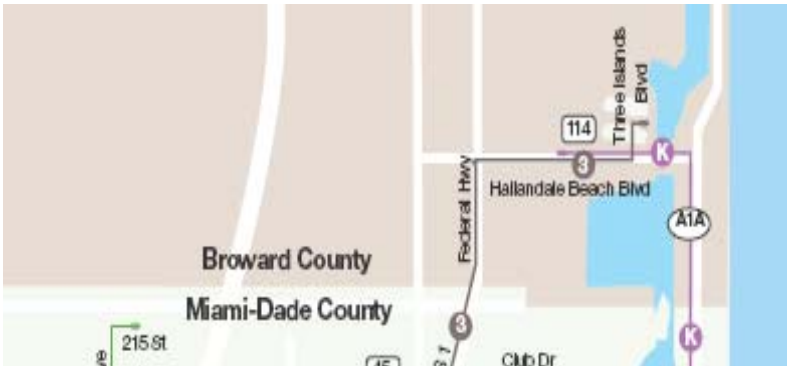
Figure 3-21

BCT Service in Miami-Dade County



Two of MDT's routes (3 and K) extend into Broward County and offer connections with three BCT routes, as shown in Figure 3-22.

Figure 3-22
MDT Service in Broward Count



In early 2010, additional regional connectivity was provided with the implementation of new express service operating primarily on I-95 High Occupancy Toll (HOT) lanes between Broward County and Downtown Miami.

Broward County Transit recently purchased new GFI Odyssey fare boxes for its fleet, and all new bus orders include that specification. Smart card readers are now being installed, with an anticipated completion date of mid 2010. Initially, the readers will only be used to process the bus operator employee identification cards to enable a single log-on capability.

BCT recognizes the need to achieve some level of interoperability with other transit providers in the region, but definitive plans have not yet been developed. BCT staff has held preliminary discussions with GFI and MDT's fare collection system vendor Cubic to gather information regarding interoperability options. They held high-level discussions with MDT to understand more about their fare collection system's features, particularly the functionality of the back-office system. In the coming months, staff will begin to evaluate the feasibility of using MDT for financial clearinghouse functions (as Tri-Rail plans to do) or hosting its own back office. Once that assessment is complete and additional information has been collected regarding various fare collection approaches and the associated costs, BCT will be in a better position to determine the best course of action given budgetary considerations.

Palm Tran

Palm Tran, a department of Palm Beach County, currently operates 35 fixed routes with a span of service from approximately 5:10 a.m. until 11:00 p.m. In addition to its directly-operated service, Palm Tran also assists with the coordination of community-based bus services in Boynton Beach, Lake Worth, and Jupiter. In 2007, Palm Tran provided approximately 10 million fixed-route trips with a fleet of 150 buses.

Palm Tran's paratransit service, Palm Tran Connection, provided approximately 900,000 trips in 2007.

Palm Tran's Route 92 travels into Broward County where it connects with BCT Routes 18, 50, and 92, as shown in Figure 3-23.

Figure 3-23
Palm Tran Service in Broward County

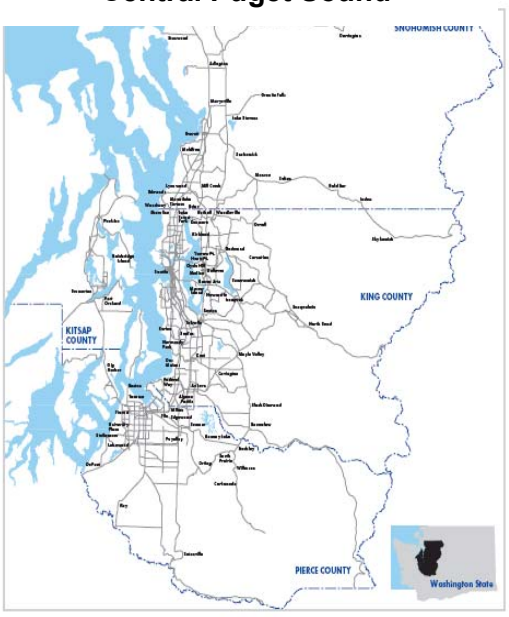
Palm Tran introduced its new fare collection equipment in the fall of 2007. Currently, the fare boxes do not have smart card processing capabilities, but that functionality could be added in the future. Similar to BCT, Palm Tran has just begun the investigation of fare integration options related to Miami-Dade's fare collection system.

■ 3.28 SUMMARY OF EASY CARD SYSTEM

The EASY Card system relies heavily on technology, with an initial base system cost of approximately $42 million, and approximately $19 million of optional components to equip Miami-Dade Transit's Metrobus, Metrorail, Metromover and Special Transportation System Program modes with an automated fare collection system. Although the region's transit operators recognize the complexity (e.g., design requirements, development of business rules and policies, required funding), of achieving fare system interoperability, there is consensus that it is desirable. Efforts toward this end continue, as the operators pursue and evaluate the options available for enhancing customer convenience, collecting more useful and accurate data, and improving operating efficiencies.

■ 3.29 CENTRAL PUGET SOUND OVERVIEW

Figure 3-24
Central Puget Sound



There are seven public transportation agencies operating in the four counties of the Central Puget Sound Region in western Washington State, including King County Metro Transit, Sound Transit, Pierce Transit, Kitsap Transit, Community Transit, Everett Transit, and Washington State Ferries. Together, they operate a network of over 4,000 vehicles providing bus, rail, ferry, demand-response, and vanpool services. In 2008, approximately 165 million trips were made on public transportation in the region.

■ 3.30 FARE PAYMENT BACKGROUND

The investigation of regional fare collection solutions began in 1994, when King County Metro (previously known as Seattle Metro) was designated as the lead agency for planning efforts related to strategies and technologies to improve regional fare coordination. At the time, many transit systems were introducing magnetic stripe passes to replace paper fare media. Although smart card technology was relatively new, a 1995 study commissioned by Seattle Metro concluded that smart cards offered greater benefits and reliability as compared to magnetic stripe technology and recommended the deployment of a contactless smart card fare collection system in the region. The following year, the Central Puget Sound Regional Transit Authority (RTA) adopted Sound Move, a 10-year regional transit system plan designed to expand the capacity of the region's major transportation corridors by adding new high capacity transportation services and facilities. Sound Move was developed to expand on existing local transit services by providing a convenient, reliable, and easy-to-use system linking King, Pierce, and Snohomish Counties. Sound Move included a mix of proposed transportation improvements, including high occupancy vehicle lanes, regional express bus routes, commuter rail, and light rail. The estimated cost of the system's plan was $3,914,000,000, as shown in Table 3-10.

The Sound Move Plan assumed local funding at 40 percent of the authorized level. Proposed funding would come from a 4/10 of one percent sales tax increase and a 3/10 of one percent increase in the vehicle excise (license tab tax) to be collected within the RTA District. In late 1996, a local tax increase to support Sound Move was approved by voters, winning a majority in each of the three counties within the RTA district.

In addition to local taxes, the systems plan assumed additional federal revenues, farebox revenues, borrowed funds (bonds), and interest revenues, as shown in Table 3-11.

Table 3-10
Sound Move Systems Plan
Estimated Costs

HOV Expressway Access Ramps	377
Regional Express Bus Routes	361
Commuter Rail	669
Electric Light Rail	1,801
Community Connections	255
Regional Fund/Reserves	280
Debt Service	171
Total (millions)	3,914

Table 3-11
Systems Plans
Estimated Federal Revenue

Local Taxes Sales Tax (0.4%) MVET (0.3%)	1,980
Bonding	1,052
Federal	727
Farebox/Other	155
Total (million)	3,914

In support of the enhanced transit network, Sound Move included nine guiding principles, one of which was a commitment to coordinate a regional and local fare structure to allow customers to use a single ticket or pass to travel on all public transit services in the regional network.

The regional fund ($280 million) was designed to pay for the system-wide elements of Sound Move, including Sound Transit's fare integration program to create a single ticket ride (budgeted at $59,345,000), research and development of innovative technologies, and planning and environmental analysis for future capital investments. The regional fund pays for Sound Transit administration. The regional fund was created with an equal percentage of local tax revenues contributed by each of Sound Transit's five subareas (Snohomish County, Pierce County, and North, South, and East King County).

Representatives from each of the transit agency boards in the three-county area held a series of forums beginning in December 1997 to discuss potential ways the region could develop the integrated fare structure included in Sound Move. The group discussed potential fare integration or coordination structures, reviewed existing fare policy, and studied financial implications. These issues were complex, given the differing characteristics of the agencies (size, governance, services offered, existing technology and needs, fare structure, and media) and their customer base demographic and socio-economic characteristics, to name a few. Each of the agencies believed it was important to support a regional program but sought to maintain autonomy and expand their individual customer base.

Staff was directed to develop a multi-agency agreement for implementation. The agreement included a provision for Sound Transit to compensate some of the agencies for potential financial losses in the early years of the program and a tiered organizational structure so that issues that could not be resolved by the subject area advisory teams were automatically elevated to higher organizational levels. In 1999, the Regional Pass and Fare Reconciliation Program Agreement was executed by the Central Puget Sound Regional Transit Authority (Sound Transit), the City of Everett (Everett Transit), King County (King County Metro), Pierce County Public Transportation Benefit Area Corporation (Pierce Transit), and Snohomish County Public Transit Benefit Area Corporation (Community Transit). The

program resulted in the introduction of Puget Pass, a regional pass designed to enhance fare coordination and transfers between the participating transit operators. Puget Pass was seen as an incremental measure as the region pursued a smart card system.

This program agreement called for each party to the agreement to designate a representative responsible for communications and administration of the agreement, for revenue reconciliation (as further described), for sales and distribution of fare media, for public information related to regional fare media, and for tracking and reporting data necessary for the preparation of forecasts and earned revenues, etc., for their respective agency. In addition to its responsibilities as a party to the agreement, Sound Transit served as the reconciliation account manager, access provider for records related to audits, forecasted and earned revenue, and annual research activities necessary for the establishment of regional fare media.

With Puget Pass, revenue was shared among agencies based on the total number of boardings and the average fare per customer and service category using on-board survey estimates. To reduce the impact of projected and actual revenue losses that were incurred by the implementation of Puget Pass, the parties were reimbursed from the Sound Transit Fare Integration Budget for revenue shortfalls for services provided. Sound Transit's 2003 Proposal for Transfer Trip Revenue Sharing Policies included the following example:

A rider uses Puget Pass to pay a $1.50 fare on a King County Metro (KCM) bus. The rider then transfers to a Community Transit (CT) bus with a $3 fare, and finally transfers to a local CT route with a $1 fare. Assuming the KCM average fare per boarding is $0.7747 and the CT average fare per boarding is $1.39, the fare reconciliation calculation would be as follows:

- KCM receives $0.7747 for its leg of the trip;
- CT receives $1.3957 x 2 (2 boardings) = $2.7914;
- The rider pays $1.50 on KCM and $2 on CT for a total of $3.50; and
- The Sound Transit fare integration fund provides $0.06661.

As early as 1997, planning was well under way for a regional electronic fare collection system, including engineering studies, development of an operating concept and business rules, specifications development, and a procurement plan. Ultimately, the agency partners determined the best approach would involve the procurement of "off the shelf" hardware and software components, with vendor modifications to accommodate core business needs versus a vendor-designed system based on specified functional capabilities. In April 2003, a $31-million contract was awarded to the ERG Group for a regional fare collection system.

In April 2003, the seven partner agencies signed the Interlocal (ILA) Cooperation Agreement for Design, Implementation, Operation, and Maintenance of the Regional Fare Coordination System. The Agreement created a Joint Board comprising the General Manager or Director of each of the participation agencies with responsibility for project oversight and contract administration. Decisions by the Joint Board required a unanimous vote of the agency representatives present at a meeting in which a quorum was present. These responsibilities included but were not limited to approval of or amendments to:

- Consultant contracts
- Project budgets

- Fare collection and customer service contracts
- Cardholder agreements and institutional account agreements

A detailed list of individual agency responsibilities also was developed for the Agreement. Key provisions of each agency's responsibilities included:

- Review contractor and consultant deliverables;
- Establish bank accounts to facilitate cash and electronic commerce transactions;
- Direct banks to honor contractor directions for collection and distribution of funds;
- Designate agency personnel to ensure data security;
- Maintain equipment;
- Report fare policy changes to contract Administrator 30 days prior to effective date;
- Develop and enter into cardholder agreements and institutional account agreements;
- Train or provide fare collection system training;
- Assist in the development of a project rollout plan; and
- Establish and maintain contractual relationships with retail revalue sites as applicable.

The agreement also identified the Project Team responsible for design and implementation of the fare collection system, including a Contract Administrator, IS/Technical Manager, Budget and Control Manager, Agency Site Managers, and a Project Assistant. The Contract Administrator was to be nominated by King County and approved by the Joint Board. The Contract Administrator was responsible for selecting the other members of the Project Team, except the Agency Site Managers who were selected by each agency.

A significant portion of the Agreement was dedicated to the regional fare collection finance plan including revenues, expenses, and cost sharing assumptions.

As of 2003, the project had received 12 federal grants, a donation from the Boeing Company (via the City of Everett Traffic Mitigation Fund), and an appropriation from the Sound Transit Technology Fund, as shown in Table 3-12.

The cost shares were allocated among the seven participating agencies based on the proportional share of the total project equipment purchased by each agency, as shown in Table 3-13.

The regional fare collection project budget included the fixed-price vendor contract costs of approximately $31 million, as shown in Table 3-14.

Items identified as other project administration costs are shown in Table 3-15. These costs were also to be shared per the regional cast-sharing formula.

It was anticipated that the agencies would also have some internal implementation costs (primarily labor), which could be covered each agency's regular operating budget or, if they met certain criteria, could be charged to their share of regional grant funds or other funds dedicated to the project. Table 3-16 displays the 2003-2006 design and implementation costs by agency, including an estimate of internal implementation costs.

Table 3-12
Regional Project Revenue Summary

Regional Project Revenue Summary			
Grant/Source	**Match % Requirement**	**Total Award**	**Total Match Requirement**
Federal Section 5307 *7 Individual Grants*	20%	$9,575,958	$2,393,990
CMAQ *3 Individual Grants*	13.5%	$2,686,000	$419,202
ITS Earmarks 5288 *2 Individual Grants*	50%	$4,421,941	$4,421,941
Boeing Donation	N/A	$500,000	0
ST Technology Fund	N/A	$3,000,000	0
Total		$20,183,899	$7,235,133

Table 3-13
Regional Grant Distribution Formula

Agency	Share of Regional Costs & Grant Revenues
King County Metro	55.15%
Community Transit	11.56%
Sound Transit	10.65%
Kitsap Transit	5.88%
Washington State Ferries	5.27%
Pierce Transit	8.61%
Everett Transit	2.88%

Table 3-14
Vendor Contract Costs and Equipment Quantities

Vendor Contract – Cost Components and Total Value			
Cost Item and Regional Quantity	**Regional Total Costs**	**Cost Distribution**	
		Regionally Shared Cost/Formula	**Individual Agency Cost**
Equipment:			
Fare Transaction Processors (2379)	$1,967,584		X
Driver Display Units (2207)	$2,789,648		X
Wireless Base System (19)	$74,461		X
Wireless Data Bus System (2207)	$326,407		X
Data Acquisition Computer (23)	$303,508		X
Back Office Computer (7)	$411,285		X
Sound Transit TVM Upgrade Kits (35)	$80,750	X	
Customer Service Terminals (33)	$280,071		X
Photo Identification Units (11)	$190,949		X
Equipment Installation:	$326,728		X
Fare Cards	$761,006	X	
Integration:			
KCM POS w/CST	$19,573		X
KCM Laptop CST Application	TBD		X
KCM Radio Control Unit Integration	$86,500		X
CT DDU w/Multiple On-Board Functions	$86,783		X
CARM Inventory Software	$72,319	X	
Back Office Integration	$246,668	X	
Reports	$563,812	X	
Implementation - Phase 1 Thru Revenue Service Beta Test	$11,197,971	X	
Implementation – Phase 2 Thru Full System Acceptance	$1,496,969	X	
Project Management	$801,013	X	
Training	$716,375	X	
Total Vendor Contract Cost	$31,015,380		

Table 3-15
Regional Fare Collection Project Administration Costs

Other RFC Project Administration Costs		
Cost Item	**Key Assumptions**	**Est. Regional Cost**
Project Management Team	• 4 FTE employed by King County • Positions: Contract Administrator, Technical Manager, Budgets & Contract Control Manager, and Project Assistant	$1,029,000
Regional Payment Funds Management	• The Fiscal Agent is to perform this function • The task is to provide a central acct. into which individual agency payments can be made and a single payment check issued on behalf of the region	TBD
Regional Technical Consultant	• Scope of Work is to provide expert support to staff and the Joint Board in the design review process and deliverable acceptance	$525,000
Sales Tax	• 100% of the vendor contract is taxable, however there may be an exemption for the software developed. In actual practice, each agency will pay the applicable rate for items delivered to their sites	$2,729,353
Contingency Budget	• 20% of the vendor contract value • Joint Board approvals required for all expenditures allocated to Contingency Budget	$6,203.353
Dispute Resolution Board	• Three experts selected jointly by the agencies and vendor • Costs shared 50/50 with vendor • DRB to have scheduled briefings and be “on call” to mediate vendor/agency deliverable acceptance/payment disputes	$122,100
Intellectual Property Software Escrow Account Fees	• All system source code to be escrowed • A contract will be secured with a firm specializing in system software escrow management • The most rigorous level of verification and updates will be utilized	$99,000
Project Evaluation	• Consultant contract • Scope of Work TBD in collaboration with FTA to support its ITS evaluation work program	$75,000
Project Marketing	• Cost of collateral (brochures, radio ads, bus ads, etc.) for the Beta Test and Full Roll-out	$300,000
Sound Transit Consultant Fee to Oversee System TVM Upgrade	• TBD	$27,100
Total		$11,109,629

Table 3-16
Total Estimated Fare Collection System Costs Per Agency

Agency	Total Project Budget (Vendor + Other Admin) Estimated Share of Regional Expense	+ Individual Agency Estimated Internal Expense to Implement	+ Total Estimated Implementation Expense
King County Metro	$23,107,184	$2,446,384	$25,553,568
Community Transit	$4,966,611	$932,640	$5,899,251
Sound Transit	$4,437,639	$593,543	$5,031,182
Kitsap Transit	$2,511,715	$732,375	$3,244,090
Wash. State Ferries	$2,250,788	$727,682	$2,978,460
Pierce Transit	$3,619,843	$824,000	$4,443,843
Everett Transit	$1,231,241	$173,040	$1,404,281
Total	$42,125,011	$6,492,664	$48,554,675

■ 3.31 ORCA SMART CARD SYSTEM

Following more than 10 years of planning, development, testing and extensive design work, what is now know as the ORCA (One Regional Card for All) system began its limited rollout in April 2009. Building upon the original 2003 Interlocal Agreement, the partner agencies signed a new agreement in April 2009 that further refines and details all ORCA program elements to accommodate the concurrent performance of the final development phase, and on-going activities related to the operating phase.

ORCA Smart Card

Figure 3-25
ORCA Card

The ORCA system uses smart cards containing microprocessors capable of collecting a variety of data each time they are used, by tapping the card on various types of fare processors in use throughout the region, including date, time, fare paid, transfer, agency, route, etc. Within just a few months following its limited rollout in April 2009, over 35,000 ORCA cards were active in the region. ORCA will eventually replace more than 300 different types of tickets and passes, including its precursor, the Puget Pass. For the initial roll-out, cards were distributed free of charge. By early 2010, customers will be required to pay a one-time fee of $5. The ORCA cards have a life of approximately three to five years.

The ORCA card can be used in three different ways:

1. Values between $5 and $300 can be stored on the ORCA E-purse. It is used just like cash to “pay as you go” for transit fares and also can be used in combination with a

pass. For subsequent trips made within two hours, only the difference is paid if another fare is higher.

2. ORCA can be used as a regional pass to travel on all bus and train services. A pass value is chosen for the ORCA card based on the price of the trips likely to be taken. The pass is valid for payment of trip fares up to the value of the pass.

3. The ORCA card can also be used to purchase passes or fare products that cover multiple rides or monthly passes valid only on a specific agency's transit services.

ORCA cards can be purchased or revalued on-line with a valid Visa or MasterCard; by mail with a check, credit card, or money order; in person at ORCA customer service offices or select retail locations (most forms of payment accepted); by phone (with valid Visa or MasterCard); or at Ticket Vending Machines that accept cash or credit card.

ORCA cards revalued on-line or by phone are available for use within approximately 24 hours. New card purchases or revalues processed at Customer Service Offices, retail locations, or Ticket Vending Machines are available for immediately use.

ORCA card purchasers who are at least 19 years of age have the option of registering their cards (name, email address, billing address, and password; ORCA card serial and verification numbers are required) to set up an autoload feature. E-purse Autoload will load a set value onto the ORCA card when the existing vaue is not sufficient to pay the fare. To set up autoload for a pass, the value will load the first time the card is tapped on a fare processor in the new month.

Registered ORCA card holders also can sign up for balance protection, which offers a replacement card and restores any value that was on the card at the time it was reported lost, stolen, or damaged.

Finally, registered ORCA card holders also can view their transaction history, including fare payment and history, and add value transactions.

Fare Collection Equipment

There are currently 2,192 buses equipped with on-board fare processing equipment, including a Driver Display Unit on the console, electronic fareboxes, and a Wireless Data On/Off Load System, which is a mobile wireless communication system used to upload transaction data and download information such as blocked card lists.

- **Portable Fare Transaction Processors** - Portable Fare Transaction Processors (PFTPs) are hand-held devices that can be used to collect fare for ferries, vanpools, or paratransit services. The ORCA system uses 132 units.

- **Stand-Alone Fare Transaction Processors** - ORCA has 126 Stand-Alone Fare Transaction Processors, which are stationary devices that collect rail and train fares.

- **Ferry Turnstiles/Tollbooths** - A total of 97 Washington State Ferry turnstiles and tollbooths have been equipped with ORCA card readers and software for fare collection.

- **Ticket Vending Machines** – There are 59 Scheidt and Bachman Ticket Vending Machines equipped with ORCA readers and software that sell new and revalue existing ORCA cards.

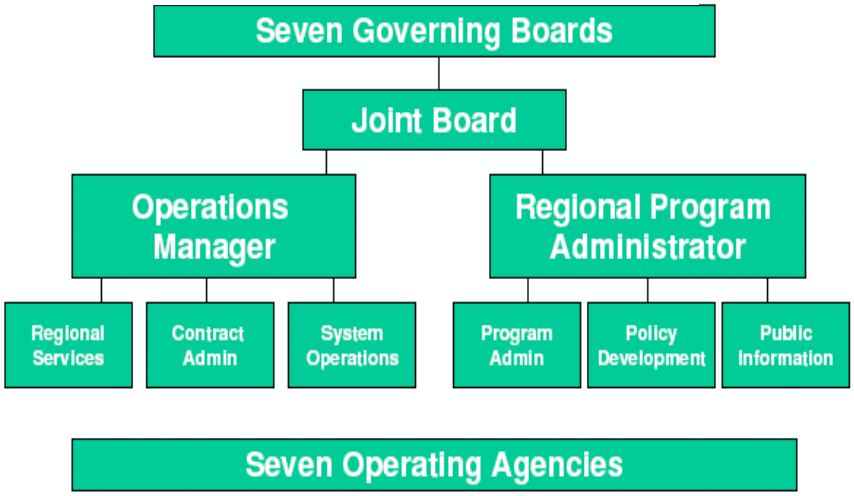
- **Customer Service Terminals** - There are 9 agency Customer Service Offices in the region that operate 20 Customer Service terminals used for card sales and revalue.

- **Terminal Revalue Units** - Approximately eight retailers use Terminal Revalue Units to revalue ORCA cards.

■ 3.32 ORCA SYSTEM MANAGEMENT STRUCTURE

Building upon the 2003 Interlocal Agreement, the 2009 Interlocal Agreement established the terms for operation and management of the ORCA system, as shown in Figure 3-26.

Figure 3-26
ORCA Management Structure



The ILA formalized the management structure for the operating phase of the ORCA system, delegating authority to the Joint Board for operational decisions.

The ORCA Operations Manager oversees the ORCA System components of the Operations Agency (King County Metro) and has responsibility for developing staffing plans, operating plans, and providing any requested information to the Joint Board. Functions of the ORCA Operations Agency include:

- Coordination of regional system operating activities including but not limited to data management, emergency response coordination, and directing the Change Control and Failure Review Committees;

- Contract administration between the RFC contractor and consultants, such as performance monitoring, warranty communications, dispute resolution, contract change administration, contractor auditing, and intellectual property escrow administration;

- Monitoring of regional services, including the functions of the Fiscal Agent, Regional Mail Center, and Regional Inventory Distribution Center;

- Coordination of committees and advisory groups that may be established by the Joint Board; and

- Coordination with the Regional Program Administrator and other regional service providers.

Managed by the Regional Program Administrator, the ORCA Regional Program Administration Agency (Sound Transit) has responsibility for administering the regionally-coordinated fare collection program and ensuring that materials and information regarding the ORCA program are consistent and complete, including:

- Program administration, such as logistical and record keeping support, maintenance of the regional program budget, invoicing, and payment processing;

- Policy development and coordination of fare collection procedures and business rules;

- Public information activities developed by regional working groups, such as website and printed content for public use and distribution, public disclosure process, and privacy and records archival policies and processes;

- Coordination of committees and advisory groups that may be established by the Joint Board to address agency security functions, security audits, and review of security incidents; and

- Coordination with ORCA Operations Managers and other regional service providers.

Regional Cost Sharing Formula for Operating Phase Through January 1, 2010

The 2009 ILA established the regional cost-sharing formula for the Operating Phase of the project, as shown in Table 3-17. The percentage was calculated based on the estimated number of revenue boardings divided by the total of all revenue boardings by all agencies, regardless of total revenue or number of ORCA transactions.

On October 1, 2009, the Joint Board adopted a cost-sharing formula to take effect January 1, 2010. This formula is based on actual cost drivers, such as the number of transactions, number of boardings, number of customers, dollar volume of use, or sales transactions as measured and reported by the ORCA system. By June 1 of each subsequent year, or such other date as the Joint Board establishes, the Joint Board will adjust and adopt the cost sharing formula to take effect January 1 of the following year.

Table 3-17
Cost Sharing Formula for Initial Operating Phase

Agency	*Share of Regional Costs*
King County Metro	66.73%
Sound Transit	11.08%
Community Transit	7.00%
Washington State Ferries	1.96%
Kitsap Transit	2.82%
Pierce Transit	8.81%
Everett Transit	1.60%

The estimated annual ORCA operating budget for regional services managed by Sound Transit, regional services managed by King County Metro, ERG maintenance and service expenses, and regional services managed by the agencies (less ORCA non-fare operating revenues) ranges from approximately $4.34 million to $6.09 million annually between 2010 and 2018.

■ 3.33 ORCA FARE PROCESSING

Intellectual Property

The Regional Fare Collection Contractor (ERG Transportation Systems) is required to provide the operating agencies with certain information and documents that are considered contractor's Intellectual Property (IP). In turn, the agencies were required to sign a nondisclosure agreement that specified "reasonable protective measures" it would undertake to prevent disclosure of contractor IP and IP materials to other than agency employees, contractors, and consultants whose duties on behalf of the agency require them to have access to certain contractor IP.

Because the detailed information related to fare processing and funds settlement is considered IP, the agencies are prohibited from sharing that information unless it is for the performance of employment or contractual duties for the agency relating to the design, implementation, operation, and maintenance of the RFCS. As such, the ORCA Fare Processing section below provides a broad overview of the ORCA system's fare processing and settlement functions.

Fare Processing Transactions

There are three major types of ORCA fare processing transactions: E-purse allocations, Retail Pass allocations, and Business Account allocations. The settlement accounts associated with each are further described in the next section "Fare Settlement Accounts."

E-Purse Allocations

Funds are received from cardholders for loading E-purse value and deposited to the E-purse Float Account held by the fiscal agent on behalf of the agencies and are distributed to an agency as the cardholder uses the card for payment of fare for travel on the agency's services are distributed as follows:

- E-purse funds used for payment of fare to a single agency, which does not involve use of E-purse transfer credit to or from another agency's services, are distributed from the ORCA E-purse Float Account to the agency on which the fare was earned.

- For trips involving multiple agencies (linked trips) that involve use of E-purse transfer credits (earned through payment of fare on one agency's service and used as credit toward payment of fare on another agency's service, the total fare deducted from the E-purse for a linked trip is the maximum fare amount charged to the E-purse from among the individual agencies whose services are used in that linked trip. The distribution of the total fares deducted from the E-purse among the agencies whose services are used in that linked trip is in proportion to the value of the fare each agency would have charged for the service used in the absence of use of the other agency's services in the linked trip.

Retail Pass Allocations

Funds received for purchase of regional transit pass products that are used on just one agency during the pass validity period are distributed entirely to that agency. Funds uses for purchase of transit passes that are used on more than one agency during the pass validity period are distributed among the agencies in proportion to the total value of the services used on each, as follows:

- The value assigned to a trip taken on just one agency is the minimum of either the fare value of the pass or the fare for the trip. For intra-system linked trips within the transfer window, the value is the minimum of either the fare value of the pass or the maximum fare of any leg in the linked trip.

- The total value assigned to an inter-system linked trip is the minimum of either the fare value of the pass or the maximum fare of any leg in the linked trip. The total value of the trip is allocated among the agencies in proportion to the value of services used during the trip. The value of each leg of the trip is the minimum of either the fare value of the pass or the fare of the leg.

- At the end of the pass validity period, the funds used for purchase of the pass are allocated among the agencies in proportion to the total value of the trips taken on each agency.

Business Account Allocations

The State of Washington has a Commute Trip Reduction Law aimed at reducing the number of single occupant vehicle trips made to and from major employment sites, including but not limited to educational, human services, and government entities. As a result, Business

Accounts have been established to facilitate the sale and distribution of discounted fare media via employers.

There are various requirements for participation in a Business Account, and differing account features, but generally there are two major product offerings. The first is the Business Passport Program, which provides a regional pass that covers the full fare of all regularly-scheduled transportation services to all benefits-eligible employees within a company. The cost of a business passport varies depending upon a company's location(s) and whether a company chooses per-trip pricing (the total value of trips taken) or flat-rate pricing (the sum of total annual transit fare values). Revenue from flat-rate Business Passport products is distributed to the Agencies based on the annual transit fare value for each customer. Per-trip Passport revenue is distributed based on the total value of trips taken by each Per-trip customer. The second major Business Account product is the Choice Program, which offers a more flexible employer purchase option for transit passes, vanpool fares, E-purse, and E-vouchers. The allocation of Business Choice Accounts for E-purse and ORCA Pass revenue is done according to the E-purse and Retail allocation methodologies described above. With ORCA, fare revenue is more accurately apportioned based on actual trip use per agency as opposed to the old system of trip use based on Commute Trip Reduction Surveys.

Fare Settlement Accounts

To process fare media, the Fiscal Agent (Sound Transit) is required to establish the following Fare Processing Accounts:

- **Regional Clearinghouse** - The central clearing account in the ORCA system used to settle all fare media transactions.

- **Float Account** – The depository for unspent funds for purse use. These funds reside in the account until the cardholder uses the ORCA card, or until transactions occur which affect the funds.

- **Regional Pass Account** - The depository for funds from the sale of regional passes. The funds reside in this account until the ORCA system apportions the ridership revenues earned by the agencies (once per month).

- **Institutional Account** – The account is used to collect and distribute funds for all Institutional Products. The majority of the activity is a one day in-and-out clearing of revenues collected and distributed. The funds reside in the account until the ORCA system apportions the ridership revenues earned by agencies (once per month).

- **Distributor Account** – The account collects funds from sales of fare media products sold by retailers and distributes those funds to the Fiscal Agent accounts. The account is swept daily and funds are transferred to the Fiscal Agent accounts. Funds are collected from retailers on a weekly basis.

- **Distributor 2 Accounts** – The account collects funds from sales of fare media products sold by retailers and distributes those funds to the Fiscal Agent Accounts. Funds are collected from retailers on a daily bases and transferred to Fiscal Agent Accounts.

- **Cardholder Claim Account** – The account holds funds from the sale of fare media in a "card not present" environment (card was not presented to a fare collection device prior to the expiration of the prescribed period) and is awaiting distribution back to the purchaser.

- **Unclaimed Property Account** – The account holds funds that are attributable to inactive cards.

- **Participant Claim Fund Accoun**t – The account holds funds from missing transactions awaiting distribution back to the agencies.

■ 3.34 ORCA PROGRAM LEGAL ISSUES

As reported by the U.S. Department of Transportation's Research and Innovation Technology Administration (RITA), the ORCA partners encountered a variety of legal challenges. These began with the preparation of a Request for Proposals, development of contract language, change amendments, terms and conditions, trade secrets, warrantee and maintenance requirements, indemnification against lost revenue and claims, and contractor performance security.

Because the partners chose a governance model that allowed them to continue operating as individual agencies versus the creation of a regional entity, there were no provisions in place for representation to look out for the best interests of the region as a whole.

The project was driven by contractual issues that required frequent legal review, and each partner agency wanted legal oversight, yet the individuals responsible for the day-to-day project development process were not authorized to hire a project attorney and lacked the staff to provide routine legal support. Some of the partner agencies had staff attorneys, while others had to hire legal services at their own expense.

To facilitate the development of the project, King County Metro provided legal support through the King County Prosecuting Attorney's office under an agreement with the partner agencies. Two attorneys worked on the project from the outset, allowing them to gain an in-depth understanding of the issues. The knowledge base was a significant resource to the project and would have been difficult for the partners to provide at the same level without KCM's support.

Technically, KCM legal staff could provide legal advice only to its client KCM, and there were concerns regarding potential conflicts of interest and the time required to provide project support. As a result of these concerns and others that were identified during later phases of project development, the 2009 Interlocal Agreement included detailed legal representation policies for the operating phase of ORCA, including mechanisms for addressing potential conflicts of interest, sharing legal services to avoid duplication of efforts and costs, and maintaining confidentiality. For example, the parties agreed that all attorney-client communications between a lawyer representing the Regional Service Provider (King County Metro) would be available to the Joint Board members and each agency on a privileged and confidential basis and may be shared among the agencies as if they were a single entity.

Another legal obstacle the partners encountered was related to the Uniform Unclaimed Property Act, which governs the disposition of tangible and intangible property that is unclaimed by its owner. A business that holds unclaimed property must file reports related to the unclaimed property it holds, and then transfer the unclaimed property to the Department of Revenue after a holding period established by State statute (generally three years).

Smart cards have a useful life of approximately five years, so any unused stored value would be subject to unclaimed property laws after three years. Tracking and reporting requirements would be burdensome for the partners, given the potential for a high volume of unclaimed low-value smart card stored accounts and could also be a deterrent to customer acceptance of smart cards.

In 2004, the Legislature exempted gift certificates, including gift cards, from the unclaimed property provisions, as long as the holders or issuers of the certificates met certain requirements. Gift cards were defined to include cards with stored value that may be exchanged for consumer goods and service. The law was somewhat ambiguous in terms of its application to public transportation stored-value fare cards.

Ultimately, the partners were successful in gaining the support necessary for legislation that relieved the public transportation agencies that hold abandoned fare card value to report the value at the end of the holding period, as long as the agency honors the card in perpetuity.

In 2008, the American Civil Liberties Union (ACLU) also raised security and privacy concerns to the Joint Board. The ACLU claimed the data associated with each card (time and date of use, route, and transit system) would allow organizations that provide discount passes to employees, for example, access to an individual's public transportation history, and personal travel characteristics. The ACLU recommended the creation of a policy to protect the privacy of an individual's transaction history with a provision to submit less detailed (date, time, and route) information to Business Accounts.

In response, the Joint Board directed its contactor to make design updates to the Business Account website consistent with the ACLU's recommendations. The changes meant that Business Account representatives would be unable to review transaction data linked to specific card numbers via the standard report section of the Business Account secure website. In spite of these measures, the transaction data linked to the ORCA cards is not exempt from disclosure under the Washington Public Records Act if requested by a Business Account.

Following is an excerpt from the ORCA Privacy Statement on http://www.orcacard.com (Appendix A) that reflecting the updated policies:

A Business Account owns the Business Cards that are distributed to its employees, students or other program participants. The Business Account has a record of serial numbers of all cards it has purchased and distributed. The card serial numbers may be linked by the Business Account to names and other PII that it may have. The ORCA Program does not collect PII associated with the serial numbers of Business Cards unless you choose to register your Business Card. For example, an Agency will typically only know that it issued ORCS Business Card number 100 through 200 to a specific employer, The

employer will know that it assigned Card #101 to a specific employee. The employer does not typically share the employee's name with the Agencies but may provide it to the Agencies for administrative purposes such as resolving questions about a card or investigating unauthorized use of the card or other business purposes.

A Business Account may use a password-protected age in the orcacard.biz Website to access reports and information about its Business Cards, including information about loading ORCA products on its cards (as described in Sections 5.0 and 6.0) and information about the use of its cards (as described in Section 7.0) The Website and its routing reports do not allow the Business Account to view use information linked to its card serial numbers. Upon written request, however, a Business Account may obtain a card serial number linked to specified transaction date in accordance with RCW 42.56.330.

■ 3.35 ORCA DATA COLLECTION AND REPORTING CAPABILITIES

Because the fare collection system is relatively new, the partner agencies have not yet fully explored the entire range of reporting capabilities and data collection opportunities available through the ORCA system. Table 3-18 presents an example of the initial standard reports generated for King County Metro, including the date range and whether they are generated based on demand or an established schedule. The other agencies also have defined some initial standard reports based on their specific data collection needs.

Table 3-18
Sample Standard Reports - King County Metro

Participant	# of Reports	Reports Viewed (list separately on each line)	Frequency (e.g. daily, weekly, monthly)	Report Date Range (e.g. day, week, month)	Scheduled or On Demand
King County Transit	1	ORCA Boardings by Product Type	Monthly	Month	On Demand
	1	ORCA Boardings by Route	Monthly	Month	On Demand
	1	ORCA Boardings by Fare & Passenger Type	8th day of each month, 6:00am	Previous month, on	Scheduled
	1	ORCA Boardings Activity	Daily	Day	On Demand
	1	ORCA Boardings Activity	Weekly	Week	On Demand
	1	Daily Boardings by Route	Daily, every 7th day	Month to date	Scheduled
	1	Institutional Linked Ridership Summary	Daily	Day	On Demand
	1	Institutional Unlinked Ridership Summary	Daily	Day	On Demand
	1	Institutional Custom Bus Usage	Monthly	Month	Scheduled
	1	Daily Sales by Payment Type	Monthly	Month	On Demand
	1	Daily Sales by Product	Weekly	Week	On Demand
	1	Daily Sales for CST (Zohreh)	8th day of each month, 4:00am	Previous month	Scheduled
	1	Settlement Position Report	Monthly	Month	On Demand
	1	Access Pass Sales Report	Daily	Day	Scheduled
	1	ORCA Accounts Total	Daily, 12:00am	System total	Scheduled
	6	Device Connections	Daily	No date range	Scheduled
	1	Device Connections	Hourly	No date range	Scheduled
	1	monthly summary sales totals	Monthly	Month	Scheduled
	1	pending business accounts	?	?	
		Ad Hoc Reports		As needed	On Demand
	1	AV_CD_DIST_DETAILS - Apr 14 2009	8x Daily at 2:45am/pm, 3:15am/pm, 3:45am/pm, 4:15am/pm	No date range By distribution > 2235 (until re-set) and KCM only	Scheduled
	1	Trip_Selection_by_OperatorDateAgency	projected: Weekly	One week, KCM op	Scheduled

It is anticipated that some of the greatest benefits in terms of cost savings and efficiencies will be realized through the system's enhanced capabilities for the more than 2000 Business Accounts and their associated transactions. As previously noted, prior to the introduction of ORCA, service utilization estimates (and the associated revenue settlement process) was based on infrequent surveys and projected ridership. As shown in Table 3-19, the ORCA system generates monthly unlinked trip reports based on actual utilization, which will allow the Business Accounts to do better program planning and budgeting. In turn, the partner agencies now receive more accurate reimbursement for travel occurring on their individual systems.

Because the ORCA cards are expected to last approximately four years, expenses related to card purchase, distribution, and administration are reduced. Business Accounts now have the ability to check card balances and products loaded on the card. Through the web-based Business Account Management Program, cards can be revalued or blocked (e.g. upon employee termination or when school is not in session).

In addition, ORCA data is readily available for download through the Business Account Management Program for use in fulfilling internal and external reporting requirements.

Table 3-19
Sample Standard Reports – Business Accounts

Participant	# of Reports	Reports Viewed (list separately on each line)	Frequency (e.g. daily, weekly, monthly)	Report Date Range (e.g. day, week, month)	Scheduled or On Demand
Business Accounts	2000+	Expired Vouchers	Monthly	Month	On Demand
		Institutional Transaction History	Monthly	As needed	On Demand
		Institutional Card Status	Monthly	Month	On Demand
		Institutional Linked Ridership Summary	Annual with renewal	Month	On Demand
		Institutional Unlinked Ridership Summary	Annual with renewal	Month	On Demand
		Institutional Vanpool Subsidy Status	Monthly	Month	On Demand
		Institutional Vanpool Usage	Monthly	Month	On Demand
		Unredeemed Products	Monthly	Month	On Demand
Lead Agents for BAs	2000+	Expired Vouchers	Monthly	Month	On Demand
		Institutional Billing	Monthly	Month	On Demand
		Institutional Card Account Transaction History	Monthly	As needed	On Demand
		Institutional Card Status	Monthly	Month	On Demand
		Institutional Linked Ridership Summary	Annual with renewal	Month	On Demand
		Institutional Unlinked Ridership Summary	Annual with renewal	Month	On Demand
		Institutional Vanpool Subsidy Status	Monthly	Month	On Demand
		Institutional Vanpool Usage	Monthly	Month	On Demand
		Participant Fare Media Summary	Monthly	Month	On Demand
		Unredeemed Products	Monthly	Month	On Demand

■ 3.36 SUMMARY OF ORCA FARE COLLECTION SYSTEM

The ORCA fare collection system involved an extensive amount of coordination and cooperation among the region's partners, following Seattle Metro's (now known as King County Metro) designation as the lead agency for planning efforts to improve regional fare coordination in 1994, through ORCA's rollout in 2009. Developing an integrated fare collection system for seven agencies that serve diverse markets, operate multiple modes, and differ in size and resources was a significant challenge. In addition to the complexity of the technology, the financial and budgetary considerations, procurement processes, business rules development, and contracting and monitoring requirements, were also complex. In spite of the significant level of effort and budget involved in the creation of ORCA, the partners anticipate far reaching benefits in terms of customer convenience, service planning improvements, and operating efficiencies.

4.0 SUMMARY OF BEST PRACTICES

■ 4.1 INTRODUCTION

Drawing from the literature review, the state-of-the-industry overview, and the case study syntheses, this chapter provides a summary of the best practices identified for agencies contemplating the implementation of regionalized services and integrated or coordinated fare systems. The observations are general in nature and provide references to agencies and regional fare projects where appropriate. The documentation of best practices provides a framework of topics and decision steps that agencies may wish to consider.

■ 4.2 OVERVIEW OF BEST PRACTICES

The process of moving toward a regional fare policy or a regional fare system should be undertaken only after a deliberate and well-thought-out process. An honest assessment of the needs, potential costs, and benefits must occur to determine if a regional approach is desirable, to what extent it should occur, and what agencies can reasonably be expected to participate.

To start the process and to keep the momentum going from the preliminary steps, to development of institutional arrangements and agreements, to system design, and finally to implementation of the system, a “Project Champion” must be identified. The Project Champion is an individual or an agency that will act as the catalyst to bring all parties together and keep the project on track through what may be a long and challenging process.

As shown in Table 4-1 complex technology applications are not a prerequisite of an effective regional fare program or policy, as demonstrated in the approaches taken by the Delaware Transit Corporation in partnership with SEPTA and those in use by the five operators in San Luis Obispo County’s regional fare program. The customers in both regions benefit from a more seamless travel experience as a result of shared fare media, while the operators receive appropriate compensation based on mutually-acceptable fare revenue sharing formulas.

Table 4-1
Key Features of Case Study Fare Collection Systems

Agency	Key Features of Fare Collection System
Southeastern Pennsylvania Regional Transportation Authority and Delaware Transit Corporation	• No technology component
City of San Luis Obispo , San Luis Obispo Regional Transit Authority South County Area Transit , and the cities of Paso Robles and Atascadero	• Evolving electronic fare collection system • Electronic fareboxes with smart card capabilities • Magnetic card readers • Printing/ encoding machines
Port Authority Transit Corporation	• FREEDOM smart card and ticket processing • Autoload feature • Ticket vending machines • Fare gates • Parking gates • Central computer system • Scalable design for future integration with other systems
Miami-Dade Transit	• EASY smart card and ticket processing • Autoload feature • Electronic fareboxes • Automatic passenger counters • Fare gates • Ticket vending machines • EASY Card and ticket point of sale devices • Parking payment capabilities • Central and garage computer systems • Regional clearinghouse • Scalable design for future integration with other systems
King County Metro, Sound Transit, Pierce Transit, Kitsap Transit, Community Transit, Everett Transit, and Washington State Ferries	• ORCA smart card processing • Autoload feature • Electronic fareboxes • Portable fare transaction processors • Ferry turnstiles and tollbooths • Ticket vending machines • Stand alone fare processors • Point of sale devices • Network of business accounts • Regional clearinghouse

Regardless of the complexity of the regional fare program approach that is ultimately selected, there are several core activities that should be undertaken prior to system development. First, an analysis of regional travel patterns should be undertaken to evaluate the amount of inter-regional and inter-system transit travel to determine what level of investment may be warranted based on the potential benefits of a new fare program. Second, the respective transit markets of the regional agencies should be examined to determine what types of fare media will likely be attractive to customers. For example, transit-dependent and rural markets may prefer to use cash and may not be as willing to adopt smart card technologies that may require a higher upfront investment in the card itself, a minimum prepayment amount, or an established relationship with a financial institution. Third, institutional barriers and challenges should be examined. Due to the various types of public agencies that administer, plan, manage, and operate transit systems in a region, there may be differing functions and missions that are incompatible. A determination must be made as to whether the difference in local, financial, operating, and political environments can be overcome to allow a common approach to be developed and implemented. And, if so, can all parties justify any necessary capital and operating expenses and associated staffing requirements?

■ 4.3 PLANNING FOR A REGIONAL FARE COLLECTION SYSTEM

If a regional fare policy or integrated fare system appears to be justified, the next step in the process is conducting the preliminary planning activities to help formulate the system specifics. This would include a variety of planning activities, including:

- Identification of potential partners and participating agencies;
- Examination of existing systems and policies, detailing similarities and differences;
- Analysis of regional fare policies and structures;
- Identification of objectives and priorities for the project;
- Identification of minimum data collection needs and reporting schedules;
- Definition of the roles and responsibilities of participants;
- Review of potential approaches and technologies; and
- Conduct alternatives analysis.

■ 4.4 INSTITUTIONAL ARRANGEMENTS

A number of institutional issues must be addressed as agencies move forward in implementing a regional fare policy and integrated fare system. Three of the main institutional components (project approach, agreements, and finances) are described below.

Project Approach

It is critical to the project's success to bring all potential partners to the table and establish participant buy-in at the initiation of the project. This should include both large and small transit operators. A common vision must be established that will guide the organizational structure and funding arrangements. An early, but critical, decision that must be made is to determine whether to use the "lead agency" or "consensus model" to govern and guide the project.

The "lead agency" approach was used by Miami-Dade Transit. The initial investment in a fare collection system made by Miami-Dade Transit formed the backbone of a regional system that includes future interoperability with the other major transit operators. MDT consulted with and accepted input from the other potential transit partners in South Florida. However, final policy decisions are made exclusively by the Miami-Dade County Board of County Commissioners. WMATA used a similar model in its partnership with the Northern Virginia Transportation Commission (NVTC) for the SmarTrip regional fare collection system. Other operators serve only in an advisory capacity to the WMATA Board of Directors. The "lead agency" approach, sometimes referred to as the "efficiency model," is a more time-efficient approach due to its simplification of the decision making process.

The "consensus model" was used in the Central Puget Sound Regional Fare Coordination (RFC) project. The RFC involved seven agencies (six transit systems and a ferry system) that agreed upon a standard fare card, coordinated the associated business and operational processes, provided centralized financial functions, and managed the contractor providing system installation and support. The "consensus model" was selected because the smaller partners did not want the larger agencies to dominate the process and decision making. This approach provides equal representation and requires frequent meetings, strong communication, and a more time-consuming process necessary to reach consensus on all major issues related to the ORCA system.

Agreements

At project initiation, formalized agreements between participating agencies and partners must be developed and ratified. These will provide the structure to guide the process, develop consensus, make implementation decisions, and detail the roles of all partners.

In the "Regional Payment Systems Partnership Action Plan" developed by the Volpe National Transportation Systems Center for the Virginia Department of Transportation (VDOT) and the Northern Virginia Transportation Commission (NVTC), it recommended that a formal organization for regional projects be established or an existing organization designated. It recommended the development of a formal agreement that included the following fundamentals:

- Establishing a policy group to set policies and specific objectives;
- Creating and empowering one or more technical committees to develop detailed operating and technology standards;
- Detailing a mechanism for determining funding shares and requirements; and
- Obtaining technical expertise and resources for project development, design, and implementation.

The NVTC's "Project Report, SmarTrip Regional Rollout" included three major recommendations for successful coordination and implementation of regional fare collection systems. The recommendations include:

- Recognizing that smaller transit agencies may not have the necessary resources (i.e., financial, staffing, and expertise);
- Recognizing that total independence is not possible when multiple transit agencies participate; and

- Taking advantage of the strengths of each transit system, especially those of the large, regional partners.

One example of successful coordination and use of agency resources as recommended in the NVTC report was the support provided by King County Metro to its partner agencies in Central Puget Sound. Due to its complexity, there were significant legal challenges to overcome during implementation of the One Regional Card for All (ORCA) system. During development, King County Metro (KCM) provided legal support through the King County Prosecuting Attorney's office, which would have been difficult for some of the other smaller partner agencies to provide at a level that would be necessary without KCM's support.

In San Luis Obispo County, California, the San Luis Obispo Council of Governments took the lead on commissioning a fare policy study and subsequently a regional revenue-sharing agreement that likely would have been too costly and burdensome for any of the regions small operators to undertake independently.

Financial Issues

For a regional fare policy or integrated fare system, several financial issues must be addressed and agreed upon prior to implementation. These include:

- Developing a coordinated fare structure, if possible;
- Determining funding splits for any capital, implementation, and operating expenses;
- Establishing roles, responsibilities, and costs for ongoing operations;
- Establishing clearinghouse responsibilities and roles, as appropriate; and
- Determining revenue controls and shares.

■ 4.5 IMPLEMENTATION OF A REGIONAL FARE COLLECTION SYSTEM

Incremental Steps

As detailed in the U.S Department of Transportation's Research and Innovative Technology Administration (RITA) lessons learned on the Central Puget Sound Regional Fare Coordination project, consideration should be given to implementation of a limited deployment fare pass before implementing a regionwide fare card system as was done with the precursors to ORCA - the U-Pass, Flex-Pass, and Puget Pass. This may help agencies identify and resolve potential problems or obstacles prior to full implementation. Individuals involved in these precursor programs brought valuable expertise to the management and governance of the ORCA system. In San Luis Obispo County, the adoption of a regional day pass, regional monthly pass, and revenue allocation formula should facilitate future migration to a smart card based system. In both cases, customers and transit operators already have overcome many of the basic obstacles associated with adoption of integrated fare collection systems.

Technology

One of the major decisions in the implementation of a regional fare project is the selection of the technology to be used. Among the factors that must be considered are the impacts of existing technology investments to determine what legacy equipment and technology can be

used. This needs to be done early in the project's development since it will define the associated financial requirements.

The recent adoption of industry standards has simplified, to some degree, the selection of appropriate technology for regional fare systems. In the past, agencies deploying smart cards were heavily reliant on proprietary technology. By using the new standards, agencies can expect to achieve much higher levels of system interoperability using commercially-available products that will result in cost efficiencies and the potential for new partnerships. Other factors that will help drive the selection of technology include addressing fare and data security and identifying integration with other technologies such as automatic passenger counters and global position systems.

Project Management and Schedule

It is important to provide strong and consistent project management for the project, including the management of all contractors and vendors. One of the insights offered by RITA in the Central Puget Sound project was the recommendation to assign a full time Site Manager with the requisite project management and substantive skills and experience, whose sole responsibility was managing program implementation. Strong project management provides oversight and guidance to gain efficiency and coordination among all tasks and work groups.

Regional fare collection systems are very technically, procedurally, and organizationally complex. The necessary staffing levels should not be underestimated. The Puget Sound RFC partner agencies said they had difficulty getting the best-qualified staff to work on the RFC project because staff members were assigned to other work, there was a lack of budget to support additional staffing, or the needed skills were difficult to find in the agency. Also, a significant time burden was added to the normal workload of subject area experts within the agencies to review documents, attend meetings, and prepare their agencies for the new systems. Some Puget Sound agency managers said they were concerned that the intense day-to-day pressure of schedule and issue resolution was precluding opportunities to give adequate attention to future-oriented visionary thinking about the project and its implications for both the region and the individual agencies. Regional fare card programs require the guidance afforded by a long-term vision of how the program fits into a regional strategy.

Many of the regional fare systems examined for this project revealed unanticipated complexity and schedule issues. Whether using the "lead agency" or "consensus-based" model, agencies need to account for the large amount of time related to contract negotiations, change orders, vendor document review, and equipment testing and modifications, to name a few. For example, the initial order of smart cards for PATCO's FREEDOM Card system was found to be faulty. What many would consider a relatively routine purchase, the unexpected situation resulted in a 10-week schedule delay. SEPTA has also experienced unanticipated delays in its fare collection system procurement, postponing proposal submission deadlines on several occasions to allow more time to respond to vendor requests for additional information and clarification. As a result, contract award is scheduled nearly a year later than originally planned.

During the project deployment phase of the ORCA project, the following recommendations were offered:

- Develop realistic deployment schedules.
- Expect and plan for delays.
- Do testing and more testing.
- Do limited deployment – start small and build upon success and lessons learned.
- Be flexible and willing to make changes during the development of a regional fare project, as it is impossible to anticipate all the issues and challenges that will arise.
- Do not overestimate agency technical knowledge or resources – especially for the smaller transit agencies.
- Account for complexity of transit operations (various operating units, time of day, operational needs, etc.).

Involvement of Constituents

The human factor must not be forgotten in the implementation process. Early involvement of agency staff will help identify desires and needs, as well as provide an opportunity for buy-in at all levels of the participating agencies, including policy makers, administration, operators, and maintenance.

Training is an essential component of the deployment phase. Sufficient pre-deployment training must occur to ensure a successful deployment. Training must be early, ongoing, and timely. Training must go beyond the operator-passenger interface and also address the internal operations of administration and maintenance personnel. Miami-Dade Transit noted that its decision to have nearly the entire staff perform station service duties during their soft launch, and ground breaking and for several weeks after system deployment was extremely beneficial. It required all staff to become educated and acquainted with the new system's functionality and features, and the staff's high visibility made a statement to the public regarding the agency's commitment to a successful launch and focus on customer service.

A comprehensive and effective marketing strategy is critical to the successful deployment of the new fare system. In addition to more traditional advertising and promotional opportunities, PATCO, for example, developed an effective partnership with a large number of retail establishments (FREEDOM to save) that enhanced the visibility of the new program, leading to broader acceptance of the FREEDOM Card system through the added value of merchant discounts.

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