Ventura County Fare Integration

A Case Study

PB2002-103226

Promoting Seamless Regional Fare Coordination

REPRODUCED BY:
U.S. Department of Commerce
National Technical Information Service
Springfield, Virginia 22161
NTIS

September 2001

Foreword

Dear Reader,

We have scanned the country and brought together the collective wisdom and expertise of transportation experts implementing Intelligent Transportation Systems (ITS) projects across the United States. This information will prove helpful as you set out to plan, design, and deploy ITS in your communities.

This document is one in a series of products designed to help you provide ITS solutions that meet your local and regional transportation needs. The series contains a variety of formats to communicate with people at various levels within your organization and among your community stakeholders:

- **Benefits Brochures** let experienced community leaders explain in their own words how specific ITS technologies have benefited their areas;
- **Cross-cutting studies** examine various ITS approaches that can be taken to meet your community's goals;
- **Case Studies** provide in-depth coverage of specific approaches taken in real-life communities across the United States; and
- **Implementation Guides** serve as "how to" manuals to assist your project staff in the technical details of implementing ITS.

ITS has matured to the point that you are not alone as you move toward deployment. We have gained experience and are committed to providing our state and local partners with the knowledge they need to lead their communities into the next century.

The inside back cover contains details on the documents in this series, as well as sources to obtain additional information. We hope you find these documents useful tools for making important transportation infrastructure decisions.

Christine M. Johnson
Program Manager, Operations
Director, ITS Joint Program Office
Federal Highway Administration

Edward L. Thomas
Associate Administrator for Research,
Demonstration and Innovation
Federal Transit Administration

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Preface

This case study details the approach taken in one specific region to plan, operate, and maintain a multi-agency, transit fare collection payment system demonstration utilizing smart card technology and other ITS technologies. As these types of multi-agency programs continue to be designed and implemented, innovative approaches to managing and acquiring systems continue to evolve. The study also documents some of the demonstration's lessons learned as well as the emergence of other regional smart card activities, including the opportunity for Ventura County to link with other southern California smart card initiatives.

The case study presents issues from a project where things didn't go as expected. The document addresses difficult issues that may be encountered when a joint interjurisdictional project is attempted. It was written with the belief that we are all better off in an environment where open discussion is nurtured, and that we can learn from the "don't" as much as from the "do". It was not the intent of the authors to find or place blame, and the reader would be making an error in attempting to interpret who might be considered at fault. While this may leave the reader with some unanswered questions, it is felt that these unanswered questions are an acceptable price for a discussion of the most significant issues. The reader should also keep in mind that despite the issues encountered, the transit agencies involved are today even more committed to the creation of an integrated fare system. From this we conclude that, while there were problems with implementation, the concept of integrated transportation payment was proven to be a success.

It should also be recognized that the project was begun during the early stages of the National ITS Program when understanding of the framework necessary for integration was very limited.

The authors would like to thank the Ventura County Transportation Commission and all those who participated in the Ventura County "Smart Passport" demonstration project for sharing their experiences and insights.

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Executive Summary

An automated transit fare collection system using smart card technology was field tested during the multi-agency "Smart Passport" demonstration project in Ventura County, California between January 1996 and October 1999. The fare collection system integrated several Intelligent Transportation Systems (ITS) technologies—automatic passenger counters, automatic vehicle location systems based on Global Positioning System technology, and contactless smart card technology—and was applied to seven bus transit systems simultaneously. Transit patrons had the option to use the Smart Passport fare card as a prepaid pass or as a "stored value" debit card that deducted the fare of each trip from a prepaid amount. When using the prepaid pass, passengers were able to ride on any of the seven systems and transfer between systems at no extra charge.

The fare collection system, the Fare Transaction and Vehicle Monitoring System, was developed by Echelon Industries using Small Business Innovation Research (SBIR) Program grants funded by the U.S. Department of Transportation Federal Transit Administration (FTA) and the California Department of Transportation (Caltrans), beginning in 1992. Echelon also used SBIR funds to finance the Smart Passport demonstration project, and served as the systems integrator. The intent of the project was to examine the interoperability of smart card technology among multiple transit operators using ITS technologies. FTA and Caltrans hoped to assess the feasibility of implementing a coordinated multi-agency fare collection system, and to gain insight into the functional requirements for implementing and operating such a system.

The Smart Passport project was coordinated by the Ventura County Transportation Commission (VCTC), a commission that operates two transit properties and is responsible for the allocation of transportation resources in Ventura County. VCTC's primary goal for the project was to create a seamless "universal ticket" for transit patrons to use on all of the county's transit systems. This goal relates to using the advanced fare payment system to encourage, accommodate, manage, and assess travel patterns of passengers between transit systems. Additionally, the participating transit agencies wanted to improve data collection and reporting processes. The reports generated from the improved data collection process could be used to analyze ridership demographics, fixed route schedule adherence, service route planning, and to identify new market segments.

The demonstration project ended in 1999 without Ventura County transit operators experiencing many of the program's anticipated benefits. The fare collection system was plagued by numerous operational and data processing problems, resulting in inconsistent data and infrequent reports. While the system performed well for some of the smaller transit operators, the system was never fully operational for the largest transit operator in the county, South Coast Area Transit, due to system reliability problems.

Despite these problems, the demonstration is considered a positive step forward in laying the foundation for regional, multi-agency coordination. The project introduced Ventura County's transit riders and the region's

transportation and non-transportation agencies to smart card technology. VCTC emerged as the champion for regional fare coordination and an advocate of smart card technology in Ventura County and throughout southern California. The Ventura County transit agencies are still committed to exploring new regional opportunities and partnerships, and intend to participate in a new program scheduled to begin in the summer of 2001. One participating operator stated, "I am looking forward to the new installation in July 2001. I think the new product will provide our transit agency with the planning tools we have been looking for."

Other transit and commuter rail agencies throughout southern California consider the demonstration project as a benchmark that serves as the nation's first test of a multi-agency fare collection system. Representatives from many of these agencies have been meeting regularly to discuss the lessons learned from this experience and to discuss plans for a coordinated regional smart card program extending from Santa Barbara to Tijuana, Mexico. The demonstration has also led to discussions of extending the program to non-transportation applications, including universities, regional parking facilities, corporate centers, resorts, and amusement parks. The Caltrans Mass Transportation Program recently developed an Electronic Fare Payment Web Site (www.dot.ca.gov/hq/MassTrans/mtpeps.html) to disseminate information about Electronic Payment Systems and other Advanced Transportation System Technologies. Caltrans stated that they are encouraged by the activities in Ventura County.

The Smart Passport project identified a set of issues that transportation planners and service providers need to examine before planning or implementing a coordinated multi-agency fare collection system. The lessons learned from Smart Passport will enable decision makers to understand the critical issues and potential benefits associated with such a system before investing in the technology, and will provide the basis for functional requirements for planners and service providers to use when designing and implementing such a system.

Many of these lessons will be incorporated into Ventura County's future program, as well as others in Southern California. Ventura County applied lessons learned in the drafting of a Request for Proposal for the new countywide system. In addition, VCTC is leading a more participatory, consensus-driven, process for implementing the new system in Ventura County (e.g., operators are jointly developing business rules to guide the new project and VCTC is meeting with each agency's chief mechanic to inspect and measure the vehicles and to discuss the program prior to equipment installation).

It is essential to note, however, that this "Smart Passport" case study demonstration illustrates one approach to managing a multi-agency fare collection system. There are numerous other approaches and business models that transportation agencies can and should consider when implementing smart card technology in their regions. A full discussion of the approaches, however, is outside the scope of this effort. Other

approaches may yield different outcomes and lessons learned. The significant lessons learned from the Smart Passport project are:

Institutional Needs

- Regional smart card programs need a champion.
- Staff resources and leadership capabilities need to be commensurate with the scope and complexity of the project, and need to be in place at the beginning of the project.
- Regular and open communication is needed among all stakeholders.
- The systems integrator needs to have a local presence.
- The participants should establish a pricing structure for the new fare media that makes them competitive with other available fare media.
- All staff need extensive and ongoing training.

Technical Requirements

- System performance requirements need to be established in conjunction with participating operators during the planning phase of the program and applied regularly to monitor performance.
- Minimum requirements for data collection processes need to be established in the planning phase of the program.
- Reporting requirements that define report formats and the reporting schedule need to be established.
- Clearinghouse and settlement responsibilities need to be designated in the planning phase of the program.

Customer Acceptance Techniques

- Implementation of new technology requires a comprehensive and effective marketing strategy using broadcast and print media.
- A program is needed that offers customers usage-based incentives and loyalties such as free transfers, fare discounts, and automatic replenishment.
- Formal and systematic surveys of and interviews with customers are needed to reliably assess customer satisfaction and to design strategies to improve satisfaction.

County, California from January 1996 until October 1999. This project field tested the Fare Transaction and Vehicle Monitoring System (FARETRANS VMS) developed by Echelon Industries using Small Business Innovation Research program grants funded by the U.S. Department of Transportation Federal Transit Administration and the California Department of Transportation. FARETRANS VMS uses automatic passenger counters, automatic vehicle location systems based on Global Positioning System technology, and contactless smart card technology called Smart Passport to pay fares and record ridership data. Transit patrons had the option to use the Smart Passport fare card as a prepaid pass (for a given ridership service for a given time period) or as a "stored value" debit card that deducted the fare of each trip from a prepaid amount chosen by the patron.

Project Scope and Purpose

The scope of the project was to install and integrate new fare collection system technology and supporting systems at several transit systems. The intent was to examine the interoperability of smart card technology among multiple transit operators using technologies—APCs, AVLs, and GPS—to increase operational efficiency for each of the transit providers. FTA and Caltrans hoped to assess the feasibility of implementing a coordinated multi-agency fare collection system, and to gain insight into the functional requirements for implementing and operating such a system. It must be emphasized that the approach used in this demonstration is just one of several approaches that can be considered to design, build, operate, and manage a new fare collection system. As programs continue to be designed and implemented, innovative approaches to managing and acquiring systems continue to evolve. A full discussion of approaches is outside the scope of this case study.

Ventura County (see Figure 1) was chosen, in part, for this demonstration because it is part of the greater metropolitan Los Angeles area, but is not encumbered by a heavily traveled transit system such as those that operate in the other four metropolitan Los Angeles counties. Unlike the other four counties, which have experienced significant growth, Ventura County remains sparsely populated and has

An automatic passenger counter is a transit technology that collects passenger boardings through either an infrared beam or a treadle mat. The Ventura County demonstration program used infrared beams.

Automatic vehicle location systems are computer-based vehicle tracking systems.

Global Positioning Systems are space-based radio positioning systems that provide position, velocity, and time data to ground receivers, allowing users to identify their geographic location.

A contactless card uses wireless communications to communicate with the card reading device and requires no contact between the card and reader.

Prepaid passes were issued for a given ridership service for a given period.

a population of only 750,000. The expectation was that it would be easier to install, operate, and test a new technology and troubleshoot problems in this environment, and then determine how a similar program could be tailored to meet the operational needs of larger, more urban transit systems.

Service Goals and Anticipated Benefits

The Smart Passport project was coordinated by the Ventura County Transportation Commission (VCTC), a commission that operates two transit properties and is responsible for the allocation of transportation resources in Ventura County. VCTC's primary goal for the project was to create a seamless "universal ticket" for all of the transit patrons to use on all of the county's transit systems. The benefits that VCTC hoped to derive from a multi-agency fare collection system included:

- Regional payment system coordination
- "Seamless" regional travel
- Enhanced passenger/user convenience
- The concept of "one account" or one payment device for regional transportation
- Cost sharing among partners.

VCTC's primary goal for the project was to create a seamless "universal ticket" for all of the transit patrons to use on all of the county's transit systems.

Additionally, the participating transit agencies wanted to improve data

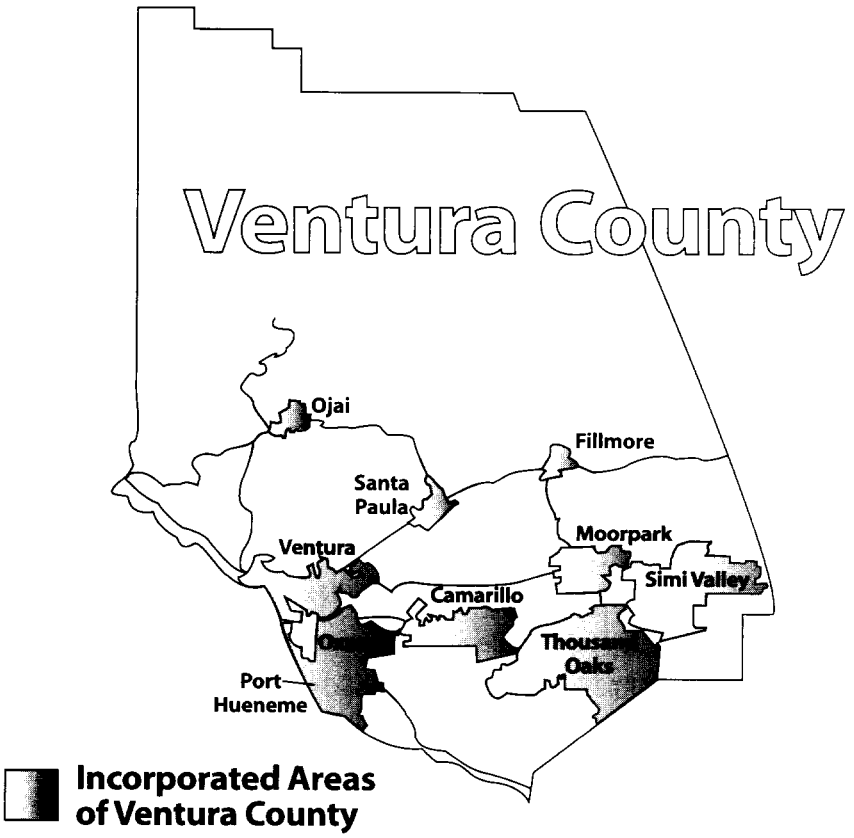

Figure 1. Map of Ventura County

collection and reporting processes, through the integration of APCs and an AVL system with the farebox. The integration of multiple ITS technologies could accommodate the seamless "universal ticket" and provide enhanced data collection capability to count passenger boardings and alightings, and track vehicle locations. In fact, several transit operators convinced their boards of directors to participate in the project by emphasizing the potential benefits to be gained from integrating ITS technologies. The deployment of these technologies would offer the participating agencies the opportunities to maximize operational efficiency by:

- Generating data and reports that decision makers, planners and schedulers could use to assess demand by route and stop and to modify headways and route schedules
- Satisfying the reporting requirements of the FTA's National Transit Database (Section 15).

Demonstration participants also expected that use of a smart card would provide an enhanced level of customer convenience and potentially increase ridership by enabling riders to transfer "seamlessly" from one system to another and by providing a stored-value feature that eliminates the need for exact change and value that can be easily reloaded at sales outlets and on the bus. This integrated ITS approach would provide regional coordination, data to evaluate further operational efficiencies, and an enhanced level of customer convenience.

Several transit operators convinced their boards of directors to participate in the project by emphasizing the potential benefits to be gained from integrating ITS technologies.

Scope of Document

This document is intended to serve as a case study of the complexity of issues that transit agency decision makers, revenue collection managers, and operations and maintenance personnel will need to address and resolve when they consider implementing smart card technology, as well as other ITS technologies, into their existing fare collection systems. This study provides information about Echelon and Ventura County's approach to the demonstration project. Different approaches (i.e., design-build-operate-maintain or use of a financial institution or other service provider as a third party) may overcome some of the challenges faced in Ventura County.

The remainder of this document describes the evolution of and technology used in this project, summarizes the results of the project and the benefits that have been realized, and discusses the lessons learned from the Ventura County demonstration that will serve as the basis for functional requirements for implementation of future multi-agency fare collection systems using smart card technology.

Project History and Implementation

The Smart Passport demonstration project was funded by the third SBIR grant received by Echelon to develop, test, and commercialize advanced fare payment technology. The first grant (Phase I funding) was issued in 1992 by FTA to analyze the feasibility of the technology. During Phase II, which was funded jointly by FTA and Caltrans in 1993, Echelon developed the fare collection equipment and field-tested several of the technologies on three commuter routes in Los Angeles County. Phase III was funded by Caltrans to develop a commercially viable product to meet a national transportation need and to conduct a demonstration project of that product. In the spring of 1994, Caltrans requested the Ventura County transit agencies to participate in the demonstration project under the leadership of VCTC. The agencies agreed to field test the operational feasibility of contactless smart card technology, using off-the-shelf components, in a variety of transit operations with minimal cost to the participating agencies.

Soon after the project began, VCTC realized that its staff was too small to manage the project and requested assistance. Caltrans subsequently provided funding for a project manager to oversee all aspects of the demonstration project, including coordinating and facilitating meetings of the operating committee, Caltrans, and other participating agencies. By January 1996, the system was developed, the equipment was installed on most buses and at bus maintenance yards, and several sales outlets were opened. The fare collection system was operational in March 1996. APCs were installed in the summer of 1996. Echelon produced the first complete set of quarterly reports in November 1996. The demonstration project ended in June 1997, but VCTC opted to keep the smart card system in operation. In July 1997, VCTC contracted with Echelon directly for the operation and maintenance of the Smart Passport system.

In the spring of 1999, VCTC and Echelon entered contract negotiations to upgrade the entire system. Unlike the original agreement, VCTC wished to include system and vendor performance criteria in the new contract (95% equipment up time and 98% data accuracy). Echelon was not willing to accept the system and performance criteria for a variety of reasons. First, Echelon could not accept performance criteria and associated penalties since VCTC was not able to ensure that buses would be made available on a timely basis for maintenance. Second, most of the FARETRANS VMS equipment was technologically obsolete (i.e., replacement parts were not available from the Original Equipment Manufacturers (OEMs). Echelon used only off-the-shelf equipment. However, after two to three years, the suppliers could not provide replacement parts that had not changed in some way. The technology was developing so quickly that various components were being made obsolete from month to month. Since no funding was made available to replace obsolete equipment, Echelon could not guarantee any performance standards. The project ended in October 1999 when Echelon withdrew from the project.

Participants

Eight transit operators agreed to participate in the demonstration project. The transit operators are listed in Table 1 in order of current size. The Ojai Trolley Service (Ojai) withdrew from the project shortly after it began. Ojai, a one-vehicle fixed route service charging 25 cents per ride, did not believe that its ridership and fare collection volume was significant enough for it to benefit from participation. The remaining seven transit operators ranged in fleet size from 43 vehicles to two vehicles. South Coast Area Transit (SCAT) has the largest fleet size and largest ridership in the county. Five of the transit operators provided local service and two provided intercity service. The transit operators offered fixed route and dial-a-ride (DAR) shuttle service. VCTC operates two of the transit services: Ventura Intercity Transit Authority (VISTA), which provides intercity fixed-route service, and Fillmore Area Transportation Corporation (FATCO), which provides local service and dial-a-ride shuttle service.

Cooperation among the seven transit systems was already underway when Ventura County was selected as the project site. The intercity bus system VISTA was in place, and a countywide flash-pass (Ventura County Passport) was being used. It was believed that Echelon's advanced technology would expedite VCTC's efforts to create an integrated, seamless transit system for Ventura County through a "universal ticket." VCTC signed a Memorandum of Understanding (MOU) with the participating transit agencies stating that VCTC would act as the lead agency for the demonstration. VCTC served as liaison between the local agencies, Caltrans, Echelon, and the project manager, and was solely responsible for the contractual and financial issues associated with the project.

Dial-a-ride service is curb-to-curb transportation service scheduled by reservation.

Flash passes are a form of transit pass that is visually verified.

Name	Fleet Size	Service Area
South Coast Area Transit (SCAT) 301 E. Third Street Oxnard, CA	43 vehicles	Cities of Port Hueneme, Oxnard, and Ventura, and portions of the unincorporated areas of the county
Ventura Intercity Transit Authority (VISTA) 950 County Square Drive #207 Ventura, CA	24 vehicles	Intercity, including portions of Los Angeles County
Simi Valley Transit 490 W. Los Angeles Simi Valley, CA	10 vehicles	City of Simi Valley
Thousand Oaks Transit 2100 E. Thousand Oaks Blvd. Thousand Oaks, CA	5 vehicles	City of Thousand Oaks
Camarillo Area Transit (CAT) 601 Carmen Drive Camarillo, CA	5 vehicles	City of Camarillo
Fillmore Area Transportation Corporation (FATCO) 1024 Ventura St., Central Avenue Fillmore, CA	3 vehicles	DAR shuttle service–Cities of Fillmore and Santa Paula
Moorpark Transit 799 Moorpark Ave.	2 vehicles	City of Moorpark
Ojai Trolley Service PO Box 1570 Ojai, CA	1 vehicle	City of Ojai

Table 1. Ventura County Transit Operators

System Components and Design

Echelon's goal was to develop a single system that integrated the system requirements requested by the transit operators. Echelon learned that integrating technologies into one system would be a more cost-effective approach.

During the third phase of the SBIR grant program, Echelon commercialized the FARETRANS VMS by integrating commercially available components that were believed to be easily maintained and replaced. Echelon's goal was to develop a single system that integrated the system requirements requested by the transit operators (i.e., advanced fare payment technology, APC, AVL, and GPS). Echelon learned, from the SBIR grant program Phases I and II, that integrating technologies into one system would be a more cost-effective approach.

The Smart Passport system tracked fare payments by fare category, (i.e., senior, disabled, and student) and by operator, route, and stop. Additionally, Echelon equipped approximately 20% of the region's bus fleet with an APC system to count all boardings and alightings by stop; GPS technology was also integrated within the Passport system. The reliability of Echelon's APC system is unknown. Echelon noted several challenges to collecting data (e.g., inability to access the vehicles, drivers not recording the route and run number, and not being informed by operators when the equipment was inoperative). The data VCTC was receiving from Echelon were substantially different from manual driver counts conducted by the transit operators. This disparity was never resolved.

The smart card component of the system uses contactless technology with the capability to store, transmit, and receive fare payment information using a built-in microprocessor and radio transmitter/receiver. The card is shown in Figure 2.

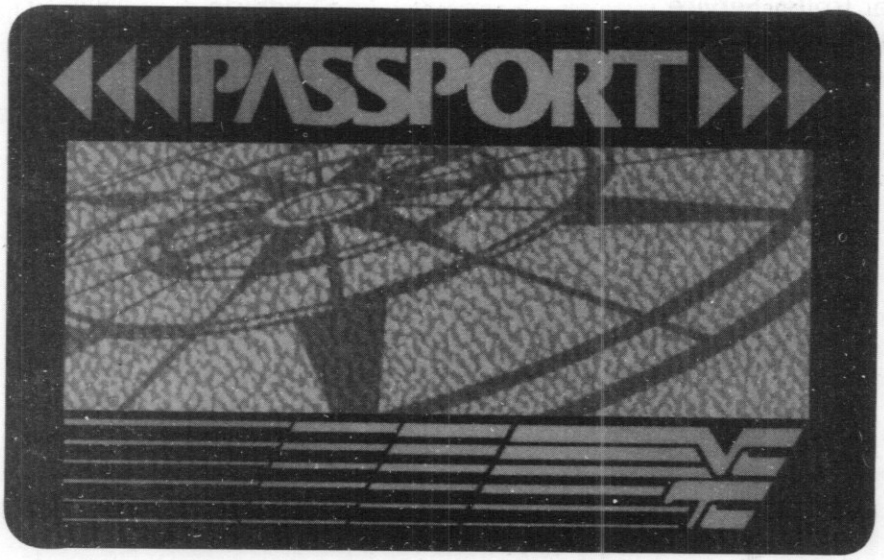

Figure 2. Passport Card

A spread-spectrum local area radio was installed on each bus for automated data upload and download. When customers used the stored value card, the system deducted the fare and stored the data in the on-board equipment. At the end of each day, the drivers drove past an electronic reader located in the garage facility, which communicated with the bus to download data. The stored data were automatically transferred from the bus via radio frequency communications to the garage host computer. The data from the seven garages' host computers were then uploaded to a central computer for processing, settlement, and reconciliation.

VCTC and the transit operators developed their business rules on an ad hoc basis as the project progressed through periodic meetings.

Administrative Support Functions

Several functions or services are required to administer a multi-agency smart card program in addition to those that are required for conventional automated fare collection systems. These include financial settlement (clearinghouse) and reporting, card management, network management, technical support and system maintenance, and customer support. These functions could be conducted by the transit operators, by the system provider, or by a third party. VCTC chose to perform many of these functions during the demonstration project largely because these functions and governance roles and responsibilities were not defined at the beginning of the project. VCTC and the transit operators developed their business rules on an ad hoc basis as the project progressed through periodic meetings.

Clearinghouse Provider

As the clearinghouse provider, VCTC was responsible for the collection, settlement, and reconciliation of transaction data; distribution and settlement of funds; and corresponding reporting functions. On a quarterly basis, each participating agency completed a reconciliation form, and sent payment to VCTC for all monthly passes, renewals, and debit card payments received. VCTC then drafted a quarterly payment schedule for the operators to compare and balance against their financial accounting records. After all parties approved the draft payment schedule, VCTC distributed funds to the operators.

Card Management

Customers did not pay a fee for purchasing their first smart card. There was, however, a $5 charge for replacing a lost card, to reflect the $5-to-$6 production cost of each card. Cards were issued at the participating transit agencies and at city hall offices. The participating agencies set no maximum limits on the stored value cards. Agencies reported that average balances were $10 to $15. Customers could renew their monthly passes and add value to their card at all sales outlets and on board all buses, except on the SCAT system. SCAT did not allow any on-board revaluing primarily because the operator believed the transaction time would increase the boarding time. VCTC accommodated SCAT on this issue as VCTC felt SCAT's participation in the demonstration was critical.

Distribution

Eight sales outlets were scattered across the county. The sales outlets included the participating transit agency offices and the city halls of Camarillo, Moorpark, Santa Paula, Simi Valley, and Thousand Oaks. Sales outlets did not receive a commission for sales. The transit agencies and city halls served as sales outlets to provide a convenient location for their transit customers. Each sales outlet was equipped with a computer with the FARETRANS VMS software allowing customers to buy and recharge cards. All other sales were by mail or telephone through VCTC. Every agency accepted checks and money orders; Camarillo also accepted cash. VCTC was the only agency that accepted credit card payments.

Customers did not pay a fee for purchasing their first smart card. There was, however, a $5 charge for replacing a lost card, to reflect the $5-to-$6 production cost of each card.

Results and Benefits

Numerous operational and data processing problems were associated with the FARETRANS VMS during the Smart Passport demonstration project. Consequently, the benefits cannot be quantified. Card users were allowed to ride at no charge when the system failed, and it failed frequently, resulting in inconsistent and infrequent reports. Thus, the system vendor was unable to provide reliable passenger counts by route and bus stop to the participating transit agencies. This was disappointing to the agencies, as their primary goal was to improve data collection and reporting processes.

However, the Smart Passport demonstration project produced numerous qualitative benefits. Despite the implementation and operational difficulties experienced with the system equipment, the demonstration project successfully introduced Ventura County's transit riders and the region's transportation and non-transportation agencies to smart card technology. Electronic Fare Payment has resulted in consideration of new business approaches to regional integration of transportation services. Electronic payment systems offer transportation planners and service providers greater flexibility in fare structures, less expense in revenue collection, and greater convenience for users and riders. The project received positive customer response, and it generated a great deal of interest and activity in the development and implementation of multi-agency electronic payment programs and other integrated transit technology applications.

An on-board survey conducted by VCTC on each of the VISTA bus lines revealed the attractiveness of the smart card to senior citizens, students, and low-income riders moving from welfare to work. Many of the users reported the card's stored-value feature was used as an effective budgeting tool, enabling them to secure access to the transportation services that they needed. Senior citizens also found the smart card's contactless feature provided them with a greater sense of comfort and safety because they could carry less cash. Several of the users surveyed expressed their satisfaction with the program and their support for its continuation.

Unfortunately, VISTA was the only agency that participated in VCTC's on-board surveys. However, in many respects, the sentiment expressed by a FATCO user sums up the experience of many of the senior citizens: "It's so easy to use the card . . . I thank God everyday for all you wonderful people at FATCO. Without the bus . . . I could not go anywhere."

This positive customer response has been accompanied by positive reaction from public and private sector decision-makers regarding implementation of smart card systems. Ventura County's transit operators are still committed to exploring new regional opportunities and partnerships, and intend to participate in the deployment of a new program by the summer of 2001. Other transit operators are considering a larger transit smart card initiative throughout southern California. The demonstration has also led to discussions of extending the program to

Here's What People Are Saying...

- *I know if I lose my card I can easily get a replacement. . . .*
- *Smart cards provide a means to budget enough money each month for transportation. . . .*
- *The typical monthly pass is too costly and exceeds my need since I do not take the bus every day. . . .*
- *Smart cards prevent the need for me to carry cash or dig through my pockets for a dollar every time I board a bus. . . .*
- *I'd rather give my kid a debit card like the smart card than cash.*

non-transportation applications, including universities, regional parking facilities, corporate centers, resorts, and amusement parks.

The demonstration project was not problem-free, but its purpose was not necessarily to perform without problems. Rather, it was to provide the transit industry with a greater appreciation of the depth of support needed for a regional effort, and to identify components of the system that require further development. Those requirements are discussed in Chapter 4 in terms of the lessons learned from the Smart Passport project. These lessons learned are now guiding the design of Ventura County's new smart card program for transit operations, and are guiding the discussions being held by planners and decision makers who are considering applications to other southern California transit operations and to non-transportation functions. Furthermore, Caltrans' Mass Transportation Program has recently launched an Electronic Fare Payment Web Site (www.dot.ca.gov/hq/MassTrans/mtpeps.html) to disseminate information, such as Ventura County's activities, about electronic payment systems and other advanced transportation system technologies.

New Ventura County Transit Program

VCTC formed a new committee to develop a Request for Proposals (RFP) for the continued development of electronic payment systems for transit operations in Ventura County. An RFP was issued in February 2000. It succinctly describes the Ventura County transit systems' experience with the Smart Passport card, and states the committee's intent to migrate to an "open" smart card system:

In an open system, there are multiple issuers and acquirers of cards that can be used to access services or to purchase products offered by multiple service providers.

> *VCTC is interested in receiving proposals for the deployment of a mature and fully functioning, stand-alone contactless smart card system for seamless travel across the six independent transit systems within Ventura County. The smart card system shall provide for the collection and distribution of financial and transit planning data by the incorporation and integration of GPS and APC systems.*

The RFP defines specific requirements for system components and supporting infrastructure, including smart card technology integration with on-board equipment, installation of point-of-sale reload infrastructure, maintenance facilities, maintenance and technical support, performance criteria, data collection and reporting processes, training, and clearinghouse and settlement functions. The requirements clearly reflect a greater public sector understanding of the complex technical, operational, and institutional issues associated with regional payment system programs.

A contract was awarded to Motorola in May 2000.

Regional Transportation Impacts

Based on the Smart Passport experience, transit operators in southern California are convinced that there are benefits to be realized and have been discussing electronic payment systems for the entire southern California region, from Santa Barbara to Tijuana, Mexico. The transit operators include Metrolink, Santa Barbara Metropolitan Transit District, Los Angeles County Metropolitan Transportation Authority, Orange County Transportation Authority, Omnitrans, Sunline Transit Agency, Riverside Transit Agency, North County Transit District, and Metropolitan Transit Development Board. These operators hold regularly scheduled discussions to share their experiences, concerns, and needs for migrating to smart card technologies. In addition, Caltrans and regional planning organizations, such as San Luis Obispo Council of Governments, San Diego Association of Governments, and Southern California Economic Partnership, have been involved in the discussions. VCTC continues to assert itself as a leader in the region by organizing meetings and raising critical issues such as the development of standards to ensure interoperability among fare collection systems being implemented by various transit operators in southern California. Most operators in southern California are including smart card technology as an option in the procurement of future fare collection equipment. Furthermore, operators in the region are considering a multi-use smart card for other applications such as paratransit, parking facilities, universities, employers, and resorts.

New Partnership Opportunities

VCTC also expects to expand the new fare collection system to "non-transportation" uses, namely a transit-university partnership. California State University Channel Islands (CSUCI), located in Camarillo, Ventura County, is the newest California State University campus. CSUCI serves primarily commuting students who are enrolled in night courses. Its student population is expected to increase rapidly over the next five years as CSUCI develops its academic programs and begins to accept traditional four-year students. Access to transit is important to university students and staff. Furthermore, CSUCI administrators are committed to establishing the university as a "green" campus, discouraging automobile use on campus by limiting parking access and promoting public transit use. A transit-university partnership in Ventura County

offers an opportunity for transit providers to increase ridership and enhance their relationships within the community.

University officials and county transit personnel have already begun preliminary discussions to define potential features of the system. The proposed partnership would use a two-card system: campus-issued and transit-issued. Applications for the CSUCI student card are planned to include a parking application, electric bicycle application, and campus bookstore purchases through a stored-value card. All campus cards will be issued by CSUCI and may be used on all buses in the county. VCTC-issued smart cards may be used only on the buses and may not be used for campus services. There will be a firewall between the activities, and CSUCI will act as the clearinghouse for its data. Establishment of the partnership will require lengthy discussions to develop detailed agreements that address policy and business rules, technical requirements, administrative support functions, and customer-related functions.

Lessons Learned

The details of the Smart Passport demonstration project are best conveyed in the context of lessons learned from Ventura County's approach. Many of the lessons learned are associated with the institutional, technical, and operational (or customer acceptance) issues associated with implementing any type of multi-agency smart card program. Integrating smart card technology into an existing fare collection system is a complex endeavor requiring fundamental changes in the way transit agencies operate. The participants in this project did not anticipate the institutional complexity of operating a multi-agency fare collection system. Consequently, the operators faced significant institutional and technological challenges. Tremendous perseverance and patience enabled the demonstration project to continue as the partners realized that the project scope was much larger than the capability of the systems integrator and the agency staff. The partners made changes throughout the project to address and resolve emerging issues. Everyone involved gleaned valuable lessons that will make future multi-agency smart card programs a success.

Integrating smart card technology into an existing fare collection system is a complex endeavor requiring fundamental changes in the way transit agencies operate.

These lessons will enable decision makers to understand the critical issues and potential benefits to be derived from the implementation of multi-purpose electronic payment programs before investing in this technology. They will also provide the basis for functional requirements for transportation planners and service providers to use when planning or implementing a coordinated multi-agency fare collection system. While the project experienced operational and data processing problems, the valuable lessons learned from the demonstration's shortfalls are invaluable to any type of technology project.

It is essential to note, however, that this demonstration project used one of numerous business models for establishing a multi-agency fare collection system. VCTC performed the financial settlements, card management, and customer support. Echelon was responsible for reporting, network management, technical support, and system maintenance. Other models may have yielded different outcomes and lessons learned. The following sections discuss several lessons learned from the Smart Passport demonstration project, in three areas:

- Institutional Needs
- Technical Requirements
- Customer Acceptance Techniques.

Each "lesson learned" discussion summarizes the problem encountered during the demonstration project and its implications and resolution, and presents either solutions that have already been adopted for the new Ventura County program or instructions or options for applying the Smart Passport experience to future programs.

Institutional Needs

Lessons Learned:

- *Regional smart card programs need a champion.*
- *Staff resources and leadership capabilities need to be commensurate with the scope and complexity of the project, and need to be in place at the beginning of the project.*
- *Regular and open communication is needed among all stakeholders.*
- *The systems integrator needs to have a local presence.*
- *The participants should establish a pricing structure for the new fare media that makes them competitive with other available fare media.*
- *All staff need extensive and on going training.*

The participants in the Smart Passport project identified six institutional issues arising from their experience in planning, implementing, operating, and maintaining a coordinated multi-agency fare collection system. Needs have been extrapolated to address each of those issues in future programs:

- A regional champion
- Sufficient staff resources and leadership
- Regular, open communication among all stakeholders
- Local presence of the systems integrator/vendor
- A competitive pricing structure
- A comprehensive training program.

Lesson Learned: Regional smart card programs need a champion.

The Smart Passport demonstration project was a risky endeavor for the participating transit operators. The project required agencies to work with or around employees who were resistant to change and reluctant to work with other public-private sector organizations.

VCTC and its board of directors successfully championed the demonstration project. They gained the support of the participating agencies by communicating their belief that the suite of technologies being offered had a proven performance record and would produce reliable ridership information. VCTC lobbied operators to participate in the demonstration by assuring operators that their agency would bear none of the costs, would receive adequate technical support to install and maintain the equipment, and would derive benefits from lower operating costs and improved service. As the participants accepted the new system, VCTC moved from the role of champion to facilitator by establishing a working group that met monthly to address and resolve policy and technical issues.

By the end of the project, the transit operators had overcome many challenges and reached a high level of institutional coordination, under the leadership of VCTC. The participating operators worked collaboratively to test a new system and supporting technology. Transit representatives were able to persuade management at all levels of the organizations to support the program. Moreover, VCTC led the effort to re-engineer many operational and business processes that required a higher level of cross-departmental cooperation, including agreeing on financial reciprocity among participants and accommodating multiple fare policies and service requirements.

Despite the numerous system reliability problems faced during the demonstration and the eventual premature dissolution of the project in 1999, VCTC's commitment to smart card technology has led to a commitment by the same agencies to deploy a new system in 2001 and to

serious discussions about development of similar programs by commuter rail and transit operators throughout southern California. VCTC has continuously promoted the anticipated benefits of a well developed smart card system, and has actively encouraged operating agencies outside of the county to consider formation of a program.

Thus, a lead organization, with a strong commitment similar to that of VCTC, is needed to:

- Articulate the vision, goals, and objectives of the region
- Gain support from decision makers at the national, regional, and local levels
- Emphasize the need for a significant public education campaign
- Secure funding for program capital and operating costs
- Establish and enforce day-to-day management controls
- Develop strict system performance measures for participating agencies, system vendors, and integrators.

VCTC led the effort to re-engineer many operational and business processes that required a higher level of cross-departmental cooperation.

Lesson Learned: Staff resources and leadership capabilities need to be commensurate with the scope and complexity of the project, and need to be in place at the beginning of the project.

Smart Passport did not have sufficient staff to manage the project. No consideration was given to hiring a project manager, data processor, or transactions specialist in the project-planning phase. As the project progressed, the participants quickly realized that VCTC could not manage the project with its existing staff. Caltrans hired a consultant shortly thereafter, but the participants were never fully satisfied with the consultant's work. The consultant's contract was eventually terminated, and the demonstration continued without a project manager. Furthermore, according to Echelon, the participating operators did not fully grasp Echelon's need for access to the vehicles for maintenance and collection of data.

The introduction of new technology requires an understanding of the scope and complexity of the project in the planning phase and a commitment by all the participants to provide sufficient staff to support that scope and complexity. As smart card technology projects progress from system design and development to beta-testing and implementation, operating and maintenance agencies will have diverse staffing requirements. The types of staff expertise needed will also vary based on the type of business model (e.g., design-build-operate-maintain) selected for the project. Figure 4 identifies the staffing requirements necessary to support smart card projects when one of the agencies, such as VCTC in the Smart Passport project, performs the role of clearinghouse (which is discussed as a technical requirement in Section 2-6).

A multi-agency fare collection system needs a project manager and a data management specialist.

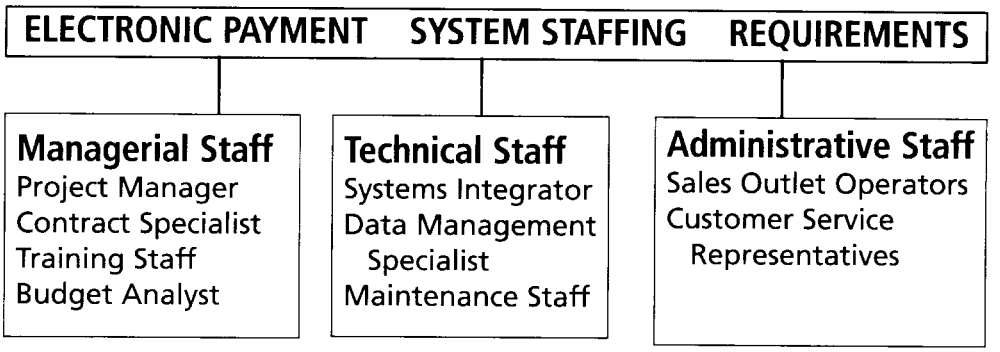

Figure 3. Smart Passport Staffing Requirements

Each of these roles contributes significantly to the success of the project. One of the critical lessons learned from Smart Passport is that a multi-agency fare collection system needs a project manager and a data management specialist.

The project manager must ensure that the desired level of communication, coordination, and performance is achieved. The project manager must work proactively with each of the participating agencies, and act as an ombudsman with the systems integrator/vendor to troubleshoot and resolve problems as they arise. It is also easier to maintain cost and budget control if the vendor and systems integrator interface with a project manager as the single point of contact through which instructions and information flow.

A data management specialist is required when an operating agency is serving as the clearinghouse provider because of the tremendous amount of data. The responsibilities include data collection, settlement, and reconciliation of transactional data and the corresponding reporting functions. During the Smart Passport demonstration, the data management specialist, who was VCTC's accountant, also distributed funds to the participating operators. It is unlikely that a data management specialist would normally perform the distribution of funds function.

It is also essential that all participating agencies understand the inherent challenges and opportunities associated with the introduction of new technology. Agency management should provide strong leadership to its staff, and emphasize that the success of the project is an agency-wide priority.

Lesson Learned: Regular and open communication is needed among all stakeholders.

Throughout the demonstration, revenue sharing and system reliability issues demanded considerable attention. Communication between Echelon, the project manager, and some of the participating transit operators was poor. Most communication between Echelon and the participants was through VCTC. Some transit operators perceived this role

as giving too much power to VCTC, and viewed Echelon as VCTC's agent —a perception that eventually degraded Echelon's relationships with the operators.

VCTC attempted to restore good relationships by hosting monthly meetings with the operators' administrative staffs, to improve coordination and communication among the participants. However, full trust between Echelon and some of the participating transit agencies was never restored.

It is essential to identify all stakeholders at the onset of a program, and ensure continual open communication between all of them. Stakeholders can include, but are not limited to, participating operators, the vendor, the clearinghouse provider or other service providers, and the project manager. Open communication between maintenance staff and the vendor is critical to building trust and maintenance staff acceptance of the technology. Technical and operational committees can facilitate coordination among them by providing a forum for them to identify, address, and resolve issues.

It is essential to identify all stakeholders at the onset of a program, and ensure continual open communication between all of them.

Lesson Learned: The systems integrator needs to have a local presence.

The systems integrator (Echelon) for this project was located approximately 100 miles from the demonstration site. The operators reported that they felt the systems integrator was not able to respond quickly to agency needs and emergencies. Additionally, operators reported that the systems integrator scheduled too many appointments during scheduled site visits, and therefore could not sufficiently address and resolve the operator's problems. Moreover, the operators reported that the systems integrator often did not carry the necessary equipment to perform the repairs. Many times the integrator would travel back to the office to find the proper equipment. Consequently, operators became frustrated with the inability of the integrator to provide timely maintenance and technical support.

The systems integrator must have a local presence to effectively service the transit operators. Excessive maintenance response time can negate any potential benefits to be derived from the smart card program. The systems integrator should have an inventory of replacement parts, which are available nearby on a just-in-time basis. It is essential that these expectations be clearly defined in the procurement and reiterated as the project is launched.

The systems integrator must have a local presence to effectively service the transit operators.

Lesson Learned: The participants should establish a pricing structure for the new fare media that makes them competitive with other available fare media.

During the Smart Passport program, each transit agency continued to set its own fare policy while offering both the existing monthly pass and the

New fare media programs must be competitive with existing pass programs to attract enough of the transit population to make the program viable.

stored value Smart Passport passes. Unfortunately, SCAT would not consent to lowering the price of the monthly Passport, making the SCAT pass more competitive. (Table 2 compares the Smart Passport prices with SCAT pass prices.) Thus, customers who traveled on SCAT lines had little incentive to purchase the Smart Passport, other than its stored-value feature. Although VCTC wanted fare parity, it was more important to secure SCAT's participation in the program.

Type of Customer	Passport	SCAT
Fixed Route		
Adults	$40	$30
Students	$30	$24
Seniors and Disabled	$20	$12
Dial-a-Ride (Passport only)		
All customers	$16	N/A

Table 2. Monthly Pass Prices

New fare media programs must be competitive with existing pass programs to attract enough of the transit population to make the program viable. Therefore, the participating agencies should establish a competitive pricing structure for the multi-agency program.

Lesson Learned: All staff need extensive and ongoing training.

Before the demonstration began, Echelon and VCTC staff visited each operator's site, to determine the locations for computers in maintenance garages, to identify the need for supporting systems components and infrastructure, and to explain the system to operations and maintenance staff. The operators reported that the time allotted to conduct the site visits was not sufficient to provide comprehensive training. Moreover, other staff involved in the project received little or no training. For example, Echelon developed "self-explanatory" software for use by the sales outlet staff. Unfortunately, many of the sales staff had limited computer skills, and the software proved to be too complicated for them to use. Additionally, drivers were not trained sufficiently to be fully committed to the project. Consequently, drivers often failed to enter the on-board information needed to provide accurate data, as well as inform management when system equipment was inoperative. Echelon reported that, in some cases, transit agency management limited their ability to properly train staff, such as restricting direct contact with staff and not allocating sufficient time for training.

Training is the mechanism that develops in-house expertise and is, therefore, critical to the overall success of the project. Management needs to be actively engaged and supportive of training efforts at the beginning of the project as well as throughout the life cycle of the program.

Technical Requirements

As previously mentioned, the transit operators participated in the demonstration project primarily to obtain better transit data. They faced many technical challenges in achieving this goal. The following technical requirements can be extrapolated from lessons learned during the project:

- System performance standards and monitoring
- Minimum standards for data collection
- A standard reporting format
- Designated clearinghouse and settlement responsibilities.

Lessons Learned:

- *System performance requirements need to be established in conjunction with participating operators during the planning phase of the program and applied regularly to monitor performance.*
- *Minimum requirements for data collection processes need to be established in the planning phase of the program.*
- *Reporting requirements that define report formats and the reporting schedule must be established.*
- *Clearinghouse and settlement responsibilities need to be specifically designated in the planning phase of the program.*

Lesson Learned: System performance requirements need to be established in conjunction with participating operators during the planning phase of the program and applied regularly to monitor performance.

The Smart Passport project required integration of new hardware and software that would enable the processing and collection of passenger data by each transit operator. The project also required a higher level of integration that would facilitate aggregation of the data to a central depository. It is unclear whether VCTC and the participating operators understood the complexity involved in integrating the equipment and systems at the beginning of the project. However, by the completion of the project, the participants began to understand the importance of working with Echelon to resolve system integration issues. The participants also recognized the importance of using commercial off-the-shelf components, maintaining a local inventory of replacement parts, and ensuring that the information technology needed to support their offices and maintenance facilities was completed installed.

One of the most critical lessons learned during Smart Passport was that newly introduced technology is judged on its ability to work with and enhance the performance of the existing system, regardless of the technology's performance in a stand-alone environment. Successfully introducing a technology when reengineering an existing system is difficult at best. This task was complicated further by a requirement to introduce the technology simultaneously into several proprietary systems, with the expectation that the same results will be achieved in each system.

Newly introduced technology is judged on its ability to work with and enhance the performance of the existing system.

System performance criteria and measures of those criteria need to be defined by the agencies in the planning phase of a program. These system performance requirements must be clearly articulated to the systems integrator/vendor to ensure a specified level of system reliability. For example, a transit agency can establish equipment "up-time" and data reliability performance measures that require the equipment to be operating at least 98% of the time and data generated by the smart card to be 95% accurate. Performance measures are an agency's tool for establishing acceptable levels of performance and monitoring the performance of a system. Additionally, the systems integrator/vendor should articulate to the agency the need for access to equipment and other system components to perform scheduled maintenance and repairs.

Criteria	Measures
Equipment "Up-Time"	With the transit operators performing recommended maintenance, all equipment and components of the system shall be fully functional a minimum of 98% of the operating hours of the system exclusive of failure caused by (a) vandalism, abuse, or neglect, or (b) vehicle accidents.
Data Reliability – Smart Card	Data generated by the smart card portion of the system, including, but not limited to, card initialization, card valuing/revaluing, on-bus transactions, transaction location, all operator route/run data, and time and day stamp shall be accurate a minimum of 95% of actual occurrences.
Data Reliability – Automatic Passenger Counter	Data generated by the APCs, including, but not limited to, boardings and alighting by stop location, time of day, and operator route/run, shall be accurate a minimum of 90% of actual occurrences.
Data Reliability – Reports	Software used for the generating reports shall be 100% accurate in its use of the data generated by the overall system exclusive of operator error.

Table 3. VCTC System Performance Criteria and Measures

As VCTC moves forward towards implementation of a new program, performance measures will be established and applied so that the contractor's performance can be assessed and the system's performance can be monitored. Examples of performance criteria and measures that VCTC has developed and plans to implement are listed in Table 3.

Lesson Learned: Minimum requirements for data collection processes need to be established in the planning phase of the program.

Reports generated from the Passport system were first received and analyzed in June 1996. The operators reported significant data discrepancies and inaccuracies in the reports. As a result, the information could not be used to evaluate ridership and system performance. Frequent operational and data processing problems contributed to the discrepancies and inaccuracies.

Echelon reported that it is essential to the success of a project that specific performance measures for data collection be articulated to all parties from the outset of the project. The performance criteria and measures that are currently being specified for the new system and program are expected to ensure better data collection processes and more accurate data. These performance measures need to be sufficiently detailed to capture the causal problem. For example, if the on-board system is working, but the card is defective, did the system fail?

Lesson Learned: Reporting requirements that define report formats and the reporting schedule must be established.

The operators stated that, in addition to the data discrepancies and inaccuracies, the reports produced by Echelon were too voluminous, too technical, and too infrequent. Delivery of the reports was a contentious issue between Echelon and the operators. The operators reported that it took Echelon several months to satisfy their requests for specific data. Echelon stated that there was a transmission lag between when the reports were sent to VCTC and when VCTC sent them to the operators. Poor communication between Echelon and the transit operators in defining specific reporting requirements contributed to the problems. As the project progressed, however, the operators began articulating specific data reporting requirements to Echelon, and VCTC began working with Echelon to design the appropriate report formats (e.g., card sales/renewals and distribution reports). As this process evolved, the transit operators gained a better understanding of their agency's specific reporting requirements and the importance of defining the requirements early in the project.

One method for ensuring substantive reports is to involve the transit agencies in designing the report formats during the planning phase of the program. In planning for the new system and program, VCTC has identified the need for the following reports: sales and revenue, bus

One method for ensuring substantive reports is to involve the transit agencies in designing the report formats during the planning phase of the program.

An alternative approach is to outsource transaction reconciliation and revenue distribution to a financial institution or third-party provider.

system performance, and National Transit Database (Section 15). Sales and revenue reports need to calibrate fare card sales and on-bus fare card usage for all sales outlets and agencies. Bus system performance reports must include average daily passenger boarding and alightings by stop, route load profiles, and ridership summaries. As a result of its experience with Smart Passport, VCTC now better understands that frequent (i.e., monthly and quarterly) reports are critical for revenue sharing and passenger data collection, and plans to require the new systems integrator/vendor to produce these reports.

Lesson Learned: Clearinghouse and settlement responsibilities need to be specifically designated in the planning phase of the program.

Clearinghouse and settlement functions were not included in the initial demonstration project design. After the project began, VCTC established various financial procedures, and assumed the role of clearinghouse. VCTC's financial officer was assigned to manage these tasks in addition to other responsibilities at VCTC.

Although VCTC was very conscientious in trying to perform the clearinghouse role, frequent system failures and the lack of regular reports hindered its efforts. Additionally, because there was no capability to download information into pre-defined databases or spreadsheets, VCTC's controller was unable to perform the required financial analysis. Consequently, VCTC and the participating operators agreed to calculate and then redistribute each agency's share of the revenue based on a market share formula.

The clearinghouse provides the means to reconcile transactions and distribute revenues to each participating operator. This is a complex task for any organization to administer. An alternative approach is to outsource this role (transaction reconciliation and revenue distribution) to a financial institution or third-party provider that has transaction settlement processing as a core competency. Regardless of the approach chosen, however, the role should be clearly designated early in the program.

Customer Acceptance Techniques

Three techniques for gaining customer acceptance were identified during the Smart Passport project:

- A comprehensive marketing strategy using broadcast and print media
- An incentive program
- Formal and systematic assessment of customer interest and acceptance.

Lesson Learned: Implementation of new technology requires a comprehensive and effective marketing strategy using broadcast and print media.

VCTC and the other transit agencies recognized the importance of developing an effective marketing strategy to promote Smart Passport. At the start of the project, advertisements were aired on three local radio stations in both English and Spanish. The participating agencies printed flyers and advertisements in local newspapers, and offered information and applications on the VCTC website. The participants reported that the radio advertisements were the most cost-effective mechanism used. Unfortunately, project delays negated much of the positive reaction to the marketing effort. As system reliability issues became widespread, VCTC discontinued the marketing campaign.

VCTC and the other transit agencies recognized the importance of developing an effective marketing strategy to promote Smart Passport.

As with any new product introduction, market penetration for new fare media depends on the operators' ability to promote the product's attributes. Operators need to differentiate the benefits of the new fare media from other available fare media and to publicize the advantages, as customers may already have had experience using a product (such as a monthly pass) that in their mind is satisfactory. Smart cards combined with APC and AVL offer an opportunity for the transit industry to improve the level and quality of service while also offering customers a fare medium that is easier and safer to use.

Lesson Learned: A program is needed that offers customers incentives and loyalties based on usage such as free transfers, fare discounts, and automatic replenishment.

The Smart Passport project offered pricing incentives to stored-value card customers by providing a 10% discount in fare. For every $10 of fare purchased, the customer received $11 of fare. The monthly Smart Passport pass also offered customers free transfer from one agency's bus to another agency's bus for the first time. However, no transfer discounts were associated with the stored-value pass program. Thus, if a stored-value pass customer transferred from a Camarillo bus to a VISTA bus, the rider paid the full Camarillo fare and the transfer fare. Another disincentive was the co-existence of other pass programs that had lower prices, such as SCAT's pre-paid monthly pass program (see Table 2). It is interesting to note that most non-SCAT customers preferred the Smart Passport stored-value pass to the monthly pass because they did not travel frequently enough to achieve any cost savings from the monthly pass.

Pricing of new fare media needs to be based on the agency's cost recovery requirements, but an electronic fare payment program also needs to be competitively priced with other available fare media. The new fare media should also introduce added convenience such as loyalty

Lessons Learned:

- *Implementation of new technology requires a comprehensive and effective marketing strategy using broadcast and print media.*
- *A program is needed that offers customers incentives and loyalties based on usage such as free transfers, fare discounts, and automatic replenishment.*
- *Formal and systematic surveys of and interviews with customers are needed to reliably assess customer satisfaction and to design strategies to improve satisfaction.*

There are other means, however, of enhancing convenience of electronic fare payment programs if financial incentives are not a viable option.

and discounts based on use. If an electronic fare payment program enhances customer convenience and offers some type of pricing incentives, such as free transfers, fare discounts, and loyalty incentives, customers are more likely to accept the technology. For example, the popularity and use of the New York Metropolitan Transit Authority (MTA) Metro Card soared when the MTA linked discounts and free transfers to the magnetic stripe card. There are other means, however, of enhancing customer convenience if financial incentives are not a viable option. The Washington Metro Area Transit Authority's (WMATA) SmarTrip Program has had a 20% market penetration without any additional pricing discounts from its existing magnetic stripe ticket. Each fare medium offers the same discount: Riders receive $22 of fare for a $20 expenditure. SmarTrip users also like the added benefit of card registration. If a card registered with the agency is lost or stolen, the remaining value of the card will be restored based on the last transaction. WMATA also plans to introduce an auto-replenishment feature to the card later this year. Finally, WMATA guarantees SmarTrip users that their privacy will be protected and that the data generated from using the card will not be sold.

Lesson Learned: Formal and systematic surveys of and interviews with customers are needed to reliably assess customer satisfaction and to design strategies to improve satisfaction.

None of the participants conducted rigorous surveys or research on changes in ridership levels during the demonstration project. Thus, any conclusions regarding customer acceptance is only an estimate. However, VCTC conducted informal surveys of customers on each VISTA bus route and received positive anecdotal responses, and positive comments were received from FATCO customers during informal interviews. The information gleaned from surveys and interviews helps the transit industry understand the positive attributes of smart cards, such as replacement policies, a budgeting tool, and the security of carrying less cash.

Reaching conclusions that can be used to improve customer satisfaction, however, requires surveying and interviewing of focus groups of participating customers and of those who chose not to purchase a smart card. There are a number of questions that can be asked to measure customer acceptance of a smart card:

- Does the smart card offer attributes for existing transit users?
- Will the card attract riders?
- Does the card stimulate increased confidence in transit services?

Conclusion

Participants in the Ventura County Smart Passport demonstration project have applied the lessons learned to a new smart card program scheduled to begin in the summer of 2001. However, the knowledge acquired in the demonstration pertains not only in Ventura County and not only to electronic fare payment. The insights gained in institutional needs, technical requirements and customer acceptance techniques can be helpful to those deploying any new type of technology in an operational setting.

References and Additional Resources

Ventura County Transportation Commission
Ginger Gherardi, Executive Director
Steven DeGeorge, Transportation Planner/Manager, Bicycle Programs, Technology, Modeling
Maureen Hooper-Lopez, Director of Transit Programs
Sally Sabin, Accounting Manager
Phone 805-654-2888
www.goventura.org

Department of Community Services, City of Simi Valley
Chuck Perkins, Transit Superintendent
Ray Turpin, Deputy Director/Transit
Phone 805-583-6456
www.ci.simi-valley.ca.us

Public Works Department, City of Thousand Oaks
Roy Meyers, Transportation Analyst
Phone 805-449-2400
www.ci.thousand-oaks.ca.us/totransit.htm

South Coast Area Transit
Laura J. Caskey, Director of Planning and Marketing
Robert Lurie, Director of Maintenance
Phone 805-487-4222
www.scat.org

Fillmore Area Transit Corporation
Terrie H. Metzler, Operations Manager
Phone 805-524-2319

City of Camarillo
Court S. Eilertson, Traffic Engineering Associate
Phone 805-388-5335
www.ci.camarillo.ca.us/live/transit.html

City of Moorpark
John Brand, Senior Management Analyst
Phone 805-529-6864
www.ci.moorpark.ca.us/rideguide.htm

Echelon Industries, Inc.
Ray Rebeiro, President
Phone 909-861-3881

United States Department of Transportation Federal Transit Administration
Stewart McKeown, Small Business Innovation Research Manager
Phone 202-366-0244
www.fta.dot.gov/research/implem/sbir/sbir.htm

Notes

Notes

Federal Highway Administration Resource Centers

Eastern Resource Center
10 S. Howard Street
Suite 4000 – HRC-EA
Baltimore, MD 21201
Phone 410-962-0093

Southern Resource Center
61 Forsyth Street, SW
Suite 17T26 – HRC-SO
Atlanta, GA 30303-3104
Phone 404-562-3570

Midwestern Resource Center
19900 Governors Highway
Suite 301 – HRC-MW
Olympia Fields, IL 60461-1021
Phone 708-283-3510

Western Resource Center
201 Mission Street
Suite 2100 – HRC-WE
San Francisco, CA 94105
Phone 415-744-3102

Federal Transit Administration Regional Offices

Region 1
Volpe National Transportation Systems Center
Kendall Square
55 Broadway, Suite 920
Cambridge, MA 02142-1093
Phone 617-494-2055

Region 2
1 Bowling Green
Room 429
New York, NY 10004
Phone 212-668-2170

Region 3
1760 Market Street, Suite 500
Philadelphia, PA 19103-4124
Phone 215-656-7100

Region 4
Atlanta Federal Center
61 Forsythe Street, SW
Suite 17T50
Atlanta, GA
Phone 404-562-3500

Region 5
200 West Adams Street
24th Floor, Suite 2410
Chicago, IL 60606-5232
Phone 312-353-2789

Region 6
819 Taylor Street
Room 8A36
Fort Worth, TX 76102
Phone 817-978-0550

Region 7
6301 Rockhill Road, Suite 303
Kansas City, MO 64131-1117
Phone 816-523-0204

Region 8
Columbia Place
216 16th Street, Suite 650
Denver, CO
Phone 303-844-3242

Region 9
201 Mission Street, Suite 2210
San Francisco, CA 94105-1831
Phone 415-744-3133

Region 10
Jackson Federal Building
915 Second Avenue, Suite 3142
Seattle, WA 98174-1002
Phone 206-220-7954

FHWA/FTA Metropolitan Offices

New York Metropolitan Office
1 Bowling Green, Room 428
New York, NY 10004-1415
Phone 212-668-2201

Philadelphia Metropolitan Office
1760 Market Street, Suite 510
Philadelphia, PA 19103-4124
Phone 215-656-7070

Chicago Metropolitan Office
200 West Adams Street, Suite 2410
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Intelligent Transportation Systems

U.S. Department of Transportation
400 7th Street SW
Washington, DC 20590

Federal Highway Administration
Room 3416, HOIT-01
Phone: (866) 367-7487
Facsimile: (202) 493-2027

Federal Transit Administration
Room 9402, TRI-10
Phone: (202) 366-4991
Facsimile: (202) 366-3765

FHWA-OP-01-033 EDL# 13479 FTA-TRI-11-01-01