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Smart Cards, Slow Deployment: Findings from Interviews with U.S. Transit Agencies

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Smart Cards, Slow Deployment: Findings from Interviews with U.S. Transit Agencies

Hiroyuki Iseki, Brian D. Taylor, Allison Yoh

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The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California. This report does not constitute a standard, specification, or regulation.

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Smart Cards, Slow Deployment: Findings from Interviews with U.S. Transit Agencies

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Abstract

This report summarizes findings from interviews with transit officials at seven agencies in North America about smart card evaluations, expectations, and implementation. As part of the project, “Designing a Policy Framework for a Statewide Transit Smart Card System,” this report was preceded by a literature review of smart card projects and an online survey of transit agencies’ knowledge of and interest in interoperable smart card systems for fare collection. The literature review found a lot of booster-like enthusiasm for smart cards, but few studies that have rigorously evaluated smart card system benefits relative to their costs, nor have they addressed the array of institutional issues that hinder implementation. Our survey revealed that many transit agencies are in the process of considering or have already adopted smart card systems, often without clear or certain information about the costs of these systems. Prior to forming collaborations with other agencies, surveyed agency officials tended to underestimate the difficulty of multi-agency partnerships. Once they entered these collaborations, however, agency officials tended to cite multi-agency agreement as the most significant barrier, more difficult to overcome than the financial costs of the systems.

Interviews conducted with transit agency officials focused on the decision-making and collaboration processes involved in adopting interoperable smart card systems, and the barriers that they faced. This report documents our findings, and begins first with a description of our interview methods, followed by summaries and highlights of each of the seven smart card projects currently being evaluated or implemented. The case studies include projects in Los Angeles County, the San Francisco Bay Area, Ventura County, Orange County, Santa Barbara County, the Washington Metropolitan Area, and Southeastern Pennsylvania. The report concludes with a summary of issues common to the seven cases, some strategies used in implementing interoperable smart card systems, and a description of next steps of our research.

Executive Summary

Smart cards are on their way to becoming ubiquitous tools to execute small financial transactions. Their improved data storage and faster processing capabilities make them vastly superior to previous generations of magnetic stripe cards. In public transit applications, smart cards have the potential to make fare payment more convenient and minimize boarding times for users, eliminate the need to collect cash at the fareboxes, and allow agencies to collect superior user data. To date, many transit agencies are in the process of adopting smart cards, and a few have fully deployed their systems. Some agencies have embraced smart cards on their own, while others have adopted smart cards jointly with neighboring transit operators, and still others have eschewed smart cards altogether. As the variation in the level of adoption and implementation among agencies shows, transit agency officials' decisions regarding the use of smart cards as transit fare media are often made in highly complex environments, influenced by operating conditions, political climate and mandates, unique histories, and the roles that transit plays locally.

Smart card technology is not new to the transit industry, as these systems have been implemented in other countries, such as the UK, Singapore, and Japan, with high levels of user acceptance, and with much broader ranges of applications. Why have multi-operator smart card systems been relatively slow to be implemented among U.S. transit agencies? What have been the barriers to coordinating multiple agencies to adopt the technology and agree on the details of implementation? And how have some agencies overcome these obstacles? Given the barriers and strategies currently in use, what is the role of California, if any? These are the questions examined in this report.

This report summarizes findings from interviews with transit officials at seven transit agencies in North America about their expectations for, evaluations, and implementation of smart card systems. Specifically, this paper explores the barriers to multi-agency implementation of smart card technology to deliver an interoperable system for the region. Interoperable smart card systems allow one card to be used across multiple operators, modes, and jurisdictions – increasing convenience for riders and automating fare collection for operators. However, such a system requires otherwise loosely coordinated operators to agree on a common

set of operating and business rules – and sometimes even fare policies – around a newly adopted technology.

In the interviews, we asked agency officials about the genesis of their projects, whether and how the project directives have changed over time, their evaluations of the benefits and costs of smart cards, and whether smart cards are seen as marginal improvements or radical upgrades to current fare collection systems. We also asked specifically about the types of obstacles encountered in working with other operators in their regions to hammer out business rules, memoranda of understanding, and contracting practices when procuring equipment to be used across many operators.

We found that agency officials interviewed were in general agreement about the benefits of smart cards, and in particular the benefits of providing riders with an inter-operator fare card. Interoperability appears to be at the genesis of most regions' efforts to evaluate and implement smart card systems, but reported barriers to implementation in our interviews ranged from practical issues, such as managing vendor contracts, to broader issues endemic to the transit industry such as the politics of public transit finance.

Given the wide array of reported obstacles to implementation at the regional level, a state as large and heterogeneous as California may be constrained in its ability to mandate interoperability across its many regions. First, findings suggest that operators may be uncertain about the benefits and the costs of *interoperable* systems. Second, interviews suggest that smart card coordination cannot be viewed apart from larger institutional conflicts over turf, authority, and accountability on a wide variety of issues. Third, regional transit smart card systems are already well on their way toward implementation in many areas, and with funding, regional partnerships have formed without guidance or intervention from higher levels of government. Although this puts California at risk of having multiple and incompatible transit fare collection systems, most transit travel and high-volume transfers continue to be intra-regional, rather than inter-regional.

These findings suggest a number of questions about the role of California in facilitating a statewide interoperable system. Is there a role, and if so, what is that role? Can state guidance or intervention be sufficient to overcome the institutional barriers reported in our interviews with transit agency officials? Now that we have explored issues facing individual operators, the next steps of our research project will examine the perspectives of metropolitan planning

organizations, regional authorities involved in transit smart card systems, and smart card vendors
– followed by recommendations for a statewide strategy.

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Introduction

This report summarizes findings from interviews with transit officials at seven agencies in North America about smart card evaluations, expectations, and implementation. As part of the project, “Designing a Policy Framework for a Statewide Transit Smart Card System,” this report was preceded by a literature review of smart card projects and an online survey of transit agencies’ knowledge of and interest in interoperable smart card systems for fare collection. The literature review found a lot of booster-like enthusiasm for smart cards, but few studies that have rigorously evaluated smart card system benefits relative to their costs, nor have they addressed the array of institutional issues that hinder implementation. Our survey revealed that many transit agencies are in the process of considering or have already adopted smart card systems, often without clear or certain information about the costs of these systems. Prior to forming collaborations with other agencies, surveyed agency officials tended to underestimate the difficulty of multi-agency partnerships. Once they entered these collaborations, however, agency officials tended to cite multi-agency agreement as the most significant barrier, more difficult to overcome than the financial costs of the systems.

Interviews conducted with transit agency officials focused on the decision-making and collaboration processes involved in adopting interoperable smart card systems, and the barriers that they faced. This report documents our findings, and begins first with a description of our interview methods, followed by summaries and highlights of each of the seven smart card projects currently being evaluated or implemented. The case studies include projects in Los Angeles County, the San Francisco Bay Area, Ventura County, Orange County, Santa Barbara County, the Washington Metropolitan Area, and Southeastern Pennsylvania. The report concludes with a summary of issues common to the seven cases, some strategies used in implementing interoperable smart card systems, and a description of next steps of our research.

Methodology

Based on survey findings from our previous research phase, we initially selected 17 smart card projects from different regions in North America. Selection of the projects was based on careful evaluation of various factors, such as the level of consideration and implementation of smart card technology, size of the smart card system, and geographic location. Selected projects

covered four stages of consideration and implementation of smart card technology: areas/regions in the process of considering smart cards, areas that considered but decided not to adopt, areas that have implemented a stand-alone system, and areas that implemented an interoperable system. Although our previous survey included operators that have *never* considered adoption of smart card technology, we did not select any of these operators for interviews, since our interviews focused on the process of evaluating smart card projects and subsequent implementation (if any).

The UCLA research team examined survey responses and information available on the Internet for agencies in each of these 17 regions/areas before selecting a final set of seven projects. The justification for the selection of each region/area and agencies is summarized below in Table 1, along with the status of smart card implementation in each area, a description of the number of agencies involved in the collaboration (if the project is interoperable between multiple partners), and the number of interviews conducted for each region.

Table 1: Summary of smart card projects selected for case studies

<i>Region</i>	<i>Project Name (if any)</i>	<i>Justification for Case Study</i>	<i>Status</i>	<i>Number of Operators in Project</i>	<i>Number of Interviews Conducted</i>
Los Angeles County	Transit Access Pass (TAP)	Large-scale multi-operator project in California	Adopted, Interoperable	18	11 officials from 10 agencies
Orange County	N/A	Evaluated the idea of joining the Los Angeles and/or San Diego interoperable systems, but subsequently rejected smart cards altogether	Rejected, both Stand-alone and Interoperable	N/A	1 official from 1 agency
Philadelphia/Southeastern Pennsylvania	N/A	Large, multi-modal operator (SEPTA) in an urban area outside of California	Considering, Interoperable	N/A	1 official from 1 agency
San Francisco Bay Area	Translink	Large-scale multi-operator project in California	Adopted, Interoperable	27	8 officials from 7 agencies
Santa Barbara	N/A	Evaluated the possibility of a stand-alone system, but subsequently rejected smart cards	Rejected, Stand-alone	N/A	1 official from 1 agency
Ventura County	GoVentura	Small urban area in California. Sponsored smart card legislation (AB 684)	Adopted, Interoperable	6	1 official from 1 agency
Washington, DC Metropolitan Area	SmarTrip	Three-year old project with advanced applications (e.g. partnerships with CitiBank and employers combining security passes and transit passes)	Adopted, Interoperable	17	3 officials from 3 agencies

Two projects – Los Angeles County’s Transit Access Pass (TAP) program and the San Francisco Bay Area’s Translink program – are presented in extensive case studies in this report because they are large-scale, multi-agency programs in heavily urbanized areas, and because they have been relatively slow to deploy, having encountered various obstacles during the process. Other projects, such as Ventura County’s GoVentura program and Washington Metropolitan Area Transportation Authority’s (WMATA) project, though implemented with cards in use, are explored in less detail because these programs were either relatively quick in implementation due to contained service areas or cohesive interoperator relationships (as in the case of GoVentura) or because the project had clearly defined leaders and market shares (as in the case of WMATA). In addition, these projects did not present as many intricate institutional issues, or were not located in the State of California.

Areas that are evaluating or have rejected smart cards (Orange County, Santa Barbara, and Southeast Pennsylvania) are explored to the extent that detailed information was available – because these agencies are still in the process of evaluating or have rejected smart cards, agency officials were not always at leisure to share with us internal documents or deliberations. We did, however, encourage them to discuss general issues, and what they did discuss is presented in this report.

After identifying these projects for case studies, we contacted participating and lead agencies within each region for interviews. If an agency participated in our preceding survey, we directly called the individual who completed the online questionnaire. For agencies that did not participate in our survey, we contacted individuals within the agency by calling and asking for specific names. We also identified individuals involved with smart card projects by soliciting names from other agency contacts in the same region – since many of these operators work closely together through staff contacts to coordinate the smart card projects.

In total, we interviewed 26 officials from 24 different agencies in March and April 2006. Interviews averaged 55 minutes, and ranged from 20 minutes to two hours, often depending on interviewees’ willingness and time availability to speak with us. Appendix A includes the interview guide of the general set of questions we asked. Where interviewees mentioned issues or concerns not specifically included in the guide, we followed up by probing in general about how these issues hindered or facilitated smart card adoption and implementation.

All interviewees were promised anonymity and – in compliance with UCLA’s Institutional Review Board – asked a series of questions about the level of confidentiality they required for their participation in this project. Throughout this report, all names and directly identifiable information have been omitted to ensure anonymity and the protection of our interviewees.

Principal Findings from Case Studies

The proprietary nature of the smart card systems continues to be problematic for agencies, as they must overcome the high costs and are often, as described by one interviewee, “held hostage” to future change orders and contract renewals. The lack of an industry standard for smart card specifications, however, has largely been overcome in regional efforts by instituting multi-agency systems that procure from one manufacturer/vendor. However, regional projects are still wrought with other problems that have delayed project implementation:

1. Lack of authority and accountability among partner agencies limits the ability of lead agencies to establish new procedures and deploy projects.
2. Existing and historical relationships between operators often set the stage for smart card projects. Interoperable systems must be formed in the context of other regional initiatives, politics concerning transit finance, and institutional histories such as long-standing traditions of independent and autonomous local operators. Where operators within a region have historically been loosely coordinated, smart card interoperability is likely to be difficult.
3. Lack of precedence in revenue sharing arrangements means that local operators are often hesitant about, if not opposed to, relinquishing control over their fare structures and policies. Because there are few examples of revenue sharing programs, local operators are uncertain about how new protocols and programs will change their revenue streams.
4. Consensus-based decision-making is often needed to garner support and participation from local operators, but such widespread veto power may result in long project delays.
5. Operators are uncertain about the benefits and costs to their agencies, and most must rely on some source of regional funding and initiative. Entering into multi-agency collaborations reduces risk.

6. Without a clear business case (ridership demographics, travel patterns) for investing in smart card systems, agencies that have rejected smart cards are taking a wait-and-see approach, and looking to other systems' experiences with smart card results.
7. Path-dependency issues, such as whether an operator has recently replaced its fare collection equipment, or the technological sophistication of existing equipment, plays a role in agencies' decisions to upgrade to smart card systems.

The wide array of obstacles to smart card adoption and interoperable systems presents some sobering questions about whether a state as large and heterogeneous as California is able to mandate interoperability across its many regions. The following sections present the seven case studies in greater detail.

Los Angeles County: Smart Cards in the Context of Public Transit Finance

The Los Angeles Transit Access Pass (TAP) project is coordinated by the Los Angeles County Metropolitan Transportation Authority (MTA), which is both the countywide funding and programming agency and also the largest transit operator of the county. Participants in the interoperable smart card project include the MTA operations (also known as Metro), the 16 municipal operators that provide services within the county, and the multi-county commuter rail service Metrolink. Discussions and planning have also included some participation from Omnitrans, which operates in the adjacent county of San Bernardino.

The Los Angeles TAP project currently is in testing, with card readers installed on all Metro buses and rail stations. Cards have not been available to the general public, but have been procured and distributed among MTA employees, some institutional partners, and a limited test group of users. The general rationale for adopting and implementing an interoperable smart card system is *not* controversial among the participating agencies in Los Angeles, and receives consistent and strong support. All interviewees with whom we spoke favor a regionally accepted pass for seamless travel, and acknowledge that this feature is important for riders, especially in a region served by a multitude of loosely coordinated operators. However, many interviewees admitted that the shared business rules for implementing and managing such a system were difficult to craft, largely due to the balkanized nature of the region, historical distrust between municipal operators and the MTA, and the need to share costs of implementing the system. In

Los Angeles, smart card implementation takes place in the context of a rich and often chaotic institutional history, complex transit financing formulae and practices, ongoing service and organizational restructuring efforts, and structural deficit.

Although the benefits to *riders* through a seamless fare media seem obvious to interviewees, the benefits and costs to *transit agencies* are less clear. Few interviewees questioned the convenience of smart cards for riders, but many were concerned about a few common issues: (a) revenue distribution and clearing, (b) individual agencies' shares of the clearinghouse and administrative costs, and (c) the adoption of smart cards in the context of the current formula allocation of local, state, and federal funding.

Revenue distribution

Currently in Los Angeles County, transfer fare policies between operators are negotiated on an *ad hoc* basis. Among some high transfer lines and connections (for instance, between Metrolink and Downtown DASH services) operators have agreed to accept another's pass or fare media to allow a rider to complete her trip. Sometimes the arrangements are reciprocal, in other cases, not, and some operators have negotiated formal agreements with each other for revenue sharing. While most operators collect a heavily discounted fare for interagency transfers (usually 25 cents), few interagency agreements exist to redistribute the transfer fares collected, because operators assume that return trips are reversals of originating trips and that they will, in one direction or another, collect a full fare. Collectively, operators in the Los Angeles region have not adopted a mechanism for countywide revenue re-distribution based on their respective levels of service provided or trips served.

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One exception, however, to the general lack of revenue redistribution agreements, has been the EZ Transit Pass program. Implemented in 2000, the EZ Transit Pass allowed pass holders to take unlimited rides on five participating transit operators. Since then, the program has grown to now include 21 transit services (including municipal operators and locally

sponsored shuttles). The MTA markets and sells the flash passes, and distributes revenues to eligible operators based on their share of trips provided on the pass.

When asked whether the EZ Transit Pass program set precedent for negotiating revenue distribution for the TAP project, respondents varied in their opinions about whether the EZ Transit Pass facilitated or hindered TAP coordination. Some felt that EZ Transit Pass was a low-tech form of the TAP card, but that it had set up the institutional agreements needed. Others felt that the flash pass was adequate, but that the next generation technology of smart cards offered some added capability – but at a cost:

Why upgrade from this low tech media? Because you can't participate in the future unless you have some sort of computer equipment [laughs]. [TAP] is a much more flexible system in the long run although it's obviously much more expensive in the short term.

Another interviewee, however, noted that EZ Transit Pass had not been easy to implement, but ultimately was successful because of the involvement of a critical MTA employee. The particular employee had been responsible for managing the annual formula allocation program since the 1980s, and had been working closely with municipal operators on financing for decades. The relationships formed from this decades-long interaction was key to the EZ Transit Pass implementation, implying that this was somewhat of a unique situation, and that TAP may be equally or more difficult to negotiate.

The TAP project is being implemented to maintain the status quo on fare policies set by unique operators, and would not disrupt the current agreements (or lack of agreements) on revenue sharing. In effect, each operator is expected to retain its fare policies.¹ However, smart cards do present a new wrinkle in how funds loaded on one operator's vehicle will reach another operator that provided service. The issue of *how* funds are cleared has been complicated by a number of questions such as when funds will clear, how often funds will clear, and who will manage the clearance. Currently, operators clear at different times of the day, with some clearing daily, weekly, or monthly. MTA has since contracted a third-party clearinghouse to handle the distribution of revenues, but other business rules – such as the designation on a smart card about whether and at what age the card holder will be given a senior discount – have been

¹ “Strategic Fare Collection Technology Assessment,” presentation to the MTA Board of Directors, by Booz-Allen & Hamilton, Special Board Workshop, August 15, 2001

difficult to agree upon because of unique operating protocols of the various individual operators. At the writing of this report, negotiations are still ongoing.

Shared costs of clearinghouse and administrative functions

The implementation of the TAP project required three main expenses – (1) the capital costs of the cards, readers, and computers, (2) the administrative costs of marketing, branding, customer support, and clearinghouse services, and (3) the maintenance costs associated with the equipment. A Congestion Management and Air Quality (CMAQ) grant provided some capital funding for the TAP project, and the availability of these funds was appealing for many of the participating operators, particularly smaller agencies that would not normally be in a position to consider new technology upgrades. Reported one interviewee:

One, we did need to replace our fare boxes and this was an opportunity to do so at a little higher percentage of federal moneys than we'd normally get for this. Normally we get 80 cents on the dollar, but here we get 88 cents on the dollar.

Maintenance costs of the card readers are left to individual operators, but the costs of administration, customer support, and clearinghouse services will be shared among the participating operators. This cost-sharing situation presents three types of questions: (1) how much will the costs be, (2) from what source will the costs be financed, and (2) for what share should each individual operator be responsible?

Estimates of shared costs

TAP's shared operating costs (clearinghouse, marketing, and distribution functions) were unknown at the time we conducted most of our interviews. (At the time of this report writing, however, MTA secured a contract to deliver clearinghouse functions at an annual cost of \$8 million.) From the MTA perspective, the primary problem with implementing interoperable smart cards is getting the cost down so that regional partners can participate. Currently, very few vendors are able to handle a project at this scale, which not only yields few bids, but also, as one interviewee described, "holds transit agencies hostage" to contract change orders and future equipment procurement.

For example, in July 2001, when the MTA released a request for proposals for smart card fare collection systems, it received only two bids – one from Cubic Transportation Systems at \$85 million, and another from Scheidt & Bachmann at \$142 million for automated equipment. After review and a Request for Best and Final

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Offer, MTA received only one final offer from Cubic, and a contract was granted by the MTA Board of Directors.² With few choices, one MTA official reported, future procurement options would be limited, and without open architecture, the market becomes a monopoly or oligopoly. Implementation of smart cards must be done as a system, integrating the cards, card readers, back office processing, and the institutions handling revenue clearance. However, there are few manufacturers that can support all levels. Cubic is the heavy hitter in this regard, and is the primary contractor for cards and readers. In March 2006, the MTA contracted ACS for clearinghouse functions in Los Angeles County, and how well this ACS-Cubic relationship will work remains to be seen.

Despite the lack of information about the shared costs of the clearinghouse at the time, however, most operators reported that they are participating nonetheless. Said one interviewee from a small operator in the Los Angeles project,

Why are people consenting to participate if this is a big uncertainty? I wish I could answer that. [laughs] I really wish I could answer that. I don't know...But I know that if the costs were too high for us, it wouldn't just be us that were complaining. It would be everybody in there – of course, other than Metro – complaining about the costs involved in this.

Municipal operators tend to feel more similar to each other than to Metro, as seen in the quote above. This safety in numbers provides some confidence, and allows agencies to share risk in participating in a project of this size and scale, even if the costs are unknown.

² Staff recommendation for Board action, “Universal Fare System: Award Contract to Cubic Transportation Systems, Inc.” presented to MTA Board of Directors Operations Committee, February 20, 2002, prepared by Jane Matsumoto, Project Manager, Universal Fare System

Sources of funding for shared costs

We interviewed two officials from the MTA and another official from a municipal operator about proposed sources for funding the clearinghouse and other shared costs. According to our interviewees, these discussions took place primarily among the general managers from participating operators (including Metro). The group of general managers determined that funds would be taken “off the top” of regional funds, and at one point had considered the use of Proposition A funds.

Proposition A, enacted by voters in 1980, generates revenue designated to improve transit service in Los Angeles County, from a half-cent sales tax. Of the \$620 million generated for 2006 through Proposition A, portions of these revenues are distributed to LA County and to the cities in LA County on a per-capita basis for rail development programs, and for discretionary purposes as set by MTA board policy.³ Taking funds “off the top” of this funding source was supported by one MTA official we interviewed. S/he reported that although the idea was supported by many of the municipal operators, other stakeholders of the region were not in favor of it because many cities do not operate fixed route transit, and would not receive the benefits of a smart card system. The MTA official argued:

Yeah, but we fund dial-a-ride and other programs! [Their] transit riders don't have fixed route, but still get the benefits of TAP and they are still countywide riders. So even though you don't have a transit operator in all 86 cities of the county, every single person of the county is a beneficiary of this. And this is what we mean by a seamless system, a true regional program.

In other words, because the smart card system delivers regional benefits, its source of funding should be regional as well. One interviewee from a municipal operator disagreed, however, based on a very different rationale. As a representative of a large city, s/he explained that the city receives a large allocation of Proposition A local funds, which is used to operate all of the community's fixed route lines. A one and a half percent decline in those revenue sources would amount to more than a million dollar shortfall. While the MTA's argument favored a regional perspective about “fair” allocation of costs to those who receive benefits, the municipal operator's rationale was based on maintaining local revenue returns.

³ *Metro Funding Sources Guide*, 2006, by the Los Angeles County Metropolitan Transportation Authority, prepared by Regional Programming Unit, Programming and Policy Analysis.

The municipal operator official we interviewed further explained the position of various institutions. The issue was heard by the Technical Advisory Committee (TAC), made up of a broad spectrum of people with representation from other non-transit sectors such as city officials. The large city clearly had the most to lose as a result of this proposal, since it receives the largest share of the local returns. City officials were the most vociferously opposed (supported also by other smaller municipalities), and the proposal for the use of Proposition A revenues was defeated.

Individual shares of cost

The MTA estimated that the total costs of clearinghouse administration would be around \$10 million annually. What portion of this total should each agency pay, and by what justification? According to one interviewee from a municipal operator,

Metro makes up 80 percent of the fares and the passengers in the region, so they should carry the bulk of the costs. It was also pointed out that of all the agencies, Metro will see the biggest benefit from this technology because of their huge cash processing costs. Obviously Metro wanted to pay less and we compromised at 70 or 75 percent. Initially it was going to be a 75 to 25 split [between Metro and the group of municipal operators]. Then we brought it to the general managers group that discusses transit policy in the region. The munis balked at paying 25 percent. The theoretical figure at the time was \$10 million for the estimated costs. So it was agreed that Metro would pay \$7 million. Then, the municipal operators would pay \$1.5 million, and the last \$1.5 million will be from user fees.

Metro officials reported that at the time of these discussions about fair shares, they had not received best-and-final-offer estimates of the annual cost, nor were they able to predict the magnitude of transactions that Metro would capture. In the end, the MTA awarded a contract with ACS for the clearinghouse and service center for \$8 million annually. Because the cost came in under the original estimate, one MTA official reported that user fees can potentially be deferred during the initial stages of implementation to encourage better smart card penetration.

Because the award of contract was made to a proposer whose costs were lower than the [prior] Engineer's Estimate of \$10 million, we hope to have more flexibility in passing cost savings on to patrons during roll-out of TAP. If I can show that there are also new opportunities for revenue generation in the form of potential co-branding, card sponsorship and advertising, we won't need the \$1.5 million from user fees. Based on reliable engineers and well-known industry

expert consultants, we got a commitment that the municipal operators would collectively \$1.5 million, as their share towards the original \$10 million estimate.

Agreeing on absolute amounts (rather than proportional amounts) to be paid by Metro and the municipal operators may have been either an overt or covert strategy to reach consensus, since it sets in no uncertain terms what municipal operators can expect to pay collectively. In this case, bids came in lower than expected, and the MTA and its regional partners hope to avoid passing any costs on to card users.

Adoption of smart cards in context of formula allocation procedures

Negotiations over shared costs and business rules have taken place within the larger context of transit finance issues in the county. As mentioned before, the MTA is both an operator and the regional planning and programming agency, and this has set a stage for institutional conflict:

I think in general there has always been a distrust of Metro for the municipal operators, and I'm sure you're familiar with the idea that they are both the planner and the operator. Since their creation, they have favored their own operations at the expense of smaller municipal operators in the county. So that's led to considerable distrust on the municipal operators for Metro. And it just drives a lot of stuff. You can't negotiate with someone if you don't trust them...

This conflict of interest not only creates tension between the municipal operators and the MTA, but internal conflict for the MTA as well. Said one MTA employee:

We in our role will try to connect up different operators. That's service coordination issues. That's what I think we should do as the regional thing. However, since we're the largest operator, there is a huge debate, and the debate is no longer out in public! It's internal between the operations unit and the planning unit, internal to the MTA. What's our goal? The operations unit says, 'I need the money to operate this service.' And the planners are saying, 'why do we need to run the Wilshire Rapid all the way to Santa Monica? Why don't we get off that route because Santa Monica Big Blue Bus operates their number 2 line?'

In addition to this organizational issue, the allocation of finite local, regional, state, and federal funds through a formula allocation procedure further complicates relationships between agencies. Our

...the application of smart card fare collection systems across the region have several implications for transit finance. First, the potential for better data collection may mean an adjustment to the formula allocation procedures, if more accurate forms of productivity measurements are possible...

interviewees shared common knowledge of widespread practice and strategy among operators to “game the formula” to maximize their shares of funding. The formula allocation procedure divides vehicle revenue miles by base cash fare to determine an agency’s “fare units,” which are then proportional to the share of funds received. In essence, lower base fares provide agencies with more fare units, and therefore a larger piece of the funding pie. And this pie, amounting to over \$745 million annually⁴, is both a substantial and finite source.

Everyone we spoke with agreed to the need for revising the formula allocation procedure. The officials we spoke with at the MTA seek revision because under the current procedure, Metro receives 70 percent of the funding, but carries 80 percent of the regional ridership. Municipal operators, on the other hand, are well aware that if the MTA implemented even a relatively minor fare decrease, their subsequent share of the funding would increase dramatically, and have dire effects on municipal operators’ shares. At the time of our interviews, the region was working on the process of revising the FAP. The urgency and importance of this issue is expressed by one of our interviewees from a municipal operator:

The formula is up for debate because people, including myself, are sick of gaming the formula. I think Torrance Transit started it, where they actually hired a mathematician to look at the formula in order to maximize their revenue. I think they reduced their base fare and increased their transfers. Their fare units shot up and I think they got an extra two million dollars out of the formula. It was really pretty disturbing to me. The formula has generally operated under a consensus and any system is only as good as people buy into it and I think that this was the first nail in the coffin of this formula because of what Torrance did. And then Metro came along, and they reduced their fare by a dime, from \$1.35 to \$1.25. And this may not seem like a lot to you but when you make up 70-75 percent of any funding pot, you can have a large effect on other operators. And they have had an effect. A lot of operators have lost money because of Metro’s fare change, and our budget situation wouldn’t be nearly as bad if we hadn’t had this Metro fare change. But Metro was within its rights to do what it did, but they pointed out a flaw in the system.

The TAP project and the formula allocation procedure are separate issues managed in different departments of the MTA, but the application of smart card fare collection systems across the region have several implications for transit finance. First, the potential for better data

⁴ *Metro Funding Sources Guide*, 2006, by the Los Angeles County Metropolitan Transportation Authority, prepared by Regional Programming Unit, Programming and Policy Analysis.

collection may mean an adjustment to the formula allocation procedures, if more accurate forms of productivity measurements are possible.

Well, everybody around the table can conceptually agree that the formula should have two components – (1) a measure of service level, ...and (2) a productivity measure [passengers]. And that's essentially what this other piece was for – fare units was a surrogate for passengers....At the moment, I know this and some of us are aware that at some later date you will have more independent reporting since most of the munis will be buying smart card equipment and I think we may then be able to get to passenger [boardings]...

Second, one municipal operator saw a very clear relationship between the MTA TAP project and the local operators' autonomy over fare policy. When asked about the TAP project's genesis, s/he reported:

It's an idea that came out of a number of things that Metro's doing. Metro was looking at a way to increase ridership throughout the county, and make it easier for riders to get from one system to another...That was one. And two, the CEO of Metro has indicated that he'd like to have not just this universal fare system, but a universal regional *fare*. One fare for the entire region! Which is not well-received [laughs] by the majority of the municipal operators, considering Metro has their base fare at \$1.25 and would love to see an increase to \$1.50 and would love to have everyone else do so as well. Well, our base fare is 50 cents. That would be an increase of a dollar! [MTA is trying] to build more ammunition for getting one fare for the entire region.

Most interviewees from municipal operators did not state such clear connections between the TAP project and fare policy autonomy, but MTA does appear to recognize the potential for the formula allocation review to complicate the TAP implementation. One interviewee at the MTA reported that:

Since the formula allocation procedure discussions haven't been formalized, we said that [TAP clearinghouse costs] would be budgeted through the annual budget process. Metro will do that through our annual budget process. That makes it easier. We kept formula allocation from contaminating and creating more conflict in the distribution of money.

Agencies participating in the TAP project must balance the need to replace aging fare collection equipment with the uncertainty of adopting a new system that may take years to implement – so many years, in some cases, that new and more advanced technology will become

available. Additionally, they weather some uncertainty about how TAP may or may not affect how funds are distributed in the county. Although the region was able to overcome the high costs of equipment procurement, the business and governing rules are now only being discussed. These discussions have taken place within an environment of institutional distrust between Metro/MTA and the municipal operators, a heated debate about transit funding allocation, and finite resources for a non-growth industry.

Lessons Learned

- Findings from the Los Angeles case present some evidence that precedence in some revenue sharing programs (such as the EZ Transit Pass program) may facilitate joint efforts to implement interagency smart card systems. However, the nature and history of interagency relationships may be more important factors for agreement and successful coordination among multiple operators.
- Differences in institutional mandates and incentives between various levels of government prevent operators and planning agencies from reaching agreement on sources of funding to pay for the smart card system. Institutions also define the objectives of a regional smart card system differently.
- Smart card systems for fare collection are technology projects that span both operations and finance – functional areas that are heavily guarded by agencies. Without precedence in joint fare programs, operators are uncertain about how interoperable smart card systems will affect their revenues.
- Agreeing on absolute amounts (rather than proportional amounts) to be paid for shared costs between operators may have been either an overt or covert strategy to reach consensus, since it sets clear parameters on what each agency is able to agree upon.

San Francisco Bay Area: Agreement without Accountability or Authority

In the Bay Area, transit is delivered by 23 agencies, all of which fall under the governing umbrella of the Metropolitan Transportation Commission (MTC). The MTC acts as the region's

planning and funding organization for the various operators in its region. Unlike the Los Angeles County MTA, the MTC does not simultaneously deliver services and funding to local operators. Based on interviews with eight officials from seven agencies participating in Translink, we found that the primary obstacles to interoperable smart card implementation are (1) ambiguous institutional authority and accountability in project deployment, (2) operators' unwillingness to cede fare autonomy, (3) unwillingness of individual agencies to cede authority over the project to the MTC, (4) lack of interest in an automatic fare payment system, and (5) limited power over the contracted vendor.

Since the first smart card test in the 1980s, the technology has substantially improved, but current obstacles have primarily been inter-operator coordination and decision-making authority. Transit agencies in the Bay Area have long been interested in developing a universal fare system that increases the convenience of using transit across operators. However, early attempts to build such a system were unsuccessful due to technical issues. The earthquake of 1989 rekindled interest in better fare collections, according to one interviewee, because damaged roads and bridges increased transit ridership. In the early 1990s a pilot project was delivered between BART and Central Contra Costa Transit Authority (County Connections) in part because of the high levels of transfers between these two systems. This concern about transfers was so substantial that the State of California in 1996 passed resolution SB 1474, which required interoperator coordinated fares, possibly an early indicator of operators' ambiguity toward coordinated fares in general. As this project was being tested, substantial issues again arose with the magnetic ticketing technology, especially in high volume environments. These operational problems stopped the pilot from developing into its full potential.

The Metropolitan Transportation Commission (MTC), however, did not abandon the idea of coordinated fare media after the pilot project proved unworkable. Rather, MTC rethought the entire project, giving rise to the current Translink smart card program. Instead of using an expensive technology simply to capture the less than 15 percent market share of interoperator transfers, Translink was re-envisioned as a way to fully automate all operators' fare collection systems. One former project manager and lead on the early Translink program

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explained that Translink marked a substantial improvement from earlier attempts to coordinate fares and a shift away from focusing only on transfers:

Instead of a technical solution focused on the highest volume of interoperator transfers, the business case changed to deploy a technology that would satisfy the operators...for as big a chunk of the marketplace as we could gobble up. There was recognition that automatic fare collection was expensive and complicated, and we didn't think it made sense to deploy a whole new fare collection system across the Bay Area if we were only going after the interoperator transfer market. So what we wanted to do, and got the agencies to sign off on, was a new technology platform for automating as much of their fare collection business as was practical.

The problem with consensus-based decision-making?

During pilot phase, the MTC in 1999 contracted Motorola as the Translink Design-Build-Operate-Maintain contractor, and formed memoranda of understanding with six operators to form a pilot Translink project. A Translink Oversight Committee (TOC) was formed consisting of project managers from various agencies. The TOC operated under a consensus-based decision-making model. In 2003, the MTC and six participating operators formalized their responsibilities for implementing and operating Translink, and created the Translink Interagency Participation Agreement (TIPA). This multilateral memorandum of understanding outlined the shared decision-making process, the governing structure, and business and operating rules.

... [T]he operating rules articulate certain things like fare policy remains the exclusive domain of the agencies. So if an agency's fare policy dictates some tweak to the Translink system design, that tweak is basically going to be approved because the group has gotten together and decided that fare policy is going to be the domain of each agency. In other words, nobody is going to step on anyone's toes if they need this bell or that whistle to deploy Translink in such a way that matches their current fare structure or policy.

The agreement to proceed only by full consensus and to allow operators to retain full fare autonomy left a lot of power to two major operators – BART and San Francisco Muni – who were designated to move forward on the project first. One major delay to Translink's implementation was BART's resistance to moving forward unless its fare structure was *fully* replicated in the Translink program.

BART declared, ‘we need our own e-purse. We don’t want to have to take just the regional electronic cash. We want our own brand of BART Bucks,’ which is just *insane*. It’s the opposite of what we’re trying to do with Translink....This governance structure was supposed to be a structure where you could have the dialogue and decide what’s best for the program. What was happening instead was...[Muni and BART] looked at the voting structure and said, ‘we run this program. It’s our program. We could have everything we want as long as we don’t break ranks.’

In other words, the first operators to go live made arguably unreasonable demands on the programming of Translink in order to accommodate all their fare programs, at the cost of major project delays. Even though other operators faced delayed implementation on their own systems, they nevertheless conceded to BART’s demands. An MTC manager whom we interviewed described,

So what ended up happening in the following couple of years was a pretty destructive cycle of the agencies developing new requirements [and contract change orders], saying it wasn’t good enough...and essentially refusing to break ranks with each other and turn the system on. So until everyone’s requirements were satisfied 100%, no one was willing to put a toe in the water.

The deluge of change orders placed additional pressure on the contracted vendor, ERG, which was not able to adequately respond. According to our interviews with some of the agencies, ERG’s business strategy was to set up and deploy the equipment as a loss leader in order to make profit through operating the proprietary system. Because of this business model, ERG was eager

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to over-promise system setup, and the company has subsequently fallen far behind schedule. While the delays in farebox installation can fairly be attributed to the vendor over-committing their

abilities, the overall delay of the project is equally, if not more so, attributed to institutional dynamics among multiple operators and lack of authority over the management of the project.

Institutional conflict in authority over Translink’s objectives

The MTC’s vision for automating operators’ fare collection systems presented some problems, however, for the Translink project due to institutional conflict between MTC, viewed as the coordinating and funding agency, and the transit providers that are responsible for their

operations. Translink's new focus on fare collection automation and MTC's charge for implementing the new system presented two problems: (1) operators were hesitant to relinquish control over their operations (and finance), of which fare collection was an integral part, and (2) while MTC was responsible for implementation, it lacked the authority to do so.

One interviewee who was a former manager at the MTC described operators' hesitancy in relinquishing control over fare collection, and how this attitude shaped how business was conducted at joint meetings:

[A]gencies wouldn't even let us at MTC put the readers on board because they were afraid of success that wasn't on their own terms and they were afraid of losing control...I will tell you that the transit districts themselves have never looked past our role as the one handing out the money. When we all came together in a project environment to deliver Translink, MTC was acting like a project management organization, and all the agencies sat at the table doing another programming exercise, arguing over how big their slice of pie was....I kept trying to yank the operator people...back to deployment. And they [just] wanted to talk money....[T]he transit district, politically, is such a vocal organization, so territorial and uninterested in yielding any of their authority for a higher, more coordinated purpose – you walk into that with a lot of tension in the relationship and it's hard to find a comfortable space to operate together.

One interviewee from a local operator also expressed the same opinion about his peer operators:

To be very honest I think all the agencies liked the concept [of Translink] but didn't want to participate because they'd lose some control...Caltrain, BART, Muni, the three operators here, we could actually have consistency across our ticket type. [A local operator] said no – because they would lose revenue streams that they hold very close to their vest....You would think that everyone wants to help out that passenger move from San Francisco through San Mateo to San Jose as an example of flowing through our system. That's not true. They're really trying to protect their turf. They don't want to lose the passenger to another agency. They don't want to lose the funding to another agency. So they're in there to build their own walls around their agency.

Lack of accountability

Despite its role as coordinator of regional projects and services, the MTC lacked authority over the Translink project because it heavily overlapped with operations and

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finance. Because fare issues fall within the purview of finance departments, and because Translink was a relatively high-profile project, MTC project management staff responsible for implementation worked together with operators' financial executives, who were not directly responsible for deployment and implementation. One interviewee from the MTC described this mismatch in staff authority between partner agencies, and the lack of accountability within each agency to deploy the project:

It became very uncomfortable for me personally ...to say 'wait a sec, I know you're the CFO of [a local operator] and let me spend a few minutes bowing down to you but you don't know a goddamn thing about deploying projects.' And I didn't have the authority or the credibility to say that to anybody. None of them are project managers. None of them have ever delivered a small project never mind a big project. And none of them had any of their performance evaluation or compensation within their own organization associated with anything having to do with implementing [Translink]. I don't know for a fact what they were evaluated based on but I guarantee you it was closer to 'representing our organization' rather than 'delivering the program.' ...So that was at the heart of why things went very sour.

Even among the consortium of operators, accountability was dispersed among multiple players:

MTC didn't want to look like the bad guy forcing it on everybody so they backed off. I'm not sure that's the right or wrong thing to do but that's what they did. They said all these other operators will now be responsible. And the operators say, we're not responsible, it's the consortium. All six operators will say that. Six general managers and consortium are busy running their own operations and really don't have time for Translink.

Lessons learned

- Consensus-based decision-making, though needed to woo operators into participating, created its own hurdles, with a few agencies delaying the entire project for the region. Because all agencies agreed to retain their current fare policies and structures, Translink has become less radical than it was once proposed, and makes more concessions to operator autonomy.
- Without the funding provided by the MTC, it is unlikely that all the agencies in the consortium would have joined. The centralized financing has minimized any disputes over the costs of the systems, but may have contributed to the "lack of ownership" among

participating operators. These sentiments were heard from more than one interviewee – one project manager described Translink’s “leadership vacuum,” and another reported that agencies’ veto power left the project susceptible to severe delays as agencies attempted to fully replicate their fare policies.

- When asked what could have been done differently, one interviewee explained that the project may have gained more political support had the consortium been able to deploy Translink with limited functionality on a few operators, or fully deployed the system one operator at a time to build momentum of support for full regional roll-out. Another interviewee suggested that difficulties in the project management stemmed from the region’s desire to mask the complexity of fare structures through technology, and that technological implementation and software development may have been simpler if agencies had coordinated fares prior to system procurement.

Santa Barbara County: Prohibitive Costs and Lack of Precedence in Revenue Sharing

According to a manager in strategic planning, transit operator staff in Santa Barbara County have considered the use of smart cards on several occasions as a way to integrate the various operators in the region and make fare payment easier for riders who travel using multiple service providers. Our interviewee explained that in addition to the one primary operator serving the south coast of the Santa Barbara area, several other operators operate service in the northern areas of the county with connecting peak period service to the southern part of the county. One operator from Ventura County provides service into the Santa Barbara area.

Consideration of smart cards first began ten years ago in the 1990s, but the state of the technology at the time and the estimated costs of the system implementation were large enough concerns to prevent adoption. The primary obstacle to smart card adoption has been high costs, especially for a relatively small agency. Our interviewee’s agency in FY2004 served a little over seven million passengers, operating 30 routes, 2.3 million annual service miles, and 178,000 annual service hours.

When asked under what circumstances his/her agency would likely reconsider smart card systems for fare collection, our interviewee explained that besides overcoming the cost, some

political support for the system or direction from higher government would be important for further consideration. Specifically, there would need to be,

...a desire on the part of the community for a more seamless transit experience... [Our] MPO... is currently doing a transit study of all the agencies in the north county, and to the extent that what comes out of the plan is some recommendations for a unified fare policy that will probably be the desire on people's parts to have us join in. If that is the result... we will be considering smart cards as one method of doing that.

Our interviewee reported that if a countywide initiative existed, he/she would be concerned next about the application of the technology to fare policies and its effect on the agency's revenues.

As you'd expect, a program involving smart cards also involves some sort of savings to the rider, which also means then potential loss of revenue to the various operators. So you'd have to work out an equitable system to make the agencies whole with regard to fares and the capital cost of implementing the program...presumably some sort of free transfer policy for the rider would be part of the equation.

Additionally, the formation of a countywide, multi-agency partnership around an interoperable project currently lacks precedence on how revenues would be shared. Currently, there are no transfer agreements in place, perhaps indicating that there has been no demand – either from the riding public or other agencies – to make transfers seamless.

In the meantime, partnered programs with other non-transit institutions are working well with existing fare media programs. For example, one large operator in Santa Barbara County offers a flash pass program for students at University of California, Santa Barbara (UCSB). A portion of students' registration fees pay for transit services, and students can ride buses without paying at the farebox. The operator also has a relatively new magnetic stripe card program for UCSB staff and faculty, which allows staff and faculty to pay full fare on a per ride basis.

When asked about expectations if smart cards are adopted in the future, an interviewee said,

There's no discussion about implementing smart cards at this time...It doesn't mean we never will. We just haven't up to this point...If we ever discuss smart cards again, if that does come back to life, I'm sure that issue [of changing fare policy, and/or transfer policy between agencies] will be part of the discussion.

Philadelphia Area: Technological Limitations with Multiple and Nontraditional Modes

Southeastern Pennsylvania Transportation Authority (SEPTA) is the major transit service provider for the Philadelphia metropolitan area, and is currently considering the use of smart cards for all five modes that they provide -- bus, subway/elevated rail, commuter rail, paratransit, and parking facilities. Their service area includes the city and county of Philadelphia, and four adjacent suburban counties, comprising of 2,200 square miles and a service population of almost four million people. Additionally, SEPTA provides limited commuter service into New Jersey and Delaware, and engages communication with other service providers in outlying areas to minimally coordinate services. This centralized nature of transit provision in the Southeastern Pennsylvania region presents a different set of institutional obstacles than regions with decentralized and multiple operators.

We're unusual because we are somewhat of a public monopoly... and unlike other areas, especially the [San Francisco] Bay Area, where there's [sic] probably 26 partners in their Translink project...[T]here the rationale was really fare uniformity – just to have everyone using a single fare media instead of separate types...In Philadelphia it's the opposite...we're kind of the major game in town.

The first attempt to evaluate smart card fare collection technology took place in 1998, when a new general manager was hired with a clear directive to change declining ridership trends. The GM sought “to find the right balance of ridership and revenue,” and the agency initiated a fare policy and fare collection modernization study that was completed in 2000. At the time, however, SEPTA's fare boxes were only about five years old, far from reaching the end of their 12-year life cycle, and estimates for magnetic and smart card hybrid systems carried a price tag in the low \$90 million range.⁵ Recounted an interviewee about the fare policy evaluation and the subsequent rejection of the fare modernization project,

I managed the fare collection contract and a colleague managed the fare policy contract; we felt we'd first figure out what the fare would be and then decide what the equipment would be. And that was the game plan. Because of the nature of transit fare elasticity, we had very little room to maneuver to maximize ridership

⁵ SEPTA Fare Collection Analysis and Conceptual Design Study, Phase B – Task 6 Final Report, by PB Team, LTK Engineering Services, November 30, 2000

and revenue, and it turned out that the Holy Grail for getting that right mix wasn't that different from what we were doing already. The whole motivation to do the fare media was that we'd have this new fare policy to carry it, but the wind really went out of the sails for fare policy when the modeling exercises were finished. Then when we saw the price of the smart card system, it all collapsed at that point.

While the primary motivation to explore smart card technology in 2000 was to find a technology that could carry forward a new fare policy,⁶ in 2005 the chief financial officer and treasurer of SEPTA resurrected the fare collection modernization effort for several different reasons: (1) existing equipment was reaching the end of its life cycle, and (2) the price of smart card systems had decreased significantly. As of July 2006, SEPTA was six months into a new effort to "define the right mix of technologies to upgrade and modernize the existing system."

This time around, the initial evaluation and recommendation are focused around the feasibility of configuring smart card systems for five different modal areas (each with unique needs) that SEPTA operates— bus, subway/elevated rail, commuter rail, paratransit, and parking. Currently, fare collection on buses is handled through a read-only magnetic stripe card for monthly and weekly unlimited ride passes. Subway, elevated, and commuter rail fare payment are handled through flash passes, which are checked when the conductor sweeps the train and collects or inspects fare instruments. Paratransit fare payment is handled using magnetic passes or cash. Finally, parking collects only cash through a drop-box at parking lots along the commuter rail lines.

We are looking at how the concept would work with smart cards alone or in combination with other technologies for all five modes. [For subway and elevated lines, turnstiles, and fare boxes, smart card implementation] is fairly straightforward. We know what the technology can do. The difficulty lies in some of the nontraditional modes of fare collection.

For example, on commuter rail, facilities are ungated and passengers board the train prior to fare inspection and payment; with a smart card system, each passenger's status would have to be checked by conductors with handheld computers. An interviewee explained that this requires consideration of the technology for handheld readers, introducing "another point of management...we're looking at the conductor as our turnstile and farebox."

⁶ Fare Policy Study, Final Report, by MultiSystems with NuStats International Portfoli Associates, Inc., September 2000

For paratransit, SEPTA is considering whether smart cards will reduce some of the difficulties that seniors and the disabled have with handling change and manual dexterity, and whether the upgraded system will meet the agency's need for data collection, routing, and scheduling. While our interviewee reported that these benefits are likely, from a preliminary and intuitive evaluation, smart card systems for paratransit must be carefully considered because,

... some of these modes are moving ahead with other modernization improvements. In our case, paratransit is using a new mobile data terminal to track clients and to do communications on routing and scheduling, so we're trying to dovetail a fare collection option onto that project...

Parking at railroad stations presents some additional physical challenges. Because parking configurations differ from station to station and because commuters park on different sides of the tracks, smart card readers and wiring would have to be installed on both sides of the track. Additionally, there is some uncertainty about how well readers will stand up in an unprotected environment. The agency is currently evaluating the feasibility of using smart cards, given that,

The agency official whom we interviewed discussed some of the general difficulties encountered when evaluating smart card system costs and benefits, and how this type of project is fundamentally different from the evaluation of other transit capital investments such as vehicle or station upgrades.

It's only a dollar to park but it probably brings in two to three million dollars a year in revenue. When you're in the transit business, of course you're constantly looking for change in the seat cushions, so parking has a role to play. But it probably wouldn't warrant the same type of technology investment as would the other conventional modes.

Although formal costing has not yet begun, the agency official whom we interviewed discussed some of the general difficulties encountered when evaluating smart card system costs and benefits, and how this type of project is fundamentally different from the evaluation of other transit capital investments such as vehicles or station upgrades. The estimated cost to outfit SEPTA modes is,

...a rather significant cost, although the real tangible assets of the project are hard to define, vis-à-vis a new railcar, a new station, a new bridge. It's steel and concrete versus routers and microchips. Costs of fare collection systems are

always so difficult because many of the costs are captured in other cost centers. If you take the subway or elevated station environment where you may be upgrading the infrastructure by building a new station or building communication capabilities, say putting fiber optic or a new signal system, well the same conduit holding the fiber optic, or the same WiFi network may be going into a station that fare collection could then use. So how do you allocate that cost, when you're asking about fare collection costs? It's not an easy answer.

He continued on to explain the difficulty in showing substantial net benefits resulting from the new fare collection system coupled with very clear expenditures:

...[It] is a very difficult business case because you are swapping out equipment and machines for new technology, without the benefit of new revenue and ridership. In other words, people may not choose to ride transit more. Your ridership may not grow simply for the fact that you have a more convenient and modernized fare collection system. So when you're showing the before and after, you're showing a lot of intangible benefits such as communication, better data, better controls, and less leakage in the revenue stream. On the costs, you're looking at all the technology and maintenance and capital costs. To a board member, that really looks like an unbalanced picture. Given Pennsylvania's history on mass transit, it's a difficult financial climate to justify moving ahead.

When asked about the area's general political and cultural climate, he explained the uniquely risk-averse nature Philadelphia.

Philadelphia has a strong Quaker tradition. We'll be the last to build a baseball stadium, the last to build a convention center, and predictably we'll be the last of the major properties to modernize fare collection. Quakers are very risk adverse...and they don't do anything unless it's absolutely necessary.

Should SEPTA choose to implement a smart card fare collection system, however, it would have the advantage of guidelines for a standardized open architecture on smart card specification, written by the Port Authority of New York and New Jersey.

Should SEPTA choose to implement a smart card fare collection system, however, it would have the advantage of guidelines for a standardized open architecture on smart card specification, written by the Port Authority of New York and New Jersey. Called the Regional Interoperability Standard for Electronic Transit Fare Payments (RIS), this specification was led by the Port Authority with input from the Metropolitan

Transportation Association (MTA) of New York, New Jersey Transit (NJT) and other agencies within the Tri-State region.⁷ A prototype system has also shown that smart cards, readers, and transaction processing systems under an open architecture can be procured from different manufacturers and vendors, ensuring competitive pricing and avoiding dependence on any one contractor.⁸ Functionally, the prototype system demonstrated transaction times well within the required transaction times and security parameters.⁹

An interviewee from SEPTA reported that if the agency were to adopt a smart card fare collection system, it would do so under the open architecture guidelines provided by the Port Authority. When asked whether the availability of these standards makes officials more or less likely to adopt smart cards, the interviewee reported that the regional standard does offer SEPTA some confidence, but does not guarantee smart card adoption:

I think it will provide the *opportunity* to say to our respective boards that this interoperability provides the *potential* to go beyond just transit payment into other forms of payment.

Lessons Learned

- Unlike other case studies in this report, where the primary obstacles have been coordinating between various operators, SEPTA's concerns have mostly been intra-organizational between different modes operated by the one agency.
- While other regional projects are born in the context of broader political issues such as transit finance (Los Angeles TAP) or in governing issues of authority and accountability (Bay Area's Translink), SEPTA's use of smart cards has been hindered mostly by a lack of clear benefits in the face of high costs, and issues with implementing a new technology that can meet the various requirements for multiple modes.
- The availability of a regional interoperable standard does provide some confidence in the technology, but (at least in the case of SEPTA) has not overcome the issues of

⁷ *Regional Interoperability Standard for Electronic Transit Fare Payments (RIS)*, published by The Greater New York & New Jersey Metropolitan Region, Port Authority of New York and New Jersey, Release 3.7, Version 1.29, February 10, 2006

⁸ http://www.incits.org/archive/2005/in050986/051130_Proposal_For_RIS.pdf (accessed October 28, 2006)

⁹ *Regional Interoperability Standard for Electronic Transit Fare Payments (RIS)*, published by The Greater New York & New Jersey Metropolitan Region, Port Authority of New York and New Jersey, Release 3.7, Version 1.29, February 10, 2006

implementing a new high-tech system across multiple modes that currently use fare payment systems of varying levels of technological sophistication.

Orange County: Uncertainty about Added Value of Smart Card Systems and Interoperability

Orange County currently has capability in its current fare boxes for smart card integration. If they chose, their GFI boxes will accept a smart card reader in parallel to their current equipment. About two years ago, under the leadership of one manager, OCTA evaluated and considered the use of smart cards and integration with the systems underway in Los Angeles, San Diego, or both.

The agency staff, all the way up to the General Manager of Operations, including the governance technology review committee, however, decided that the project did not add value to their existing fare collection system.

It does not make sense for us. We did not initially see a lot of value in smart cards. At that time it was not a mature technology. Even today, I truly don't believe it's a very mature technology. And there are still some disputes between LACMTA and San Diego. From our perspective, we don't care if we have a smart card or not. We would evaluate a smart card if we could see inherent value to it. We just don't see the value right now...we just did not understand what value smart cards would bring to our customers.

Most customers currently buy day passes or monthly passes on magnetic stripe cards, which have been sufficient for processing. Additionally, the low income levels of OCTA riders raises some doubt for agency officials, who question whether riders would continue loading the cards, and whether this would, "add value to their experience."

The possibility of smart card system adoption at OCTA depends on several factors. First, agency officials want to know the value of the cards to their riders, the start-up and support costs, the implications that this new technology may have for the vehicle operators. OCTA is looking to Los Angeles's and San Diego's experiences, especially with the customer experience and penetration rates, as well as their ability to reach out to non-transit partnerships.

We would like to see what they are doing first. There is no imperative for us to go with smart cards right now... From our perspective, there needs to be more acceptance of smart cards, not only by transit agencies, but by other

merchants...otherwise why would [a rider] take some of the liquidity out of cash and put it in a smart card...

In terms of the value of interoperability with another county's smart card system, our interviewee was even more skeptical. Without high volumes of transfers between OCTA and San Diego or Los Angeles operators, "interoperability in smart cards is a nice thing to have, but I just don't see a lot of business value in it."

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Additionally, the OCTA official we interviewed explained that until limited use smart cards are more readily available for use as day passes, for example, the agency would have to continue with the cheaper magnetic stripe passes in parallel to any smart card system they would adopt. Indeed, this is an issue for which the Los Angeles project is seeking an answer, as their procured integrated smart card readers will accept only smart cards and cash.

When asked how closely OCTA continues to monitor the programs in Los Angeles and San Diego, our interviewee reported that since the death of the project champion, the agency has lost its most involved individual and potential project supporter. Since then, OCTA has not been actively following the development of smart card systems in the Southern California region.

Lessons Learned

- Orange County's decision to reject smart card adoption was based on uncertain costs and benefits.
- Unlike other regional operators, however, like in Los Angeles and the Bay Area, OCTA's intended application for smart cards is not to consolidate multiple fare media in one region, but to provide a more convenient fare medium to riders. Currently, their existing magnetic stripe card system is sufficient for fare collection, especially given the costs of the smart cards (for riders) and the new system development (for the agency).
- Until there is demand for travel between OCTA and Los Angeles or San Diego services, OCTA has decided to wait and learn from other operators' experiences.

Ventura County: Early Adoption in a Small Organization

In the mid-1990s, Caltrans instigated an early smart card pilot project on the 80-bus fleet of Ventura County Transportation Commission (VCTC). The goal of the pilot project was to demonstrate the effectiveness of off-the-shelf technologies for smart card fare media. After five years of operation the demonstration project ended in 1999, in part because the technologies used were not Y2K compliant. While there were technical problems with the operation of the demonstration, VCTC recognized the added convenience for their riders and the additional data available for improved operation of their transit agencies. VCTC developed a new project in the spring of 2000, which is the ongoing GoVentura project. The whole system cost \$1.7 million to install, and was funded from federal, state, and local money. GoVentura has been in operation now for five years.

There were two main reasons that VCTC pursued a new smart card system after their demonstration project. The first reason was customer acceptance and demand. Riders loved the convenience of the cards, as many transit riders in the county use more than one transit system to get around. The second reason VCTC was enthusiastic about smart cards was the capability to obtain data on the riders' usage of the transit systems. While VCTC concedes that rider convenience can be attained by using lower-tech fare media such as magnetic stripe cards, robust ridership data is really only possible with smart cards.

The GoVentura project is unique in that it is entirely managed by VCTC, including financial clearing and reconciliation. The official we interviewed from VCTC reported that the agency is better able to take advantage of smart card capabilities by managing and clearing transactions in-house. In particular, VCTC identified the data available from smart card use as a major advantage for their operations. One complaint that we heard about smart card vendors from the Ventura experience is that, according to our interviewee, the vendors "only partially understand their product." She/he explains this statement:

They understood the fare collection of their product, but didn't really understand the value of the data, and they didn't understand bus operations as much as they should... [they] do not understand the subtleties of bus operations, and there are a lot of subtleties of bus operations...[they] don't understand the value of the data that comes from all this, and the data is far more important than the fare media.

The data are so valuable that VCTC is willing to absorb the costs of administering the data collected as well as coordinating the use of the data across all six independent transit operators in Ventura County. This cost is not trivial, and minimizes the use of smart cards as a cost saving device. VCTC also manages the six independent operators that are part of the GoVentura program. One way that VCTC minimizes friction among agencies is to treat each transit operator, in addition to the transit rider, as a customer. Our interviewee explained why he sees VCTC's partner operators as customers:

It's complex because you have a different set of customers and different set of values attached to the product. Implementing smart cards, especially on a regional level, there are two set of customers we have considered. One is the bus rider and the other is the operators who participate in the program. We have funded the entire program, but we still look at them as customers since we provided them with the data and other benefits of smart cards....Those two very different sets of customers carry a lot of requirements. When you compare that to other ITS projects, other ITS customers tend to be for a single group, which allows you to focus your project more...we are serving the fare collection portion of an operator, but we're also serving the planning portion and the policy portion of the operators. So there are a lot of customers rolled up in the operator.

The VCTC view that other operators are customers ensures that VCTC remains the central manager of the program while serving their partners' interests. This approach simplifies the role of participating agencies and improves coordination among agencies throughout the county.

Perhaps because of the long-standing experience VCTC has had with different smart card systems, they have a specific definition of interoperability that is not completely consistent with the definition provided by other smart card proponents. As the Director of Technology with VCTC explained:

We see interoperability as a huge issue...Interoperability means that you can take their card and use it on our system and our card and use it on their system. If we are all using the same system from the same vendor, that's simply one project that's very large....We identify interoperability as being able to buy a single trip from a different vendor. We still look for and hope for it. It is very difficult.

This definition specifically calls for one card for use across multiple vendor platforms, regardless of the vendor. This requires a level of openness from the vendors with regard to hardware and software that is difficult, at best, to achieve. To date, vendors such as Cubic or

ERG seek to enter exclusive contracts for smart card systems, as they have done with TAP and Translink.

Their previous experience with smart cards showed the promise of smart cards as fare media for improving the transit experience in the county. This is meaningful because Ventura County does not have a large transit riding population, and sees smart cards as a media that will help them provide better and more convenient service to their riders.

Lessons Learned

- VCTC's early experiences with smart card use have shown the data capability of the cards, and prompted the agency to continue their use primarily for customer convenience and data collection.
- VCTC's success in implementing and deploying the system may also be attributed to its relatively small fleet size and few partner operators. Its role as central data provider and manager to the participating operators minimizes disagreement between operators.

Washington Metropolitan Area: Proprietary Software and Legal Actions with Vendor

Including both Metrorail and Metrobus operations, the Washington Metropolitan Area Transit Authority (WMATA) serves a population of 3.5 million people in a 1,500 square-mile service area. WMATA has offered SmarTrip smart cards since 1999. The SmarTrip cards are usable for bus and rail fare payment, as well as for parking charges in Metro park-and-ride lots. The cards were introduced with the intent of creating a regional fare card that can be used across transit systems in Washington, D.C., Virginia, and Maryland. Future program expansion will include all 17 transit agencies in the metropolitan area that stretches from Northern Virginia through Maryland. The agencies we spoke to indicated that the SmarTrip program had always been envisioned as a regional system. One interviewee stated that smart cards were always evaluated on a regional level, and the agency was always committed to this approach. The idea of a stand alone smart card system was never considered.

There are currently over 300,000 SmarTrip cards in circulation. Riders purchase the cards for \$5 and can recharge the cards at Metro stations, on the vehicles or online. In addition, Metro has recently partnered with CitiBank to offer a SmarTrip branded credit card. The credit card functions as both a regular credit card and as a fare card. Credit card holders can transfer

funds from their credit account to their SmarTrip account, but these cards do not allow for deducting fares directly from the riders' bank accounts. Metro riders are able to use their SmarTrip cards for free intra- and intermodal transfers within the Metro system.

WMATA Created the Regional Customer Service Center (RCSC) with the aid of a grant from the U.S. Department of Transportation awarded in 2000. The RCSC provides customer service, card management, transaction clearing and settlement, and management of the point-of-sale (POS) network to the participating transit agencies. The creation of the RCSC allows for other agencies to more easily join the SmarTrip program without having to administer the fare collections and reconciliations in house. Participating agencies contract with the RCSC as the central clearinghouse for the SmarTrip administration, and the costs are paid from the individual agencies' operating funds.

The SmarTrip program is in operation and open to the public on WMATA's entire fleet of buses and all rail stations. The equipment and cards are supplied by Cubic Transportation Systems of San Diego, California, and future participating transit agencies have also entered into contracts with Cubic to procure the necessary farebox equipment and software. The full deployment of the SmarTrip system throughout the region, however, has been delayed due to concerns about which version of the operating software each agency will procure. WMATA's system uses a previous generation (Version 3) software, but other agencies are scheduled to receive Version 4. As one interviewee explained, the delay in deploying the system was largely related to the software incompatibility, which was largely vendor-driven.

The creation of a regional customer service center allows for other agencies to more easily join the SmarTrip program without having to administer the fare collections and reconciliations in house. Participating agencies contract with the RCSC as the central clearinghouse for the SmarTrip administration, and the costs are paid from the individual agencies' operating funds.

The software issue was a complete surprise to the agencies expecting to join the regional SmarTrip program. Eventually, WMATA was able to negotiate an upgrade for the Metro system to Version 4 at Cubic's expense, but this further delayed other agencies from participating. At the writing of this report, the SmarTrip farebox equipment is scheduled to be installed on transit vehicles operated by other participating agencies/

Interviewees from multiple agencies in the region said that interoperability with WMATA is a major factor influencing the decision to pursue SmarTrip cards for their riders. One interviewee explained that, “we went with Cubic for ease of interoperability with WMATA.” WMATA’s investment in its own system reduced much of the risk for other agencies, and made their decisions to join relatively easy, since Cubic technology was tested and proven on WMATA’s fleet.

We selected [to use smart cards] because the technology was already in place on the rail portion of WMATA, which is most of the riders in the region...I don’t think we would be pursuing smart cards if this wasn’t a regional program.

Transit agencies were interested in smart cards because WMATA was taking the lead, but the agencies are encouraged to participate through federal and state grant money that subsidizes the costs of equipment installation. The Virginia Department of Transportation offered grants that covered the initial costs of joining SmarTrip. However, the grant money from the state became available after Cubic was selected as the WMATA vendor. At least one agency official we interviewed indicated that they were not part of the vendor negotiations at all, but was relatively happy following WMATA’s lead.

One agency in Virginia used grant money to replace their fare boxes with ones designed for smart cards. This agency was interested in electronic fare boxes before the grant money was available, but was not going to buy smart-card-ready equipment due to the cost. After state money was available for joining the SmarTrip program, the agency decided getting involved with smart cards was a priority.

The SmarTrip program takes advantage of partnering opportunities, as well. Being in the nation’s capital, many transit riders share the same employer—the federal government. One agency reported that 95 percent of their riders are federal employees. Federal employees have been using smart cards for transit for about 10 years, and have been able to refill their fare passes through their paychecks. Because of the size of the federal workforce, some agencies expecting to join the SmarTrip program estimate that over 70 percent of their ridership already carries the SmarTrip cards for use on Metrorail or Metrobus. These existing users increase the transit agencies’ interest in improving the convenience of using their transit systems, as well as credit card companies’ interest in capturing small transactions from a well-defined and established market segment.

General Observations and Conclusion

One problem with collecting interview data on the decision-making process around smart cards is changes in staffing at these respective agencies. For some organizations and smaller areas, such as Santa Barbara, we must rely to some degree on lore passed down through agencies as project managers or principle decision-makers leave projects, move onto other organizations, or even when they pass away, as was the case with OCTA. With these changes, organizations lose institutional memory about how events were shaped in past evaluations, internal discussions, and even public deliberations. Additionally, even when we were able to contact officials who were directly involved in past or present decision-making processes around smart cards, we rely on their accounts of events, which are often influenced to some degree by their individual interpretation of the world, and some level of individuals' attempts to "make sense" of events *post facto*. Even with verifying techniques such as interviewing multiple individuals from the same agency, it is difficult to know the extent to which officials as a group within an agency may reify, understand, or corroborate events or histories.

Despite these issues, our interview data do provide us some important findings and observations and raise further questions for future research:

1. Agencies participating in smart card projects must balance the need to replace aging fare collection equipment, with the uncertainty of adopting a new system that may take years to implement – so many years, in some cases, that new and more advanced technology may become available. Some agencies are choosing to wait for other leaders to share lessons learned, but other agencies are also taking advantage of funding opportunities provided by their regional projects, despite uncertainty about how operating costs will be shared.
2. Cost and funding availability is a crucial issue in deciding on new technology adoption. (Santa Barbara, SEPTA, Los Angeles). This issue is also compounded by uncertainty about the actual benefits of the smart cards to agencies.
3. The number of key players in a region may be an important factor in how quickly an interoperable system can be deployed. SEPTA and WMATA were able implement what they planned without much coordination with other operators in the region because they are by far the largest agency in the region with much funding available to implement the smart card technology. In contrast, two key local operators in the Bay Area made the planning very difficult. In the Los Angeles case, although LACMTA is vastly larger than

its partner operators, most political struggle is between the MTA/Metro and the municipal operators as a group.

4. Transit agencies, clearly risk-averse institutions in a static industry, show little interest in doing different things (i.e. new kinds of service, new markets, etc.) or doing things differently (i.e. marginal cost pricing, linking with larger smart card systems, etc.). Rather, their focus appears to be on *adding* a new fare media type, while keeping current fare systems (cash, flash passes, etc.) largely in place. It is no wonder that most see only marginal benefits from adopting complex, expensive new systems.
5. The causes of lack of coordination among agencies in a region run much deeper than fare media (i.e. institutional mistrust, competition, etc.), so it is no surprise that new fare media do little to increase coordination. However, operators participating in regional projects have suggested some strategies for coordinating multiple agencies that may not trust each other. When smart cards have presented some threat to regional distribution of funding, for example, the MTA has separated smart card financing from broader discussions about regional transit finance by budgeting smart card operation costs through annual budgets rather than through regional budgets.
6. Where existing revenue sharing programs exist, interoperable smart card systems may be easier to implement due to existing arrangements and agreements. Additionally, some interview data suggest that “piggybacking” smart card projects on existing policy or external events – such as operator strikes or disasters – may ease institutional barriers.
7. Our interviews suggest that smart card vendors may not always understand how their products will be used by transit agencies. The VCTC example, for instance, and some of the problems in the Bay Area were due to vendors’ poor understanding of transit. Also, the vendors offer little in the way of useful data products, which seem important enough for even a small regional operator to pursue smart cards.
8. In hindsight, our interviewees as a group raised issues that warrant further exploration: First, should multi-agency partnerships first install equipment and then work out governance and business rules, or should they decide upon the governance and business rules before equipment installation? Second, should consortia standardize the technology first, or agree on a region-wide set of fares first? Last, should consortia attempt to adopt a limited smart card system, but build upon it gradually over time, or produce all design requirements before turning on the system?

The next phase of our research will examine perspectives from the state and metropolitan planning organizations, and synthesize these findings to examine obstacles experienced at local, regional, and state levels.

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Appendix A: Consent Script and Interview Guide

Introduction and Consent:

Thank you for considering being a participant in our research on the use of smart cards for fare collection by transit agencies. As you may know, this research is being conducted by the UCLA Institute of Transportation Studies on behalf of the California Department of Transportation. This interview should take about forty-five minutes, and you are free to stop the interview at any time. The interview will be recorded for the purpose of transcribing our conversation, only so that we can make sure we fully understand your answers.

It is important that you understand that your responses are strictly confidential and participation is voluntary. At any time after the interview, you can review, edit or erase the tapes of your participation. Your responses will be reviewed only by the UCLA researchers working on this project and any identifying information will not be shared with the California Department of Transportation, or any other individuals or organizations. Further, none of your responses will be presented in any publications or other materials produced from this research in a way that identifies you or your transit agency without your explicit authorization.

Will you agree to be interviewed for this project? (Yes/No)

Are you comfortable with this interview being recorded? (Yes/No)

Thank you.

(At this point either the interview will begin or the participant will be thanked for their consideration and the conversation will end.)

<p>Please describe the process by which your agency joined the consortium of operators in your region.</p>
<p>Genesis of the idea of SC or IO system (was there something about the timing of the idea)? Was there precedent already?</p>
<p>How did the idea spread through your agency? Through your region/consortium? Lines of communication or protocol for considering an idea (set by previous ITS projects, previous partnerships with other transit agencies and non-transit agencies).</p>
<p>Who led the process? Who were the key players (champions) and why did they play such important roles in the adoption?</p>
<p>Where was the project or decision “located” in your consortium? In your particular agency? (Were smart cards an operational, financial, or planning project)? In your opinion, did it matter which department or agency initiate, recommended, evaluated, or managed the project?</p>
<p>How was the lead agency selected? What are the lead agency’s primary responsibilities or interests? (Enforcement, coordination, resolve disputes among participating agencies, funding, etc.)</p>
<p>What is your agency’s role (participant or lead) in the IO system?</p>
<p>Was it easy or difficult to obtain a consensus among agencies in the region from the beginning? What were the concerns? Who was interested in this, who was not? What did operators agree on? What did they disagree on?</p>
<p>How did participants of the consortium reach agreement on disputed issues?</p>
<p>What were the principal factors motivating your agency’s adoption of IO smart cards? Principal factors motivating the region or the consortium? What, in your view, was the most important reason for adopting smart cards? For adopting IO smart cards?</p>
<p>Were other means available (besides SC) for achieving that objective? Why were smart cards chosen over other means?</p>
<p>How did your agency evaluate SC potential or potential of an IO system? Extent of evaluations? Agency’s ability to do in-house evaluation? Did you look to other agencies? Sources of information?</p>
<p>What were incentives for your agency to adopt? What were the risks and costs?</p>
<p>When adopting SC, was the ability to change fare policy considered an important</p>

factor? Major issue, minor issue, or non-issue (Why or why not?)
When in the process (and how) did your agency or consortium identify funding for SC? What are federal sources of funding? What are regional sources? What are local sources? Require voter approval?
How did you select your vendor? Challenges? Problems? Describe your agency's (or your consortium's) negotiations with the smart card vendor. Did you have sufficient information or leverage? Did you develop with the vendor specialized products for your agency or region, or use already developed products?
Were there unexpected challenges or successes in deciding on the technology or on an IO system?
Please tell us a little about the <i>implementation and applications of IO smart cards.</i>
What are short-term uses for smart cards? What are long-term visions for smart card applications? Do you intend to (or do you already) partner with other non-transit industries for smart card applications (such as banks, toll-collection, security cards, etc.)? What do you foresee as (or have been) challenges or advantages to doing so? How about implications for costs?
Did your agency keep cash fares with the adoption of SC? If so, why? If not, why not? If you have cash fares now, do you plan to phase them out in the future? Why/why not?
Has the implementation of SC been similar to the implementation of other ITS technologies that your agency has undertaken? If so, how? If not, why not?
Has the implementation of a partner IO program been similar to implementation of other partnered or inter-agency programs that your agency has undertaken? If so, how? If not, why not?
How was the system financed?
How were revenues reconciled/shared before IO system? How is it done now? Was it difficult to implement the IO because of revenue sharing issues? Why? Why not?
What worked or did not work well in planning and implementation of the interoperable smart card system? Could anything have been done differently?
What kinds of data are you collecting with smart cards, and how does your agency use the data? How does your consortium use the data?
When deciding on forming a consortium or adopting SC, was the ability to implement flexible fare policies (e.g. distance- or time-based fare) considered? Was it a major issue, minor issue,

Now that your consortium has adopted and/or implemented IO smart cards, how would your agency evaluate the project so far?

Are there specific organizational or regional objectives that smart cards help your agency or consortium address? If so, what evidence is there that SC is achieving its intended goals? If not, why/how did smart cards fail? Any unintended benefits? Any unintended shortcomings?

Are smart cards a radical new tool, or are they a mild improvement on the previous system?

Unexpected benefits, unexpected costs, unexpected challenges, anything surprisingly easy about forming the IO system? Was formation of consortium or interagency agreements more or less difficult than initially expected? If so, why? If not, why not? Did the technology present any unexpected challenges? Was anything unexpectedly easy about the formation of the consortium? If so, why was it easy?

Statement of Confidentiality:

Okay, just a few more questions. As I stated at the beginning of our interview today, your responses are confidential and we will not present any of your responses in a way that can be linked directly to you.

However, in writing our reports and to most clearly convey some of the issues you've discussed today, would you allow us to use quotes from our conversation today? (We would not identify you directly.) **Yes/No**

Would you authorize us to identify your position in our reports? **Yes/No**

If we would like to identify your agency in our reports, would you be okay with that?
Yes/No